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Bird Conservation Strategy for Bird Conservation Region 5: Northern Pacific Rainforest

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Preface

Environment Canada (EC) led the development of all-bird conservation strategies in each of Canada's Bird Conservation Regions (BCRs) by drafting new strategies and integrating new and existing strategies into an all-bird framework. These integrated all-bird conservation strategies will serve as a basis for implementing bird conservation across Canada, and will also guide Canadian support for conservation work in other countries important to Canada's migrant birds. Input to the strategies from EC's conservation partners is as essential as their collaboration in implementing their recommendations.

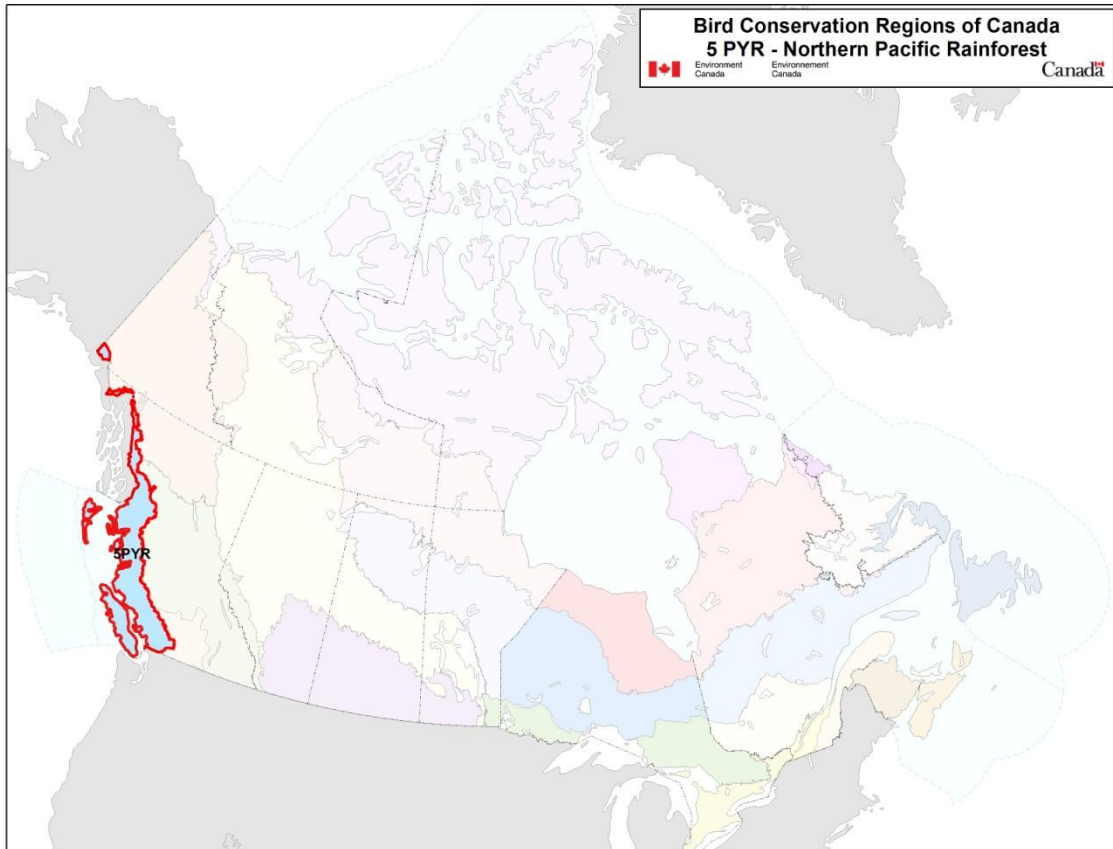
Environment Canada has developed national standards for strategies to ensure consistency of approach across BCRs. Bird Conservation Strategies will provide the context from which specific implementation plans can be developed for each BCR, building on the programs currently in place through Joint Ventures or other partnerships. Landowners including Aboriginal peoples will be consulted prior to implementation.

Conservation objectives and recommended actions from the conservation strategies will be used as the biological basis to develop guidelines and beneficial management practices that support compliance with regulations under the *Migratory Birds Convention Act, 1994*.

Acknowledgements

Ivy Whitehorne, Paul Levesque, Véronique Connolly, Alicia Newbury and Elsie Krebs were the main authors of this document. This strategy follows templates developed by Alaine Camfield, Judith Kennedy and Elsie Krebs with the help of the BCR planners in each of the Canadian Wildlife Service regions throughout Canada. However, work of this scope cannot be accomplished without the contribution of other colleagues who provided or validated technical information, commented on earlier draft versions of the strategy, and supported the planning process. We would like to thank the following people: Jeanine Bond, Sean Boyd, Andre Breault, Rob Butler, Dan Buffett, Dick Cannings, Pete Davidson, Krista De Groot, Wendy Easton, Dan Esler, Kevin Fort, Dave Fraser, Moira Lemon, Erika Lok, Tanya Luszc, Nancy Mahony, Kathleen Moore, Ken Morgan and Patrick O'Hara.

Bird Conservation Strategy for Bird Conservation Region 5: Northern Pacific Rainforest



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Executive Summary

The Northern Pacific Rainforest, Bird Conservation Region (BCR) 5, extends from the western Gulf of Alaska south through British Columbia, Washington, Oregon, to northern California. In Canada, the terrestrial portion of BCR 5 is about 205,000 km² in extent, covering British Columbia from the coast inland through the Coast Mountains, and includes Vancouver Island and Haida Gwaii. It also extends northwards inland of the Alaska panhandle and includes a small corner of extreme southwestern Yukon Territory. This region encompasses the marine environment as well, from the coastline westward to the limit of Canada's 200-nautical mile exclusive economic zone. BCR 5 is dominated by mountainous topography cut by numerous fjords and glacial valleys. Coastal waters are ice-free and associated with a narrow coastal shelf and slope. The region has some of the wettest climate in North America, with the north coast receiving up to 5,000 mm of rain a year. The oceanic influence also means temperatures are generally mild.

This conservation strategy for BCR 5 in the Pacific and Yukon Region (PYR) builds on existing bird conservation strategies and complements those created for the other BCRs across Canada. BCR strategies will serve as a framework for implementing bird conservation nationally, and also identify international conservation issues for Canada's priority birds. This strategy is not intended to be highly prescriptive, but rather is intended to guide future implementation efforts undertaken by various partners and stakeholders.

The mild coastal climate and Pacific Ocean combine to create important bird habitats unique to this BCR. While estuaries form only a tiny fraction of the coastline, they are crucial habitat for a wide variety of waterfowl, seabirds and shorebirds. BCR 5 is also a major migration and wintering area for birds in Canada. Wetlands of the Fraser River delta and estuary are the most important wintering habitat for waterbirds in British Columbia, and the delta also supports millions of migrating shorebirds and the largest overwintering population of raptors in Canada. The Fraser River estuary's importance has been widely recognized, both as a site of hemispheric importance under the [Western Hemisphere Shorebird Reserve Network](#), a [Ramsar site](#) and an [Important Bird Area](#).

Two hundred and ninety-three (293) species of bird regularly breed, overwinter or migrate through the Canadian portion of BCR 5.¹ Of these, 139 species were identified as priority species. All bird groups were represented on the priority species list, although the list is dominated by landbirds (41% of the total list) and waterbirds (27%). Over half of the waterbirds (56%) and waterfowl (62%) occurring in BCR 5 were identified as priority species, as compared

¹ Species occurrence was determined using records obtained from *The Birds of British Columbia* (Campbell et al. 1990, 1997, 2001), preliminary data from the [British Columbia Atlas of Breeding Birds](#), [eBird Canada](#), [NatureServe](#), the Pacific Coast Joint Venture's *Strategic Plan and Biological Foundation* (Martell 2005), the *Atlas of Pelagic Seabirds* (Kenyon et al. 2009), Bird Studies Canada's British Columbia Coastal Waterbird Survey dataset (1999-2007), and expert opinion.

to only 39% of the landbirds. Forty-six percent (46%) of the priority species are considered at risk, either federally or provincially.

Identifying the broad habitat requirements for each priority species within the BCR allowed species to be grouped by shared habitat-based conservation issues and actions. Coastal habitat types (including estuaries, rocky shorelines, mudflats and beach/dune habitats) and waterbodies (both marine and freshwater) are important for a broad suite of waterfowl, shorebirds, seabirds and even some landbirds. Forested habitats throughout the BCR, especially mature and old growth coniferous habitat types, are particularly important to a large set of priority landbirds. Also important to this bird group are herbaceous habitats, specifically the endangered Garry Oak ecosystem as well as old field habitats in the Lower Mainland and southeastern Vancouver Island.

The population objectives in this strategy are categorical and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain." Over 63% of priority species, with representatives from all bird groups (landbirds, shorebirds, waterbirds and waterfowl), were assigned an objective to "assess" population status while "maintaining" current levels in the interim. For 6% of species, population levels were deemed to be at or near the objective. Five percent (5%) and 9% of species were assigned objectives to increase the population by 50% and to double the population, respectively. For a small proportion of species (6%), all listed under the federal *Species at Risk Act* (SARA), we have deferred to the population objectives developed in Recovery Strategies.

An assessment of threats identified a number of conservation issues facing priority species in the various habitats of PYR's BCR 5. Residential and commercial development was recognized to be a very high threat across most terrestrial habitat types for many priority species (including waders like the Great Blue Heron, many shorebirds, and several raptor species, including owls). This is probably most true in southern parts of the BCR, such as the Lower Mainland and southeastern Vancouver Island. Logging and wood harvesting was identified as a very high threat in all forested habitats for many priority species (e.g., Northern Saw-whet Owl, Marbled Murrelet, Chesnut-backed Chickadee, Harlequin Duck). Invasive non-native species also emerged as a very high threat, particularly in coastal habitat. Many of these are colonial-nesting seabirds subject to predation by introduced mammalian predators (rats, racoons, mink) on offshore islands. Climate change also was identified as a very high threat, and again the list of affected species is dominated by seabirds, like Pink-footed Shearwater and Cassin's Auklet, as warming sea surface temperatures are thought to be linked to lower ocean productivity. Climate change may manifest in the form of sea level rise, which may eliminate or severely reduce the extent of certain coastal habitats (e.g., mudflats) that are key migratory stopover foraging sites for shorebird species such as Western Sandpiper, Dunlin and Red Knot. Finally, oil pollution emerged as a high-level threat for a great number of seabirds and waterbirds (e.g., Black-footed Albatross, Common Murre, Pelagic Cormorant) that rely on coastal and offshore marine waters throughout the BCR.

Conservation objectives were designed to address threats and information gaps that were identified for priority species. They describe the environmental conditions and the research and monitoring that are thought to be necessary for making progress towards population objectives and for understanding underlying conservation issues for priority bird species. The majority of conservation objectives for BCR 5 relate to maintaining or enhancing habitat quality and quantity, and to reducing mortality or increasing productivity. Ensuring adequate habitat includes maintenance of the full range of naturally occurring habitat types, maintaining the quality of existing habitats, and retaining important features on the landscape (e.g., standing dead snags for cavity nesting birds). Reducing mortality includes addressing a wide suite of sources of accidental mortality, including bycatch in commercial fisheries, ingestion of plastic or lead shot, exposure to oil, collisions with human-made structures, destruction of nests, and pesticide poisoning.

Recommended actions identify on-the-ground activities that will help to achieve the conservation objectives. Actions are deliberately strategic rather than highly detailed and prescriptive. Whenever possible, recommended actions will benefit multiple species and/or respond to more than one threat. Given the importance in BCR 5 of conservation objectives relating to the maintenance and enhancement of habitat, it is not surprising that securing and protecting habitat emerges as a key theme. Actions relating to the development of beneficial management practices or other voluntary private sector codes of practice are similarly common, in part because site management and protection actions often have aspects that relate to the development of voluntary best practices. Another large set of recommended actions relate to policy and practices surrounding fisheries bycatch of seabirds. A significant proportion of actions fall into both the monitoring and research categories, indicating that knowledge gaps exist for specific species (relating either to a specific threat or current population status) where more information is required before conservation actions can be effectively formulated.

Introduction: Bird Conservation Strategies

Context

This document is one of a suite of Bird Conservation Region Strategies (BCR strategies) that have been drafted by Environment Canada for all regions of Canada. These strategies respond to Environment Canada's need for integrated and clearly articulated bird conservation priorities to support the implementation of Canada's migratory birds program, both domestically and internationally. This suite of strategies builds on existing conservation plans for the four "bird groups" (waterfowl,² waterbirds,³ shorebirds,⁴ and landbirds⁵) in most regions of Canada, as well as on national and continental plans, and includes birds under provincial/territorial jurisdiction. These new strategies also establish standard conservation planning methods across Canada, and fill gaps, as previous regional plans do not cover all areas of Canada or all bird groups.

These strategies present a compendium of required actions based on the general philosophy of achieving scientifically based desired population levels as promoted by the four pillar initiatives of bird conservation. Desired population levels are not necessarily the same as minimum viable or sustainable populations, but represent the state of the habitat/landscape at a time prior to recent dramatic population declines in many species from threats known and unknown. The threats identified in these strategies were compiled using currently available scientific information and expert opinion. The corresponding conservation objectives and actions will contribute to stabilizing populations at desired levels.

The BCR strategies are not highly prescriptive. In most cases, practitioners will need to consult additional information sources at local scales to provide sufficient detail to implement the recommendations of the strategies. Tools such as beneficial management practices will also be helpful in guiding implementation. Partners interested in participating in the implementation of these strategies, such as those involved in the habitat Joint Ventures established under the North American Waterfowl Management Plan (NAWMP), are familiar with the type of detailed implementation planning required to coordinate and undertake on-the-ground activities.

² NAWMP Plan Committee 2004

³ Milko et al. 2003

⁴ Donaldson et al. 2000

⁵ Rich et al. 2004

Strategy Structure

[Section 1](#): Summary of Results – All Birds, All Habitats of this strategy presents general information about the BCR and the subregion, with an overview of the six elements⁶ that provide a summary of the state of bird conservation at the sub-regional level. [Section 2](#): Conservation Needs by Habitat provides more detail on the threats, objectives and actions for priority species grouped by each of the broad habitat types in the subregion. [Section 3](#): Additional Issues presents additional widespread conservation issues that are not specific to a particular habitat or were not captured by the threat assessment for individual species, as well as research and monitoring needs, and threats to migratory birds while they are outside of Canada. The approach and methodology are summarized in the appendices, but details are available in a separate document (Kennedy et al. 2012). A national database houses all the underlying information summarized in this strategy and is available from [Environment Canada](#).

⁶ The six elements are: Element 1– priority species assessment; Element 2 – habitats important to priority species; Element 3 – population objectives; Element 4 – threat assessment; Element 5 – conservation objectives; Element 6 – recommended actions.

Characteristics of Bird Conservation Region 5: Northern Pacific Rainforest

BCR 5, the Northern Pacific Rainforest, extends from the western Gulf of Alaska south through British Columbia, Washington, Oregon, to northern California. In Canada, the terrestrial portion of BCR 5 is about 20.5 million hectares (ha) in extent, covering British Columbia from the coast inland through the Coast Mountains, and includes Vancouver Island and Haida Gwaii (Fig. 1). It also extends northwards inland of the Alaska panhandle and includes a small corner of extreme southwestern Yukon Territory. BCR 5 also encompasses the marine environment, from the coastline westward to the limit of Canada's 200-nautical mile exclusive economic zone. In British Columbia, terrestrial areas of BCR 5 are represented by the Georgia Depression and Coast and Mountain Ecoprovinces; the marine portion of the BCR is represented by the Strait of Georgia, Southern Shelf, Northern Shelf and Offshore Pacific Marine Biogeographic Units.

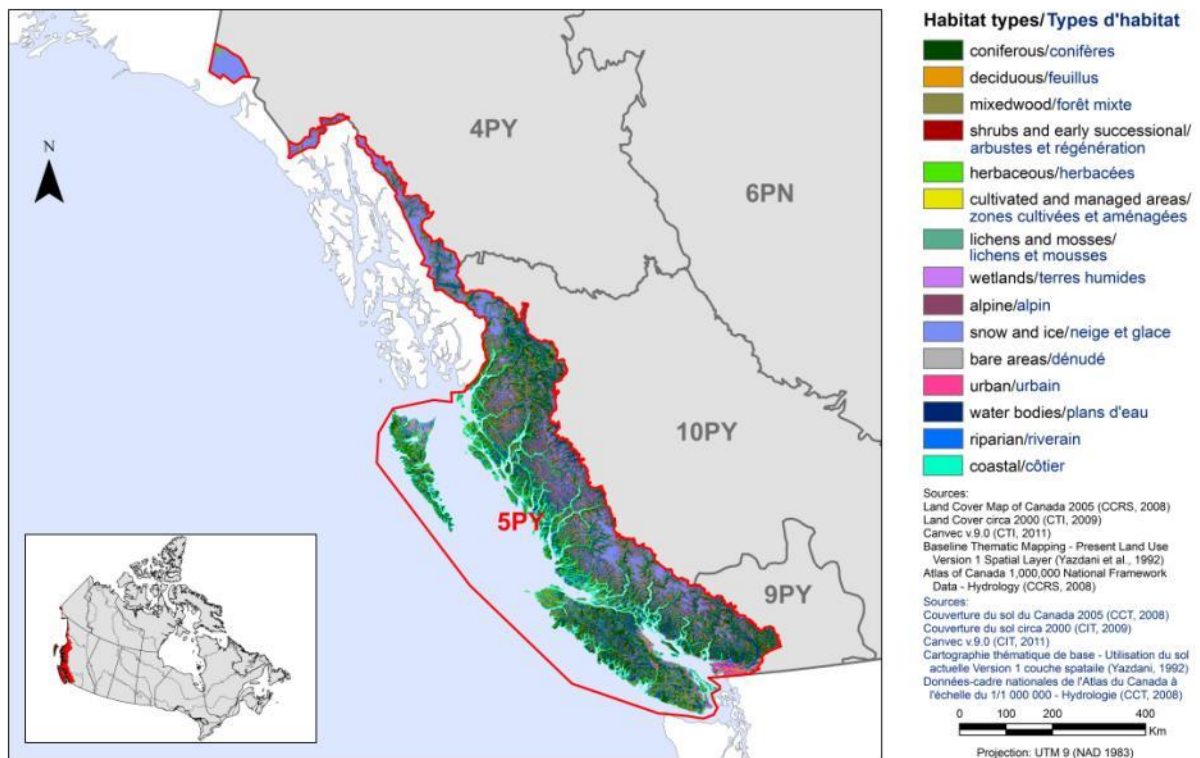


Figure 1. Landcover in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

BCR 5 is dominated by mountainous topography cut by numerous fjords and glacial valleys. Coastal waters are ice-free and associated with a narrow coastal shelf and slope. The region has some of the wettest climate in North America, with the north coast receiving up to 5,000 mm of rain a year. The oceanic influence also means temperatures are generally mild (Martell 2005). The rugged coastline of BCR 5 supports millions of breeding seabirds at hundreds of sites. Estuaries form only a tiny fraction of the coastline, but are crucial habitat for a wide variety of waterfowl, seabirds and shorebirds. BCR 5 is also a major migration and wintering area for birds

in Canada. Wetlands of the Fraser River delta and estuary are the most important wintering area for waterbirds in British Columbia, and the delta also supports millions of migrating shorebirds and the largest overwintering population of raptors in Canada. The Fraser River estuary's importance has been widely recognized, both as a site of hemispheric importance under the [Western Hemisphere Shorebird Reserve Network](#), a [Ramsar site](#) and an [Important Bird Area](#). Two hundred and ninety-three species of bird regularly breed, overwinter, or migrate through the Canadian portion of BCR 5. BCR 5 also has high levels of endemism, with several unique subspecies inhabiting Haida Gwaii and Vancouver Island.

Over three-quarters of British Columbia's human population lives within BCR 5, concentrated around Vancouver, Victoria, the lower Fraser Valley and the east coast of Vancouver Island; Vancouver is the third-largest urban area in Canada in terms of population size (Martell 2005, Statistics Canada 2008). Development pressures are intense and threaten the unique and important habitats in the region, including the rich and diverse wetlands and estuaries of the Fraser River delta and Canada's only Garry Oak parkland. While the west coast of Vancouver Island, the central and north coast of British Columbia and Haida Gwaii are largely unpopulated, forest structure throughout the BCR (particularly at more accessible low to mid-elevation sites) has been heavily altered by timber harvest which has greatly reduced the amount of old-growth forest and often fragmented what old-growth remains (Martell 2005). Commercial fishing is also an important economic activity throughout BCR 5, and includes the commercial harvest of over 80 species of finfish, shellfish and marine plants. Aquaculture (both finfish and shellfish) is a significant and growing activity. British Columbia's waters also support a large and busy shipping industry (Martell 2005). Agriculture occupies less than 1% of the landscape and is largely restricted to the lower Fraser Valley and the east coast of Vancouver Island (Martell 2005).

About 19.5% (just over 4 million ha) of the terrestrial portion of the BCR is protected within national, provincial and regional parks (Hectares BC 2012; Fig. 2). Very little marine area is protected, and this is heavily biased towards shallow areas (<200m deep) adjacent to the coast (B.C. Ministry of Environment 2006).

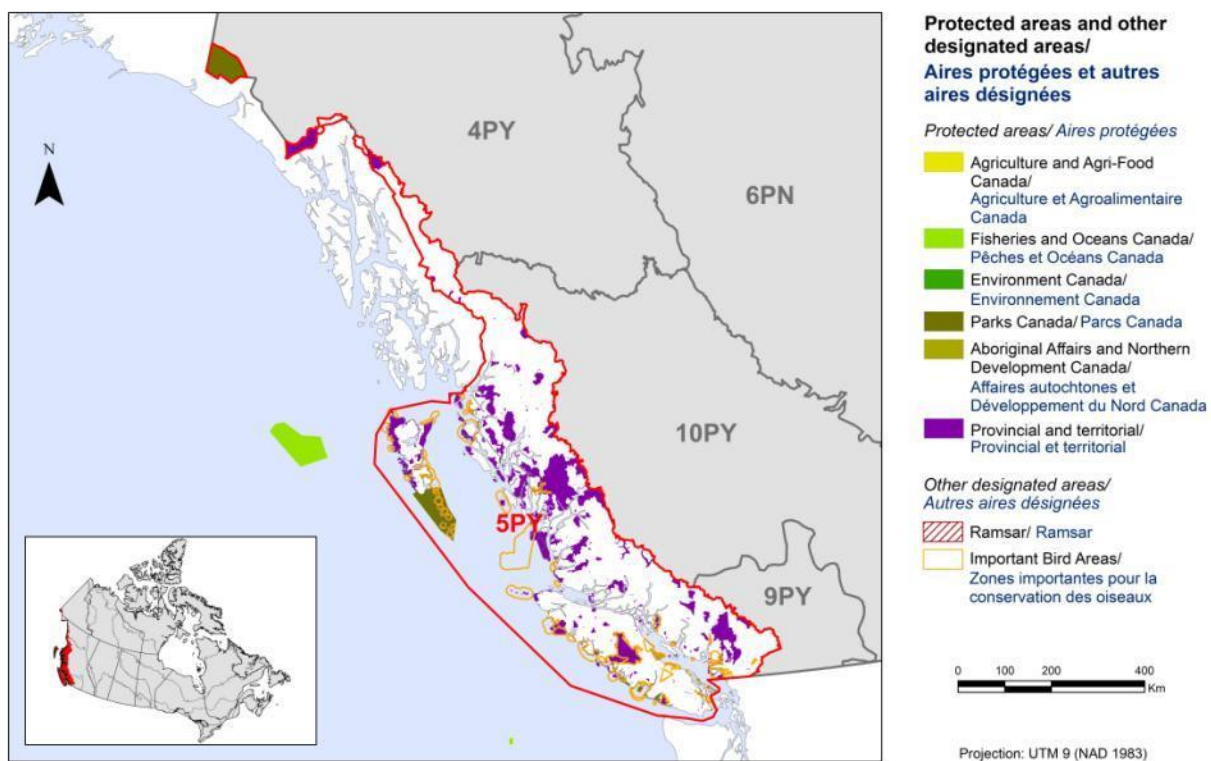


Figure 2. Map of protected and designated areas in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Section 1: Summary of Results – All Birds, All Habitats

Element 1: Priority Species Assessment

These Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each BCR subregion (see [Appendix 1](#)). Species that are vulnerable due to population size, distribution, population trend, abundance and threats are included because of their “conservation concern.” Some widely distributed and abundant “stewardship” species are also included. Stewardship species are included because they typify the national or regional avifauna and/or because they have a large proportion of their range and/or continental population in the subregion; many of these species have some conservation concern, while others may not require specific conservation effort at this time. Species of management concern are also included as priority species when they are at (or above) their desired population objectives but require ongoing management because of their socio-economic importance as game species or because of their impacts on other species or habitats (see [Appendix 2](#)).

The purpose of the prioritization exercise is to focus implementation efforts on the issues of greatest significance for Canadian avifauna. Table 1 provides a full list of all priority species and their reason for inclusion. Tables 2 and 3 summarize the number of priority species in BCR 5 Pacific and Yukon by bird group and by the reason for priority status.

In BCR 5, the priority species list is dominated by landbirds (57 of 139 priority species) and waterbirds (38 species). Over half of the waterbirds (56%) and waterfowl (62%) occurring in BCR 5 were identified as priority species, as compared to only 39% of the landbirds. Forty-six percent (46%) of the priority species are considered at risk, either federally or provincially.

In BCR 5, Canada Geese were identified as a priority species. Historically, Canada Goose populations in southern British Columbia were characterized by very low densities and a scattered distribution, but, through transplant programs and natural dispersal, these Canada Geese have expanded their distribution and abundance in BCR 5 significantly over the last three decades (e.g., southeast Vancouver Island, Lower Mainland, Fraser Valley). In this strategy, population objectives, identified threats and recommended actions related to Canada Geese refer solely to migratory populations, and do not refer to resident populations that both breed and winter in urban areas. These resident geese are responsible for a high incidence of conflicts with humans, and urban authorities (such as municipal governments) may elect to set population objectives for resident Canada Geese and manage toward that goal through habitat modification and control measures.

Table 1. Priority species in BCR 5 Pacific and Yukon, population objective, and the reason for priority status.

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Bald Eagle	Landbird	3		Assess / Maintain					Y	Y	Y			
Band-tailed Pigeon	Landbird	4		Increase 50%	SC	SC	Blue	Y	Y		Y			Added
Barn Owl	Landbird	3		Assess / Maintain	T	SC	Blue							
Barn Swallow	Landbird	5		Increase 100%	T		Blue							
Belted Kingfisher	Landbird	3		Assess / Maintain					Y		Y			
Black Swift	Landbird	5		Increase 100%				Y	Y		Y			
Black-throated Gray Warbler	Landbird	3		Assess / Maintain					Y	Y	Y			
Bullock's Oriole	Landbird	5		Increase 100%					Y					
Cassin's Vireo	Landbird	4		Increase 50%					Y					
Chestnut-backed Chickadee	Landbird	3		Assess / Maintain					Y	Y	Y			

¹ PIF: Partners in Flight (Rocky Mountain Bird Observatory 2005)

² CSCP: Canadian Shorebird Conservation Plan (Donaldson et al. 2000)

³ WOW: Wings Over Water (Milko et al. 2003)

⁴ Population objectives were modified based on expert review so may not correspond directly with the population trend (PT) score. In addition, waterfowl objectives were taken from the Pacific Coast Joint Venture's Strategic Plan and Biological Foundation (Martell 2005).

⁵ Assessed by COSEWIC ([Committee on the Status of Endangered Wildlife in Canada](#)) as: E, Endangered; T, Threatened; SC, Special Concern

⁶ Species listed on [Schedule 1 of the Species at Risk Act](#) as E, Endangered; T, Threatened; SC, Special Concern (Species at Risk Public Registry 2012)

⁷ Red: Red Listed, Blue: Blue Listed by the [British Columbia Conservation Data Centre](#)

⁸ NAWMP: North American Waterfowl Management Plan (North American Waterfowl Management Plan, Plan Committee, 2004)

⁹ Expert review indicates that at species was added or removed from the priority list as a result of expert opinion

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Common Nighthawk	Landbird	3		Assess / Maintain	T	T								
Cooper's Hawk	Landbird	5		Increase 100%					Y					
Golden-crowned Kinglet	Landbird	5		Increase 100%					Y		Y			
Gyr Falcon	Landbird	3		Assess / Maintain			Blue							
Hairy Woodpecker	Landbird	3		Assess / Maintain			Blue (<i>picoideus</i>)		Y		Y			
Horned Lark (<i>strigata</i>)	Landbird	3		Recovery objective ¹⁰	E	E	Red							
Hutton's Vireo	Landbird	2		Maintain current					Y		Y			
Lewis's Woodpecker	Landbird	3		Increase ¹⁰	T	T	Red							Added
MacGillivray's Warbler	Landbird	4		Increase 50%					Y		Y			
Northern Goshawk (<i>laingi</i>)	Landbird	3		Recovery objective	T (<i>laingi</i>)	T (<i>laingi</i>)	Red (<i>laingi</i>)							
Northern Harrier	Landbird	3		Assess / Maintain					Y					
Northern Pygmy-Owl	Landbird	3		Assess / Maintain			Blue (<i>swarthi</i>)		Y		Y			
Northern Saw-whet Owl (<i>acadicus</i>)	Landbird	3		Assess / Maintain							Y			
Northern Saw-whet Owl (<i>brooksi</i>)	Landbird	3		Assess / Maintain	T (<i>brooksi</i>)	T (<i>brooksi</i>)	Blue (<i>brooksi</i>)				Y			
Northwestern Crow	Landbird	3		Assess / Maintain					Y		Y			
Olive-sided Flycatcher	Landbird	5		Increase 100%	T	T	Blue	Y						
Orange-crowned Warbler	Landbird	5		Increase 100%					Y		Y			
Pacific Wren	Landbird	3		Assess / Maintain					Y		Y			

¹⁰ No longer breeds in the BCR, but continues to occur as occasional non-breeding individuals or small wintering populations. Interim population objective set as "increase," with the future goal of re-establishing breeding populations within the BCR.

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Pacific-slope Flycatcher	Landbird	3		Assess / Maintain					Y	Y	Y			
Peregrine Falcon (<i>anatum</i>)	Landbird	3		Assess / Maintain	T (<i>anatum</i>)	T (<i>anatum</i>)	Red (<i>anatum</i>)							
Peregrine Falcon (<i>pealei</i>)	Landbird	3		Assess / Maintain	SC (<i>pealei</i>)	SC (<i>pealei</i>)	Blue (<i>pealei</i>)							
Pine Grosbeak (<i>carlottae</i>)	Landbird	3		Assess / Maintain			Blue (<i>carlottae</i>)							
Pine Siskin	Landbird	5		Increase 100%					Y		Y			
Purple Finch	Landbird	4		Increase 50%					Y					
Purple Martin	Landbird	3		Assess / Maintain			Blue							
Red Crossbill	Landbird	4		Increase 50%					Y		Y			
Red-breasted Sapsucker	Landbird	4		Increase 50%					Y	Y	Y			
Rough-legged Hawk	Landbird	3		Assess / Maintain			Blue							
Rufous Hummingbird	Landbird	5		Increase 100%				Y	Y	Y	Y			
Rusty Blackbird	Landbird	3		Assess / Maintain	SC	SC	Blue	Y						
Short-eared Owl	Landbird	3		Assess / Maintain	SC	SC	Blue							
Snowy Owl	Landbird	3		Assess / Maintain			Blue							
Sooty Grouse	Landbird	5		Increase 100%			Blue	Y	Y	Y	Y			
Spotted Owl	Landbird	3		Recovery objective	E	E	Red	Y						
Spotted Towhee	Landbird	3		Assess / Maintain					Y		Y			
Steller's Jay	Landbird	3		Assess / Maintain			Blue (<i>carlottae</i>)		Y	Y	Y			
Townsend's Warbler	Landbird	3		Assess / Maintain					Y		Y			
Varied Thrush	Landbird	3		Assess / Maintain					Y		Y			
Vaux's Swift	Landbird	3		Assess / Maintain					Y		Y			
Vesper Sparrow (<i>affinis</i>)	Landbird	3		Recovery objective	E (<i>affinis</i>)	E (<i>affinus</i>)	Red (<i>affinis</i>)							

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Violet-green Swallow	Landbird	3		Assess / Maintain					Y		Y			
Western Bluebird	Landbird	5		Increase ¹⁰			Red							
Western Meadowlark	Landbird	5		Increase ¹⁰			Red							
Western Screech-Owl (<i>kennicottii</i>)	Landbird	3		Assess / Maintain	SC (<i>kennicottii</i>)	SC (<i>kennicottii</i>)	Blue (<i>kennicottii</i>)							
Western Wood-Pewee	Landbird	5		Increase 100%										
White-tailed Ptarmigan (<i>saxatilis</i>)	Landbird	3		Assess / Maintain			Blue (<i>saxatilis</i>)							
Willow Flycatcher	Landbird	5		Increase 100%				Y	Y		Y			
American Golden-Plover	Shorebird	3	4	Migrant (no population objective)			Blue	Y						
Black Oystercatcher	Shorebird	3	3	Assess / Maintain				Y			Y			
Black Turnstone	Shorebird	3	3	Assess / Maintain				Y			Y			
Black-bellied Plover	Shorebird	3	5	Assess / Maintain							Y			Added
Dunlin	Shorebird	3	5	Assess / Maintain							Y			Added
Long-billed Curlew	Shorebird	3	5	Recovery objective	SC	SC	Blue	Y						
Marbled Godwit	Shorebird	3	4	Assess / Maintain				Y						
Red Knot	Shorebird	3	5	Migrant (no population objective)	T (<i>roselaari</i>)	T (<i>roselaari</i>)	Red	Y			Y			
Red-necked Phalarope	Shorebird	3	4	Assess / Maintain			Blue							
Rock Sandpiper	Shorebird	3	3	Assess / Maintain							Y			
Ruddy Turnstone	Shorebird	3	4	Assess / Maintain				Y						
Sanderling	Shorebird	3	5	Assess / Maintain				Y						

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Short-billed Dowitcher	Shorebird	3	5	Assess / Maintain			Blue				Y			
Surfbird	Shorebird	3	4	Assess / Maintain				Y						
Wandering Tattler	Shorebird	3	3	Migrant (no population objective)			Blue							
Western Sandpiper	Shorebird	3	3	Assess / Maintain							Y			Added
Whimbrel	Shorebird	3	5	Migrant (no population objective)				Y						
Wilson's Phalarope	Shorebird	3	4	Assess / Maintain				Y						
American Bittern	Waterbird	3	4	Assess / Maintain			Blue							
Ancient Murrelet	Waterbird	3	4	Assess / Maintain	SC	SC	Blue	Y			Y			
Black Tern	Waterbird	4	5	Increase 50%				Y			Y			
Black-crowned Night-Heron	Waterbird	3	4	Assess / Maintain			Red				Y			
Black-footed Albatross	Waterbird	3	5	Assess / Maintain	SC	SC	Blue	Y			Y			
Brandt's Cormorant	Waterbird	3	4	Assess / Maintain			Red	Y			Y			
Buller's Shearwater	Waterbird	3		Assess / Maintain			Blue							
California Gull	Waterbird	3	3	Assess / Maintain			Blue				Y			
Caspian Tern	Waterbird	3	2	Assess / Maintain			Blue							
Cassin's Auklet	Waterbird	3	3	Assess / Maintain			Blue				Y			
Common Loon	Waterbird	3	3	Assess / Maintain							Y			Added
Common Murre	Waterbird	3	2	Assess / Maintain			Red				Y			
Common Tern	Waterbird	3	3	Migrant (no population objective)							Y			

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Double-crested Cormorant	Waterbird	3	1	Assess / Maintain			Blue							
Flesh-footed Shearwater	Waterbird	3	3	Assess / Maintain			Blue							
Glaucous-winged Gull	Waterbird	3	3	Assess / Maintain							Y			
Great Blue Heron (<i>fannini</i>)	Waterbird	3	1	Assess / Maintain	SC (<i>fannini</i>)	SC (<i>fannini</i>)	Blue (<i>fannini</i>)							
Green Heron	Waterbird	3	2	Assess / Maintain			Blue							
Heermann's Gull	Waterbird	3	3	Assess / Maintain							Y			
Horned Grebe	Waterbird	3	4	Assess / Maintain	SC									
Horned Puffin	Waterbird	3	3	Assess / Maintain			Red	Y			Y			
Laysan Albatross	Waterbird	3	4	Assess / Maintain			Blue	Y			Y			
Leach's Storm-Petrel	Waterbird	3	4	Assess / Maintain				Y						
Manx Shearwater	Waterbird	3	4	Assess / Maintain				Y			Y			
Marbled Murrelet	Waterbird	3	5	Recovery objective	T	T	Red	Y			Y			
Northern Fulmar	Waterbird	3	3	Assess / Maintain			Red							
Pelagic Cormorant	Waterbird	3	4	Assess / Maintain			Red (<i>pelagicus</i>)	Y			Y			
Pigeon Guillemot	Waterbird	3	4	Assess / Maintain							Y			
Pink-footed Shearwater	Waterbird	3	4	Recovery objective	T	T	Blue	Y						
Rhinoceros Auklet	Waterbird	3	2	Assess / Maintain							Y			
Short-tailed Albatross	Waterbird	3	2	Recovery objective	T	T	Red	Y						
Thayer's Gull	Waterbird	3	3	Assess / Maintain							Y			
Thick-billed Murre	Waterbird	3	3	Assess / Maintain			Red				Y			
Tufted Puffin	Waterbird	3	4	Assess / Maintain			Blue				Y			
Western Grebe	Waterbird	3	3	Increase 100%			Red				Y			

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Western Gull	Waterbird	3	2	Assess / Maintain							Y			
Xantus's Murrelet	Waterbird	3	4	Assess / Maintain				Y			Y			
Yellow-billed Loon	Waterbird	3		Assess / Maintain			Blue							
American Wigeon	Waterfowl	3		Maintain current								Y	High	
Barrow's Goldeneye	Waterfowl	3		Maintain current								Y	High	
Black Scoter	Waterfowl	3		Increase								Y	Mod High	
Blue-winged Teal	Waterfowl	3		Assess / Maintain								Y	Mod High	
Brant (Black)	Waterfowl	3		Maintain current			Blue					Y	Highest	
Brant (Western High Arctic)	Waterfowl	3		Assess / Maintain			Blue					Y	Highest	
Bufflehead	Waterfowl	3		Maintain current								Y	High	
Cackling Goose	Waterfowl	3		Assess / Maintain			Blue					Y	Highest	
Canada Goose (Dusky)	Waterfowl	3		Assess / Maintain			Red (occidentalis)					Y	Highest	
Canada Goose (Pacific)	Waterfowl	1		Maintain current								Y	Highest	
Canvasback	Waterfowl	3		Assess / Maintain								Y	Mod High	
Cinnamon Teal	Waterfowl	3		Assess / Maintain								Y	Mod High	
Common Goldeneye	Waterfowl	3		Assess / Maintain								Y	Mod High	
Greater Scaup	Waterfowl	3		Increase								Y	High	
Greater White-fronted Goose	Waterfowl	3		Assess / Maintain								Y	High	
Green-winged Teal	Waterfowl	3		Assess / Maintain								Y	Mod High	
Harlequin Duck	Waterfowl	3		Assess / Maintain								Y	High	
Lesser Scaup	Waterfowl	3		Increase								Y	High	
Lesser Snow Goose	Waterfowl	3		Maintain current								Y	High	

Table 1 continued

Priority species	Bird group	Population trend score (PIF ¹)	Population trend score (CSCP ² , WOW ³)	Population objective ⁴	COSEWIC ⁵	SARA ⁶	British Columbia provincial listing ⁷	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP priority ⁸ (waterfowl only)	NAWMP rank ⁸ (waterfowl only)	Expert review ⁹ (changes to priority list)
Mallard	Waterfowl	3		Assess / Maintain								Y	High	
Northern Pintail	Waterfowl	3		Maintain current								Y	High	
Northern Shoveler	Waterfowl	3		Assess / Maintain								Y	Mod High	
Surf Scoter	Waterfowl	3		Increase			Blue					Y	High	
Trumpeter Swan	Waterfowl	3		Maintain current								Y	High	
Tundra Swan	Waterfowl	3		Assess / Maintain			Blue					Y	High	
White-winged Scoter	Waterfowl	3		Increase								Y	High	

Table 2. Summary of priority species, by bird group, in BCR 5 Pacific and Yukon.

Bird group	Total species	Total priority species	Percent listed as priority	Percent of priority list
Landbird	147	57	39%	41%
Shorebird	36	18	50%	13%
Waterbird	68	38	56%	27%
Waterfowl	42	26	62%	19%
Total	293	139		100%

Table 3. Number of priority species in BCR 5 Pacific and Yukon by reason for priority status.

Reason for priority listing ¹	Landbirds	Shorebirds	Waterbirds	Waterfowl
COSEWIC ²	16	2	7	0
Federal SARA listed ³	14	2	6	0
Provincially listed ⁴	23 ⁵	6	24 ⁶	6
NAWMP ⁷	-	-	-	26
National/continental concern	8	11	13	-
Regional concern	19	-	-	-
National/continental stewardship	8	-	-	-
Regional stewardship	29	8	25	-

¹ A single species can be on the priority list for more than one reason. Note that not all reasons for inclusion apply to every bird group (indicated by "-").

² COSEWIC indicates species assessed by the Committee on the Status of Endangered Wildlife in Canada as Endangered, Threatened, or Special Concern.

³ Species listed on Schedule 1 of the *Species at Risk Act* as Endangered, Threatened, or Special Concern.

⁴ *Provincially Listed* indicates species listed by Red-listed or Blue-listed by British Columbia's Conservation Data Centre.

⁵ Three additional species have provincially-listed subspecies: Hairy Woodpecker (*picoideus*), Steller's Jay (*carlottae*), and Northern Pygmy Owl (*swarthi*).

⁶ One additional species, the Pelagic Cormorant, has a provincially-listed subspecies (*pelagicus*).

⁷ NAWMP indicates species ranked in the North American Waterfowl Management Plan (Plan Committee 2004) as having Moderately High, High or Highest breeding or non-breeding conservation and/or monitoring need in the BCR.

Element 2: Habitats Important to Priority Species

Identifying the broad habitat requirements for each priority species within the BCR allowed species to be grouped by shared habitat-based conservation issues and actions (see [Element 2: Habitats Important to Priority Species](#) for details on how species were assigned to standard habitat categories). If many priority species associated with the same habitat face similar conservation issues, then conservation action in that habitat may support populations of several priority species. BCR strategies use a modified version of the standard land cover classes developed by the United Nations (Food and Agriculture Organization 2000) to categorize habitats and species were often assigned to more than one habitat class.

In BCR 5, a maximum of two broad-scale habitat associations were identified for each priority species. In BCR 5, coastal habitats and marine waters are used by the greatest number of priority species (68 and 42 species, respectively; Fig. 3). Coniferous forests (31 species) and herbaceous habitats (grassland and agricultural areas; 29 species) are also widely used.

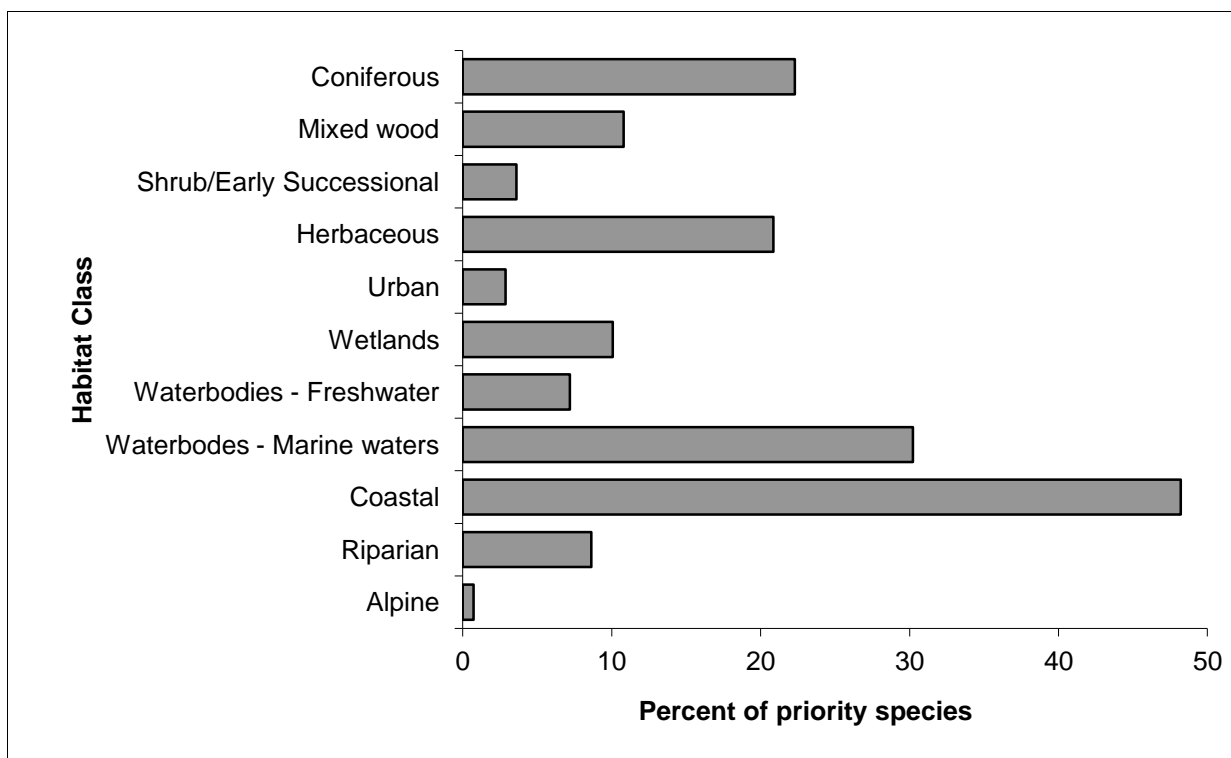


Figure 3. Percent of priority species that are associated with each habitat type in BCR 5 Pacific and Yukon.

Note: The total exceeds 100% because each species may be assigned to more than one habitat.

Element 3: Population Objectives

Population objectives allow us to measure and evaluate conservation success. The objectives in this strategy are assigned to categories and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the

objective is set as “assess and maintain,” and a monitoring objective is given (see [Element 3: Population Objectives for Priority Species](#)). For any species listed under the *Species at Risk Act* (SARA) or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. The ultimate measure of conservation success will be the extent to which population objectives have been reached over the next 40 years. Population objectives do not currently factor in feasibility of achievement, but are held as a standard against which to measure progress.

Over 63% of priority species, with representatives from all bird groups, were assigned an objective to “assess” population status while “maintaining” current levels in the interim (Fig. 4). For 6% of species, population levels were deemed to be at or near the objective. Five percent (5%) and 9% of species were assigned objectives to increase the population by 50% and to double the population, respectively. For a small proportion of species (6%), all SARA-listed, we have deferred to the population objectives developed in Recovery Strategies.

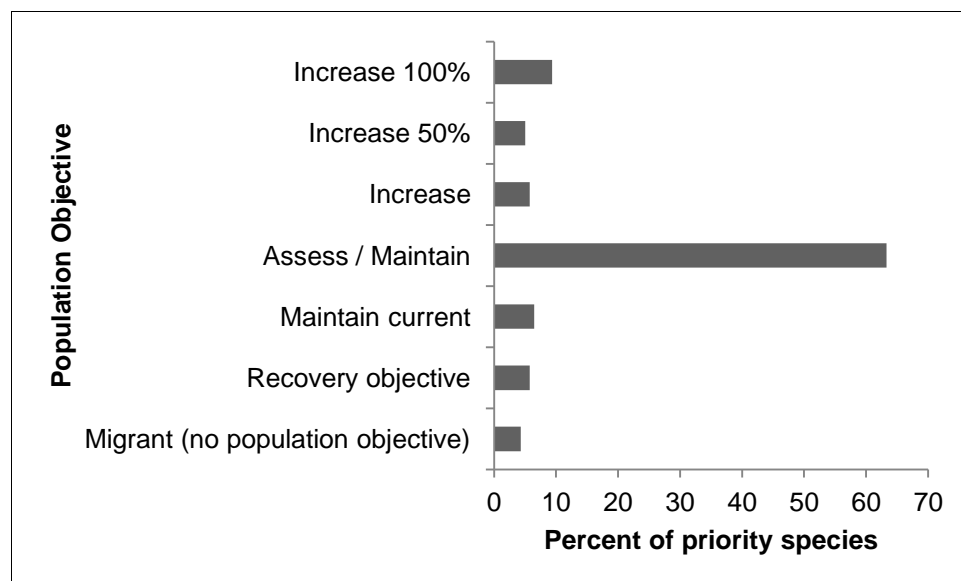


Figure 4. Percent of priority species that are associated with each population objective category in BCR 5 Pacific and Yukon.

Element 4: Threat Assessment for Priority Species

The threats assessment process (see [Element 4: Threat Assessment for Priority Species](#)) identifies threats believed to have a population-level effect on individual priority species. These threats are assigned a relative magnitude (Low, Medium, High, Very High), based on their scope (the proportion of the species’ range within the subregion that is impacted) and severity (the relative impact on the priority species’ population). This allows us to target conservation actions towards threats with the greatest effects on suites of species or in broad habitat classes. Some well known conservation issues (such as predation by domestic cats or climate change) may not be identified in the literature as significant threats to populations of an

individual priority species and therefore may not be captured in the threat assessment. However, they merit attention in conservation strategies because of the large numbers of individual birds affected in many regions of Canada. We have incorporated them in a separate section on [Widespread Issues](#), but, unlike other threats, they are not ranked.

Residential and commercial development (1.1 Housing and urban areas) was recognized to be a very high threat (Fig. 5) across most terrestrial habitat types for many priority species (including waders like the Great Blue Heron, many shorebirds, and several raptor species, including owls). This is probably most true in southern parts of the BCR, such as the Lower Mainland and southeastern Vancouver Island. Logging and wood harvesting was identified as a very high threat in all forested habitats for many priority species (e.g., Northern Saw-whet Owl, Marbled Murrelet, Chesnut-backed Chickadee, Harlequin Duck). Invasive non-native species also emerged as a very high threat, particularly in coastal habitat. Many of these are colonial-nesting seabirds subject to predation by introduced mammalian predators (rats, racoons, mink) on offshore islands. Climate change (11.1 Habitat shifting and alteration) also was identified as a very high threat, and again the list of affected species is dominated by seabirds, like Pink-footed Shearwater and Cassin's Auklet, as warming sea surface temperatures are thought to be linked to lower ocean productivity. Climate change may manifest in the form of sea level rise which may eliminate or severely reduce the extent of certain coastal habitats (e.g., mudflats) that are key migratory stopover foraging sites for shorebird species such as Western Sandpiper, Dunlin, and Red Knot. Finally, oil pollution (9.2 Industrial and military effluents) emerged as a high-level threat for a great number of seabirds and waterbirds (e.g., Black-footed Albatross, Common Murre, Pelagic Cormorant) that rely on coastal and offshore marine waters throughout the BCR.

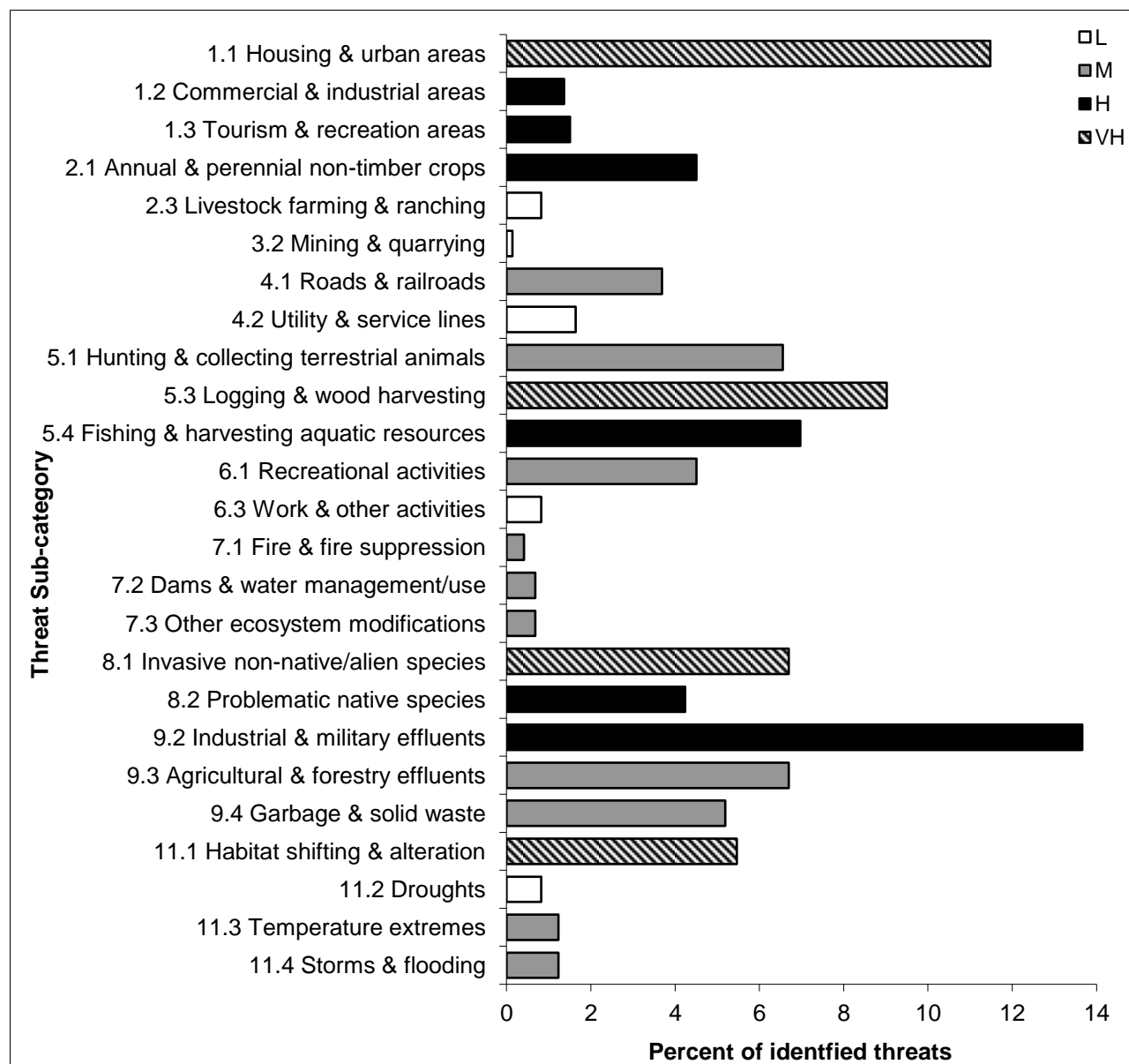


Figure 5. Percent of identified threats to priority species within BCR 5 Pacific and Yukon by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 5 (for example, if 100 threats were identified in total for all priority species in BCR 5, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). Shading in the bars (VH = very high, H = high, M = medium and L = low) represents the rolled up magnitude of all threats in each threat sub-category in the BCR. (See [Element 4: Threat Assessment for Priority Species](#) for details on how magnitude was assessed).

Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class.

Overall ranks were generated through a roll-up procedure described in Kennedy et al. (2012). L represents Low Magnitude threats; M = Medium; H = High; VH = Very High. Blank cells indicate that no priority species had threats identified in the threat category/habitat combination.

Threat category	Habitat class											
	Coniferous	Mixed	Shrub/Early Successional	Herbaceous	Urban	Wetlands	Waterbodies - Freshwater	Waterbodies - Marine Waters	Coastal	Riparian	Alpine	Overall
Overall	VH	H	M	VH	M	H	M	VH	VH	H	L	
1 Residential & commercial development	VH	H	L	VH	H	H	M	L	VH	H	L	VH
2 Agriculture & aquaculture	M			VH	M	H			H	L		H
3 Energy production & mining						L						L
4 Transportation & service corridors	M	L	L	M	M	L	M		M	M		M
5 Biological resource use	VH	VH	M	M	M	L	M	VH	M	H		VH
6 Human intrusions & disturbance	L	L		M		L	L	L	H	L		M
7 Natural system modifications	L		M	H	M		M		L	M		M
8 Invasive & other problematic species & genes	VH	M	H	VH		M			VH	H		VH
9 Pollution	L	L	L	H	L	M	M	VH	H	L		H
11 Climate change & severe weather	M	M	M	M	L		L	VH	VH	M	M	VH

Threats to priority species while they are outside Canada during the non-breeding season were also assessed and are presented in the section [Threats Outside Canada](#).

Element 5: Conservation Objectives

Conservation objectives were designed to address threats and information gaps that were identified for priority species. They describe the environmental conditions and research and monitoring that are thought to be necessary for progress towards population objectives and to understand underlying conservation issues for priority bird species. As conservation objectives are reached they will collectively contribute to achieving population objectives. Whenever possible, conservation objectives were developed to benefit multiple species, and/or respond to more than one threat (see [Element 5: Conservation Objectives](#)).

The majority of conservation objectives for BCR 5 relate to maintaining or enhancing habitat quality and quantity, and reducing mortality or increasing productivity (Fig. 6). Ensuring adequate habitat includes maintenance of the full range of naturally-occurring habitat types, maintaining the quality of existing habitats, and retaining important features on the landscape (e.g., standing dead snags for cavity nesting birds). Reducing mortality includes addressing a wide suite of sources of accidental mortality, including bycatch in commercial fisheries, ingestion of plastic or lead shot, exposure to oil, collisions with man-made structures, destruction of nests, and pesticide poisoning.

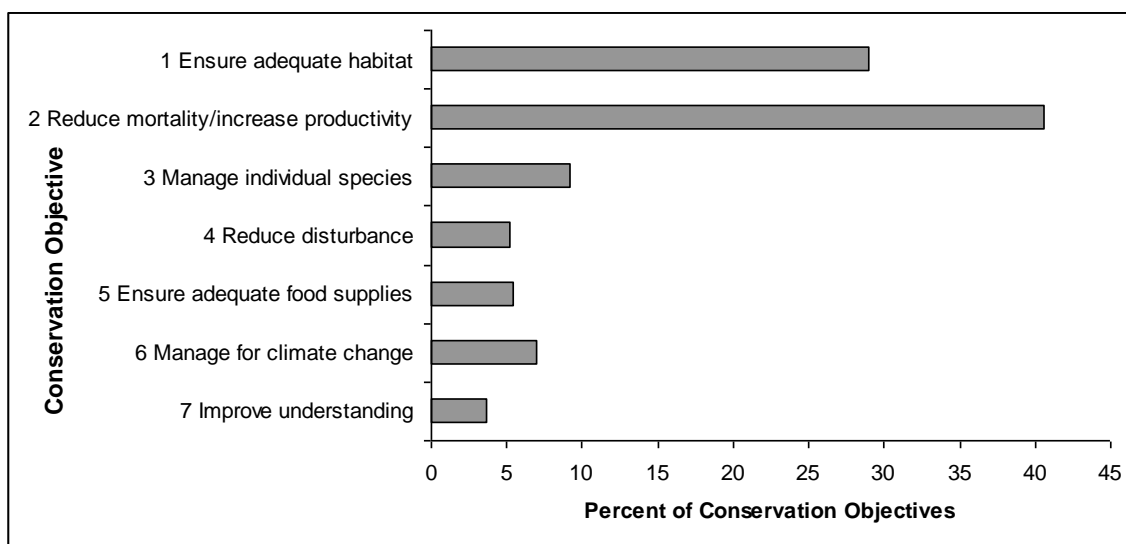


Figure 6. Percent of all conservation objectives assigned to each conservation objective category in BCR 5 Pacific and Yukon.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives. Actions are strategic rather than highly detailed and prescriptive (see [Element 6: Recommended Actions](#)). Whenever possible, recommended actions benefit multiple species, and/or respond to more than one threat. Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but will usually be more general than those developed for individual species.

Given the importance in BCR 5 of conservation objectives relating to the maintenance and enhancement of habitat, it is not surprising that securing and protecting habitat emerges as a key theme (Fig. 7; 1.1 Site/area protection). Actions relating to the development of beneficial management practices or other voluntary private sector codes of practice (5.3 Private sector standards and codes) are similarly common, in part because site management and protection actions often have aspects that relate to the development of voluntary best practices. Another large set of recommended actions relate to policy and practices (5.2 Policies and regulations) surrounding fisheries bycatch of seabirds. A significant proportion of actions fall into both the research (8.1) and monitoring (8.2) categories, indicating that knowledge gaps exist for specific species (relating either to a specific threat or current population status) where more information is required before conservation actions can be effectively formulated.

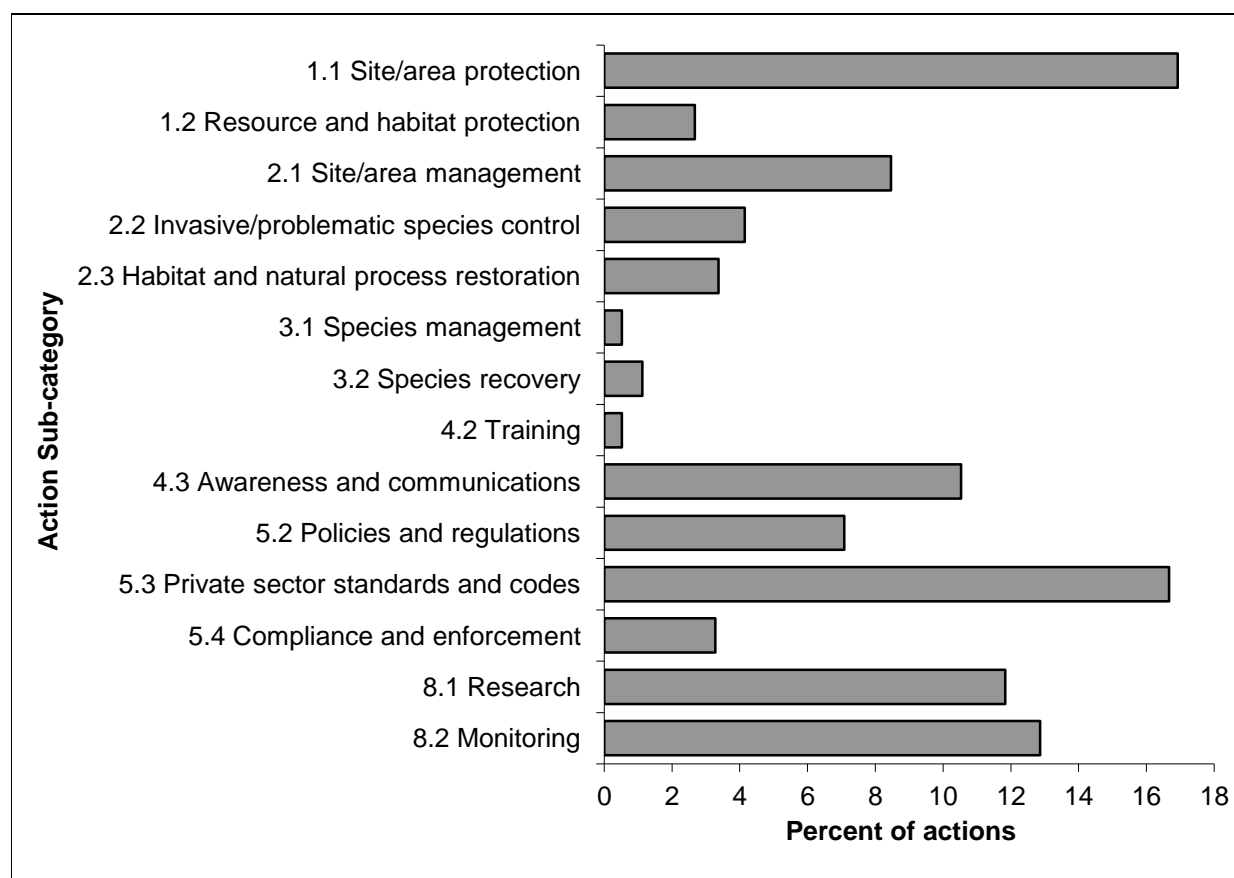


Figure 7. Percent of recommended actions assigned to each sub-category in BCR 5 Pacific and Yukon.

5.3 Private sector standards and codes includes adoption of voluntary codes of practice, including sector-specific Beneficial management practices for bird conservation. *8.1 Research* and *8.2 Monitoring* refer to specific species where information is required before conservation actions can be formulated. For a discussion of broad-scale research and monitoring requirements, see [Research and Population Monitoring Needs](#) in Section 3.

Section 2: Conservation Needs by Habitat

The following sections provide more detailed information on priority species, their threats and objectives within each of the broad habitat classes that occur in BCR 5 Pacific and Yukon. Where appropriate, habitat information is provided at a finer scale than the broad habitat categories in order to coincide with other land management exercises in the region. Note that in this strategy, all areas presented below are expressed as a percentage of the terrestrial area of BCR 5 in British Columbia, unless otherwise stated. Some species do not appear in the threats table because their low level threats have not been assigned objectives or actions and/or identified threats are addressed in the [Widespread Issues](#) section of the strategy.

In this strategy, a number of priority species which once bred in or around the lower Fraser Valley and southeast Vancouver Island no longer do so; they occur only as occasional non-breeding individuals (Horned Lark (*strigata*), federally Endangered and provincially Red-listed; Lewis's Woodpecker, federally Threatened and provincially Red-listed; and Western Bluebird, provincially Red-listed); or as small wintering populations (Western Meadowlark, provincially Red-listed). In this strategy we have identified threats that likely contributed to these species' declines, and recommend actions which address these threats. While such actions may not immediately benefit these species within the BCR, they will lay the groundwork for re-establishing suitable habitat, a necessity for the success of any future reintroductions of breeding populations to be successful.

Coniferous

Coniferous forests (defined as habitat where over 75% of tree basal area is coniferous trees) are the dominant landcover of BCR 5, covering over 55% of the terrestrial area of the BCR (Martell 2005; Fig. 8). The temperate coastal forests are dominated by western redcedar, western hemlock, Douglas-fir, and Sitka spruce. At higher elevations yellow-cedar, mountain hemlock and amabilis fir occur (B.C. Ministry of Forests 1997, 1999b). Mild, wet winters allow conifers to grow year-round, and the rarity of natural stand-initiating disturbances means that individual trees can live for centuries or longer and reach massive dimensions. In BCR 5, coniferous forests are used by 31 priority species (29 landbirds and two waterbirds; Table 5). One priority species, Lewis's Woodpecker, no longer breeds in the region and occurs only as occasional, non-breeding individuals.

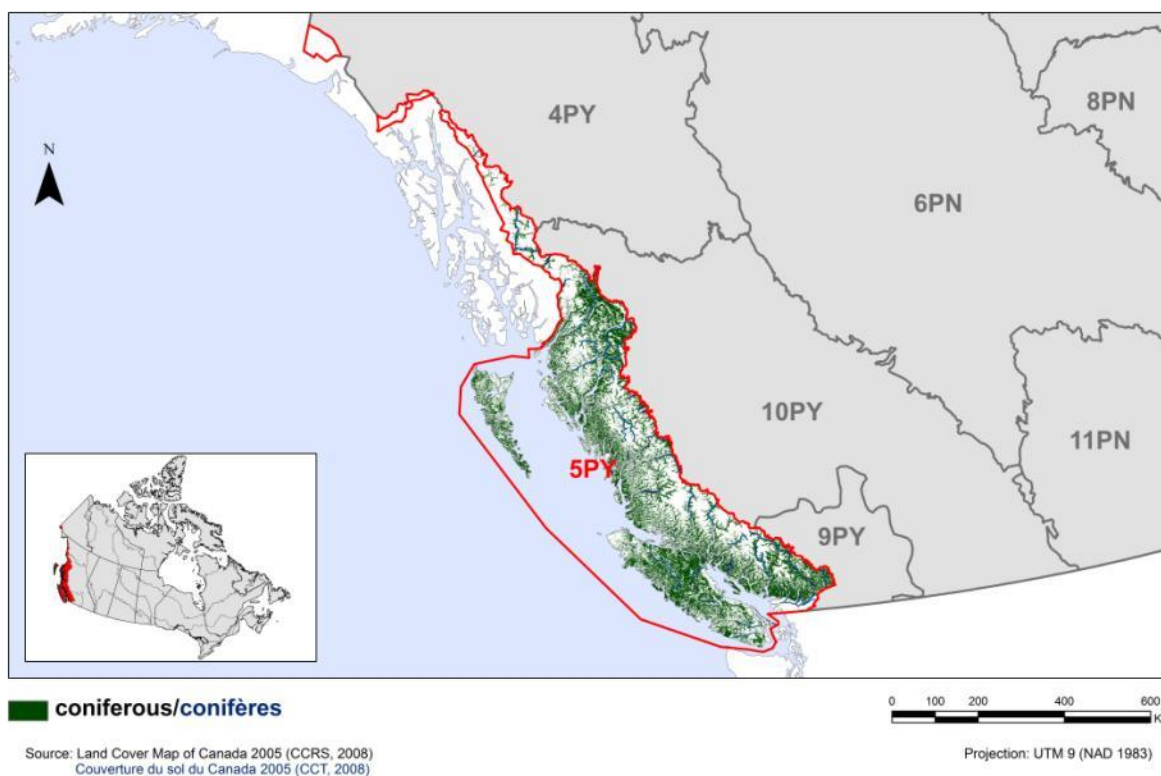


Figure 8. Map of coniferous habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

The primary threat to priority species in coniferous habitats is the loss of habitat and key habitat attributes to timber harvest (Fig. 9). Habitat is also lost to urban and industrial development. Introduced and invasive species also threaten priority species via predation, competition, and habitat degradation. Key actions to address these threats include the management of timber harvest to maintain biodiversity and wildlife values, protection of key areas of coniferous forest habitat, and control or eradication of introduced species (Table 6).

Table 5. Priority species that use coniferous habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Ancient Murrelet	old growth, mature	burrows	Assess / Maintain	Y	Y	Y	
Band-tailed Pigeon	mature	mineral springs, openings/clearings, fruiting understory shrubs	Increase 50%	Y	Y	Y	
Chestnut-backed Chickadee	mature	cavities, snags, openings	Assess / Maintain			Y	
Cooper's Hawk	mature	cottonwood riparian, veteran trees	Increase 100%		Y		
Golden-crowned Kinglet	mature, old growth		Increase 100%		Y	Y	
Hairy Woodpecker	mature, old growth	snags, openings/clearings	Assess / Maintain			Y	
Hutton's Vireo	mature, old growth	openings/clearings	Maintain current			Y	
Lewis's Woodpecker	mature, Douglas-fir	snags, recent burns, openings/clearings, low stem density	Increase ¹	Y			
Marbled Murrelet	old growth	nest platforms	Recovery objective	Y	Y	Y	
Northern Goshawk (<i>laingi</i>)	mature, old growth		Recovery objective	Y			
Northern Pygmy-Owl	mature, old growth	cavities, openings/clearings	Assess / Maintain			Y	
Northern Saw-whet Owl (<i>acadicus</i>)	mature, old growth	cavities, openings/clearings, snags	Assess / Maintain			Y	
Northern Saw-whet Owl (<i>brooksi</i>)	mature, old growth	cavities, openings/clearings, snags	Assess / Maintain	Y		Y	
Olive-sided Flycatcher	mature	recent burns, openings/clearings, snags, veteran trees	Increase 100%	Y	Y		
Pacific Wren	mature, old growth	large woody debris	Assess / Maintain			Y	
Pacific-slope Flycatcher	mature, old growth		Assess / Maintain			Y	
Pine Grosbeak (<i>carlottae</i>)	mature	old burns, clearcuts, openings/clearings, fruiting understory shrubs	Assess / Maintain	Y			
Pine Siskin	mature, old growth	cone crops	Increase 100%			Y	
Purple Finch	mature	openings/clearings	Increase 50%		Y		
Red Crossbill	mature, old growth	cone crops	Increase 50%		Y	Y	
Red-breasted Sapsucker	mature, old growth	snags, openings/clearings	Increase 50%		Y	Y	
Rufous Hummingbird	mature, old growth	openings/clearings	Increase 100%		Y	Y	
Rusty Blackbird	mature, old growth	forested wetlands, bogs, openings	Assess / Maintain	Y	Y		
Sooty Grouse	mature	openings/clearings, old burns	Increase 100%	Y	Y	Y	
Spotted Owl	old growth	cavities, snags	Recovery objective	Y	Y		
Steller's Jay	mature, old growth		Assess / Maintain			Y	

Table 5 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Townsend's Warbler	mature, old growth		Assess / Maintain			Y	
Varied Thrush	mature, old growth	fruiting understory shrubs	Assess / Maintain		Y	Y	
Vaux's Swift	old growth	cavities, snags, cottonwood riparian, chimneys	Assess / Maintain			Y	
Western Screech-Owl (<i>kennicotti</i>)	mature, old growth	cavities, openings/clearings	Assess / Maintain	Y			
White-tailed Ptarmigan (<i>saxatilis</i>)		snow fields	Assess / Maintain	Y			

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

¹The interim population objective is to increase the numbers of birds in the BCR, with a future goal of re-establishing a breeding population.

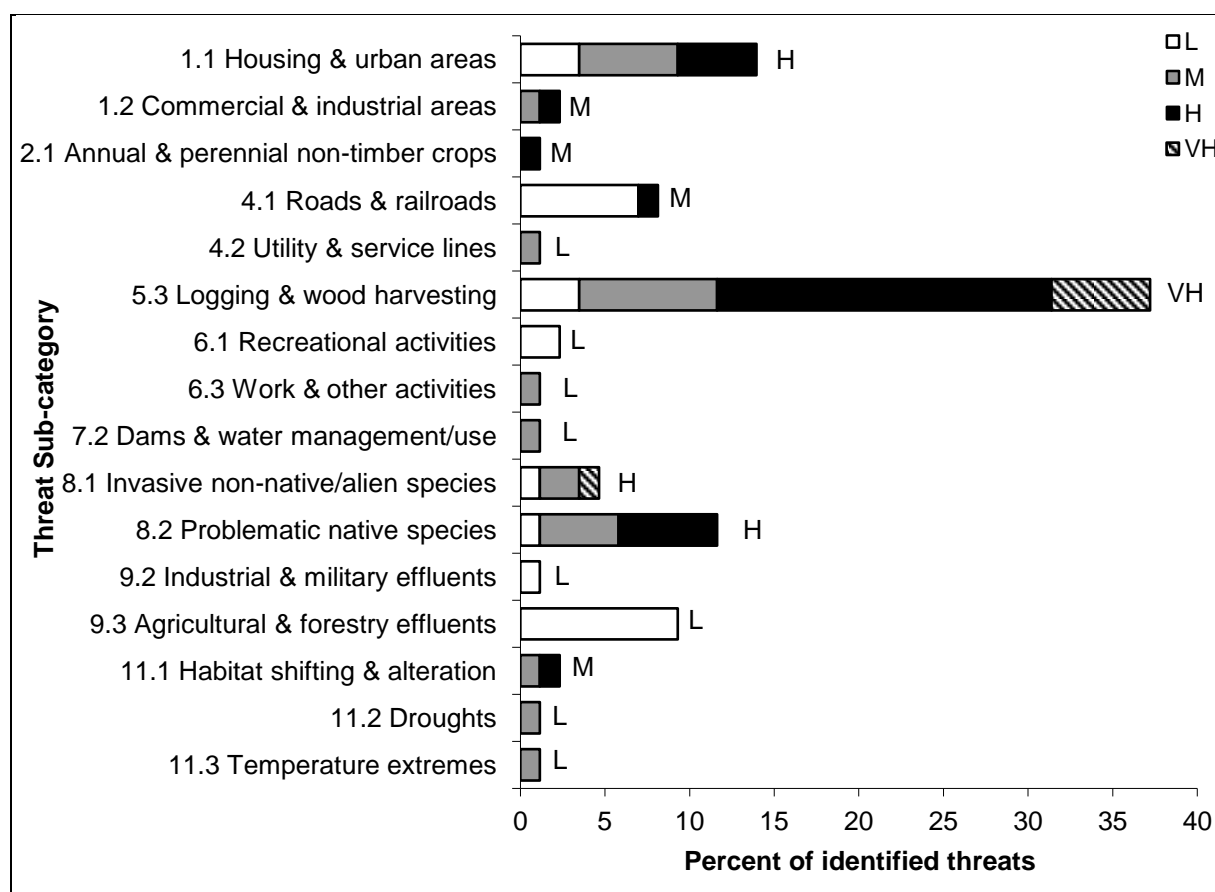


Figure 9. Percent of identified threats to priority species in coniferous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coniferous habitat (for example, if 100 threats were identified in total for all priority species in coniferous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in coniferous habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *8.1 Invasive non-native/alien species* includes competition from European Starling, and effects of introduced mammals (raccoons, squirrels, rats, deer) on coastal islands. *8.2 Problematic native species* includes effects of locally overabundant native deer and competition/predation by the Barred Owl. *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

Table 6. Threats addressed, conservation objectives, recommended actions and priority species affected for coniferous habitat in BCR 5 Pacific and Yukon.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of coniferous habitats and changes in structural diversity due to residential development and forest management.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 2.1 Annual & perennial non-timber crops 5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of coniferous habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.2 Maintain the size, shape and configuration of habitat within the natural range of variation. 1.4 Maintain important habitat features on the landscape.	Manage forests to maintain a mosaic of all habitat types and seral stages. Avoid large clearcuts and use harvest techniques such as selective cutting and variable retention that mimic natural disturbance regimes and retain important habitat features such as large veteran trees, snags, and cavity-bearing trees. Maintain structural diversity by managing for a variety of species in multi-aged stands, with well-developed shrub understory and canopy closure. Protect all remaining old-growth stands and maintain large contiguous tracts of mature trees to minimize fragmentation and edge effects. Maximize connectivity of old-growth and mature forest patches.	1.1 Site/area protection 5.3 Private sector standards and codes	Ancient Murrelet, Band-tailed Pigeon, Chestnut-backed Chickadee, Cooper's Hawk, Golden-crowned Kinglet, Hairy Woodpecker, Hutton's Vireo, Lewis's Woodpecker, Marbled Murrelet, Northern Goshawk (<i>laingi</i>), Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>), Northern Saw-whet Owl (<i>brooksi</i>), Olive-sided Flycatcher, Pacific Wren, Pacific-slope Flycatcher, Pine Grosbeak (<i>carlottae</i>), Pine Siskin, Purple Finch, Red Crossbill, Red-breasted Sapsucker, Rusty Blackbird, Sooty Grouse, Spotted Owl, Steller's Jay, Townsend's Warbler, Varied Thrush, Vaux's Swift, Western Screech-Owl (<i>kennicottii</i>)
Increased "edge effect" leading to increased nest predation on Marbled Murrelet.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of coniferous habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Secure and manage old growth coniferous habitat for Marbled Murrelet through various methods including land acquisition, conservation easements, stewardship agreements, establishment of formal parks and protected areas, or management areas such as Wildlife Habitat Areas and Old Growth Management Areas. Avoid further fragmentation of old growth habitat used by Marbled Murrelet. This includes reducing roads and trails through	1.1 Site/area protection 5.3 Private sector standards and codes	Marbled Murrelet

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 6 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
				these habitats. Ensure that habitat fragmentation and edge effects are considered in forest development plans.		
Loss of habitat to hydroelectric developments, reservoir creation and habitat fragmentation from the creation of electric transmission lines.	4.2 Utility & service lines 7.2 Dams & water management /use	Maintain and enhance the quality and diversity of coniferous habitats.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Secure suitable Spotted Owl habitat to compensate for habitat loss and degradation. Route future infrastructure away from areas known to be occupied by Spotted Owl. When possible, utilize pre-existing infrastructure corridors rather than creating new ones that further fragment habitat. Ensure that habitat fragmentation and resulting "edge effect" is considered in future transmission line development plans.	2.1 Site/area management 5.2 Policies and regulations 5.3 Private sector standards and codes	Spotted Owl
Harvested areas may function as ecological traps.	5.3 Logging & wood harvesting	Maintain and enhance the quality and diversity of coniferous habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Research is needed to determine if and how clearcuts function as ecological traps for Olive-sided Flycatcher.	8.1 Research	Olive-sided Flycatcher
Predation of priority species by introduced predators.	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing future introductions.	3.5 Prevent and control the spread of invasive and exotic species.	Remove introduced predators (e.g., rats, raccoons) from all currently active and historical Ancient Murrelet colonies. Remove or control populations of introduced species which may prey upon Northern Saw-whet Owl (<i>brooksi</i>) nests (e.g., raccoons, red squirrels) on the Haida Gwaii archipelago. Monitor Haida Gwaii and seabird colonies for introduced or dispersing predators (including call-playback for Barred Owl on	2.2 Invasive/problematic species control 4.3 Awareness and communications 8.2 Monitoring	Ancient Murrelet, Northern Saw-whet Owl (<i>brooksi</i>)

Table 6 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
				Haida Gwaii). Increase public awareness of the impacts of introduced predators to avoid future introductions.		
Degradation and loss of understory vegetation caused by introduced and/or overabundant deer. Reductions in bird and rodent prey due to degradation and loss of understory vegetation caused by introduced deer in Haida Gwaii (Northern Saw-whet Owl [<i>brooksi</i>]).	8.2 Problematic native species 8.1 Invasive non-native/alien species	Ensure introduced and/or overabundant deer are not negatively impacting priority species.	3.5 Prevent and control the spread of invasive and exotic species. 3.6 Reduce overabundant species.	Remove, reduce or control the population of introduced deer on the Haida Gwaii archipelago to maintain natural undergrowth and ground vegetation. This could be achieved in part by eliminating or increasing bag limits. In other areas where overabundant native deer are negatively impacting understory vegetation (e.g., Gulf Islands), conduct site-specific deer population control to maintain densities <0.1 deer/ha. Monitor deer density and browse intensity to identify problem areas and to evaluate the effectiveness of population control measures.	2.2 Invasive/problematic species control 2.3 Habitat and natural process restoration 5.2 Policies and regulations 8.2 Monitoring	Golden-crowned Kinglet, Hutton's Vireo, Northern Saw-whet Owl (<i>brooksi</i>), Pacific Wren, Pacific-slope Flycatcher, Rufous Hummingbird
Reduced survival of priority owl species due to Barred Owl competition and predation. Genetic swamping of the Northern Spotted Owl by	8.2 Problematic native species	Determine the impacts of Barred Owl on other owl populations as Barred Owls expand their range.	7.4 Improve understanding of causes of population declines.	Research is required to determine Barred Owl impacts on native owl populations (such as predation rates on priority species, degree of competition for prey, and extent of interbreeding between Barred and Spotted Owls) and identify potential mitigation strategies.	8.1 Research	Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>), Northern Spotted Owl, Western Screech-Owl (<i>kennicottii</i>)

Table 6 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Barred Owl.						
Decreased availability of nest cavities due to competition from European Starlings.	8.1 Invasive non-native/alien species	Ensure that nest site competition is not limiting Lewis's Woodpecker populations.	3.1 Reduce competition with invasive species.	Conduct research to understand conditions under which nest-site competition with European Starlings can limit Lewis's Woodpecker populations, and determine if increasing European Starling populations contributed to Lewis's Woodpecker declines in the Georgia Basin.	5.3 Private sector standards and codes 8.1 Research	Lewis's Woodpecker
House Finch competing with Purple Finch for resources.	8.2 Problematic native species	Ensure that competition is not limiting populations of priority species.	3.2 Reduce competition with problematic native species.	Determine the ecological relationships between Purple Finch and House Finch in BCR 5. Identify the factors driving House Finch population increases and range expansion.	8.1 Research	Purple Finch
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate and rodent species. If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Chestnut-backed Chickadee, Hutton's Vireo, Lewis's Woodpecker, Olive-sided Flycatcher, Vaux's Swift
Lowered productivity, nest abandonment and failure due to nest site disturbance from forestry operations.	6.3 Work & other activities	Avoid disturbance of nesting raptors.	4.2 Reduce disturbance from industrial or work activity.	Maintain a 200m undisturbed buffer around all active goshawk nest trees. Minimize disturbances near goshawk nest sites between 15 February and 1 September.	2.1 Site/area management 5.3 Private sector standards and codes	Northern Goshawk (<i>laingi</i>)
Salmonella exposure at bird feeders	1.1 Housing & urban areas	Reduce or eliminate disease transmission	2.6 Reduce the spread of disease.	Educate the public about the threat posed by salmonellosis and solutions to reduce disease transmission, such as regular cleaning of bird feeders and closing feeding	4.3 Awareness and communica-	Pine Siskin, Purple Finch

Table 6 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
		at bird feeders.		stations when local or regional disease outbreaks occur.	tions	

Mixed Wood

Mixed-wood habitats (where coniferous tree basal area is less than 75% of total tree basal area) occur throughout BCR 5, typically within more extensive coniferous forest wherever disturbance or soils have allowed a substantial deciduous component to develop (Fig. 10). Fifteen (15) priority species (all landbirds) have been identified as using mixed-wood habitats (Table 7).

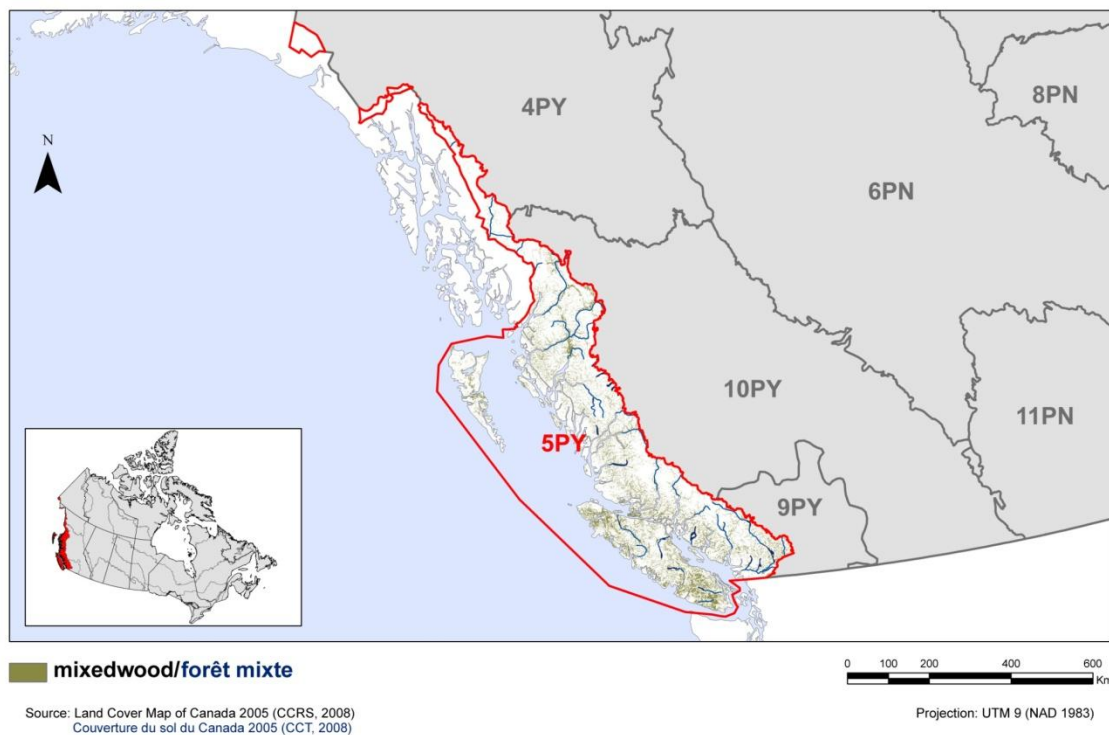


Figure 10. Map of mixed wood habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Threats to priority species in mixed wood habitats are similar to those in coniferous forest, with loss of habitat and key habitat attributes to forestry and urban/industrial development being the primary threats (Fig. 11). Competition with, and predation by, introduced and invasive species also presents risks. Key actions to address these threats include the management of timber harvest to maintain biodiversity and wildlife values, protection of key areas of habitat, and research into potentially problematic predators and competitors to quantify threats and identify potential mitigation strategies (Table 8).

Table 7. Priority species that use mixed wood habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Band-tailed Pigeon	mature	mineral springs, openings/clearings, fruiting understory shrubs	Increase 50%	Y	Y	Y	
Black-throated Gray Warbler	mature		Assess / Maintain			Y	
Bullock's Oriole	mature	cottonwood riparian	Increase 100%		Y		
Cassin's Vireo	mature		Increase 50%		Y		
Chestnut-backed Chickadee	mature	cavities, snags, openings	Assess / Maintain			Y	
Hairy Woodpecker	mature	snags, openings/clearings	Assess / Maintain			Y	
Northern Pygmy-Owl	mature	cavities, openings/clearings	Assess / Maintain			Y	
Northern Saw-whet Owl (<i>acadicus</i>)	mature, old growth	cavities, openings/clearings, snags	Assess / Maintain			Y	
Olive-sided Flycatcher	mature	recent burns, openings/clearings, snags, veteran tree	Increase 100%	Y	Y		
Pine Siskin	mature, old growth	cone crops	Increase 100%			Y	
Purple Finch	mature	openings/clearings	Increase 50%		Y		
Red-breasted Sapsucker	mature, old growth	snags, openings/clearings	Increase 50%		Y	Y	
Steller's Jay	mature, old growth		Assess / Maintain			Y	
Townsend's Warbler	mature, old growth		Assess / Maintain			Y	
Western Wood-Pewee	mature	recent burns, openings/clearings	Increase 100%		Y		

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

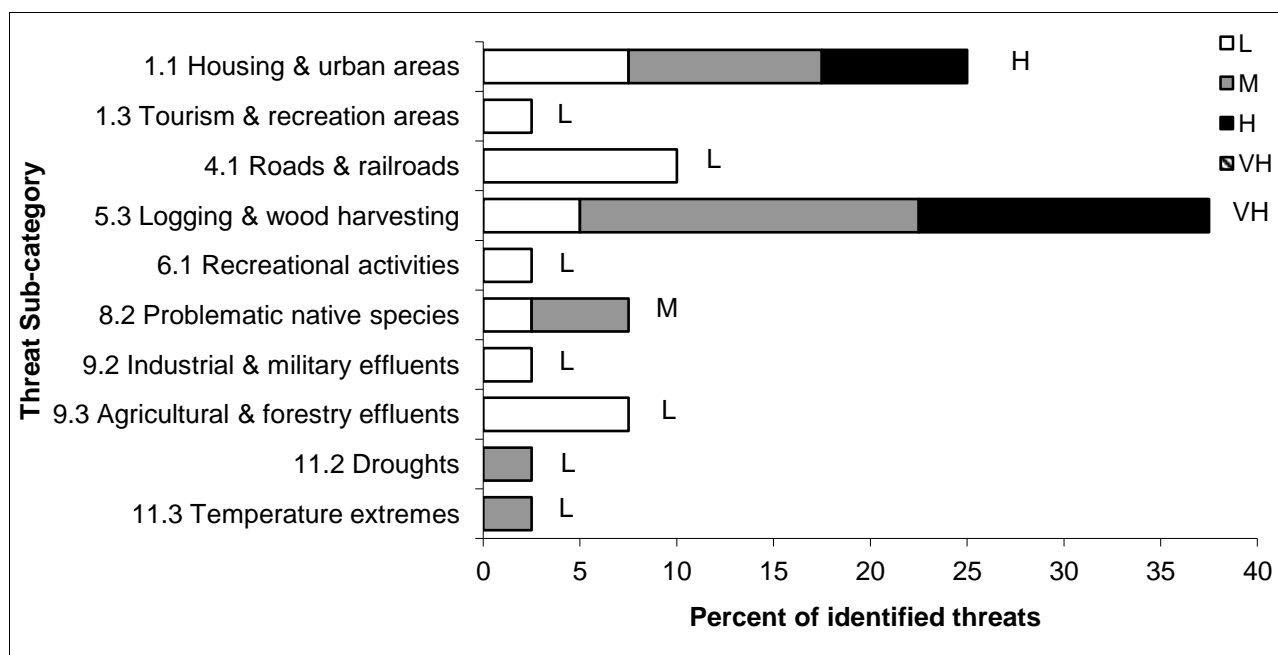


Figure 11. Percent of identified threats to priority species in mixed wood habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in mixed wood habitat (for example, if 100 threats were identified in total for all priority species in mixed wood habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in mixed wood habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *8.2 Problematic native species* includes competition with House Finch and predation by Barred Owl and Bald Eagles. *9.3 Agricultural and forestry effluents* refers to pesticide use.

Table 8. Threats addressed, conservation objectives, recommended actions and priority species affected for mixed wood habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat sub-category	Objectives	Objective category	Recommended actions	Action sub-category	Priority species affected [†]
Loss of habitat due to urban/industrial development and logging.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 5.3 Logging & wood harvesting	Maintain and enhance the quantity, quality and diversity of mixed woodland habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.2 Maintain the size, shape and configuration of habitat within the natural range of variation. 1.4 Maintain important habitat features on the landscape.	Protect key areas of mixed forest stands and maintain large contiguous tracts of mature trees through various methods including land acquisition, conservation easements, stewardship agreements or establishment of formal parks, protected areas, or management areas. Maintain key habitat features such as large veteran trees, snags, and cavity-bearing trees. Use a variety of forest management techniques to maintain a diversity of structural stages and important habitat components.	1.1 Site/area protection 5.3 Private sector standards and codes	Band-tailed Pigeon, Black-throated Gray Warbler, Bullock's Oriole, Cassin's Vireo, Chestnut-backed Chickadee, Hairy Woodpecker, Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>), Olive-sided Flycatcher, Pine Siskin, Purple Finch, Red-breasted Sapsucker, Steller's Jay, Townsend's Warbler, Western Wood-Pewee
Harvested areas may function as ecological traps.	5.3 Logging & wood harvesting	Maintain and enhance the quantity, quality and diversity of mixed woodland habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Research is needed to determine if and how clearcuts function as ecological traps for Olive-sided Flycatcher.	8.1 Research	Olive-sided Flycatcher
Reduced survival of priority owl species due to Barred Owl competition and predation.	8.2 Problematic native species	Determine the impacts of Barred Owl on other owl populations as Barred Owls expand their range.	7.4 Improve understanding of causes of population declines.	Research is needed to determine Barred Owl impacts on native owl populations (such as predation rates on priority species and the degree of competition for prey) and identify potential mitigation strategies.	8.1 Research	Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>)

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 8 continued

Threats addressed	Threat sub-category	Objectives	Objective category	Recommended actions	Action sub-category	Priority species affected [†]
House Finch competing with Purple Finch for resources.	8.2 Problematic native species	Ensure that competition is not limiting populations of priority species.	3.2 Reduce competition with problematic native species.	Determine the ecological relationships between Purple Finch and House Finch in BCR 5. Identify the factors driving House Finch population increases and range expansion.	8.1 Research 8.2 Monitoring	Purple Finch
Salmonella exposure at bird feeders.	1.1 Housing & urban areas	Reduce or eliminate disease transmission at bird feeders.	2.6 Reduce the spread of disease.	Educate the public about the threat posed by salmonellosis and solutions to reduce disease transmission, such as regular cleaning of bird feeders and closing feeding stations when local or regional disease outbreaks occur.	4.3 Awareness and communications	Pine Siskin, Purple Finch

Shrub/Early Successional

Shrub and early successional habitats are transient, occurring where disturbance (either natural or anthropogenic) has removed the tree cover and the vegetation is dominated by shrubby, early seral forms (Fig. 12). Five priority species, all landbirds, were identified as using this habitat type (Table 9).

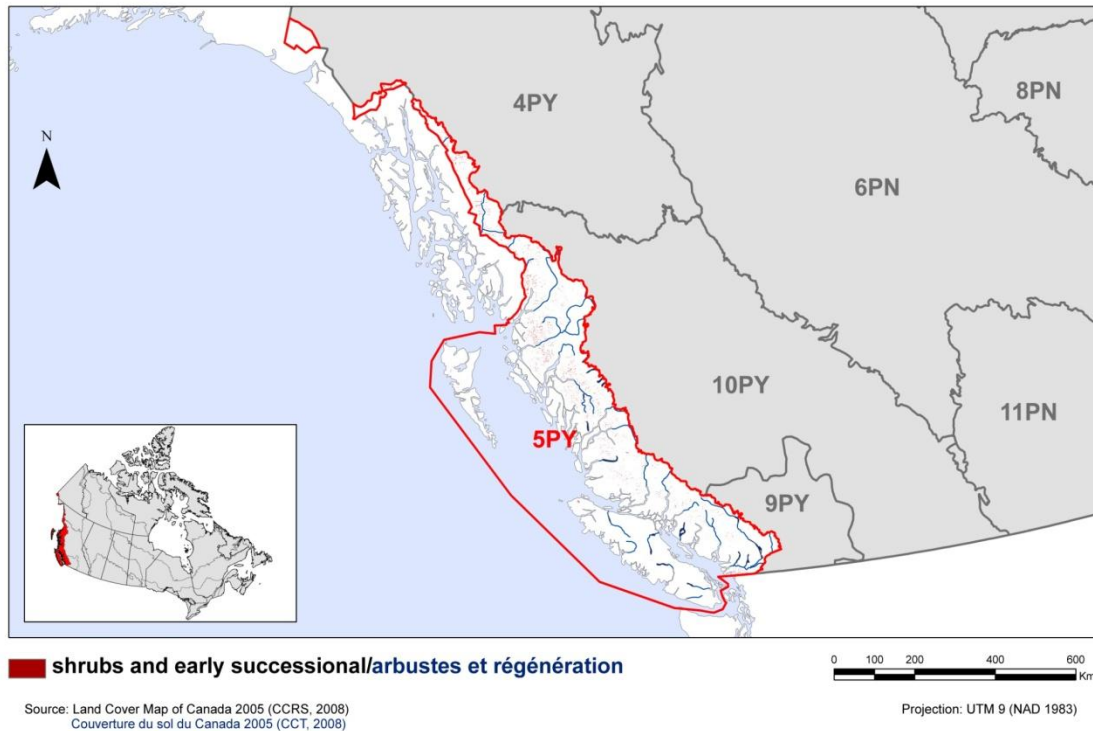


Figure 12. Map of shrub/early successional habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

The primary threats to priority species in this habitat type are the loss or degradation of habitat due to development or forestry activity, and degradation of habitat due to overbrowsing by deer (Fig. 13). While new patches of habitat are created by timber harvest, they are typically managed for accelerated conifer regrowth, which may reduce their suitability for various priority species (Betts et al. 2010). Key actions to address these threats include management of timber production and harvest to maintain sufficient high-quality early seral habitat on the landscape, and control of overabundant and/or introduced deer populations (Table 10).

Table 9. Priority species that use shrub and early successional habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Common Nighthawk	early seral	recent burns, clearcuts, rocky clearings, outcrops/bluffs	Assess / Maintain	Y			
MacGillivray's Warbler	early seral	cottonwood riparian, recent burns	Increase 50%			Y	
Orange-crowned Warbler	early seral	openings/clearings	Increase 100%			Y	
Spotted Towhee	early seral	openings/clearings, dense shrubs	Assess / Maintain			Y	
Willow Flycatcher	early seral	openings/clearings	Increase 100%		Y	Y	

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

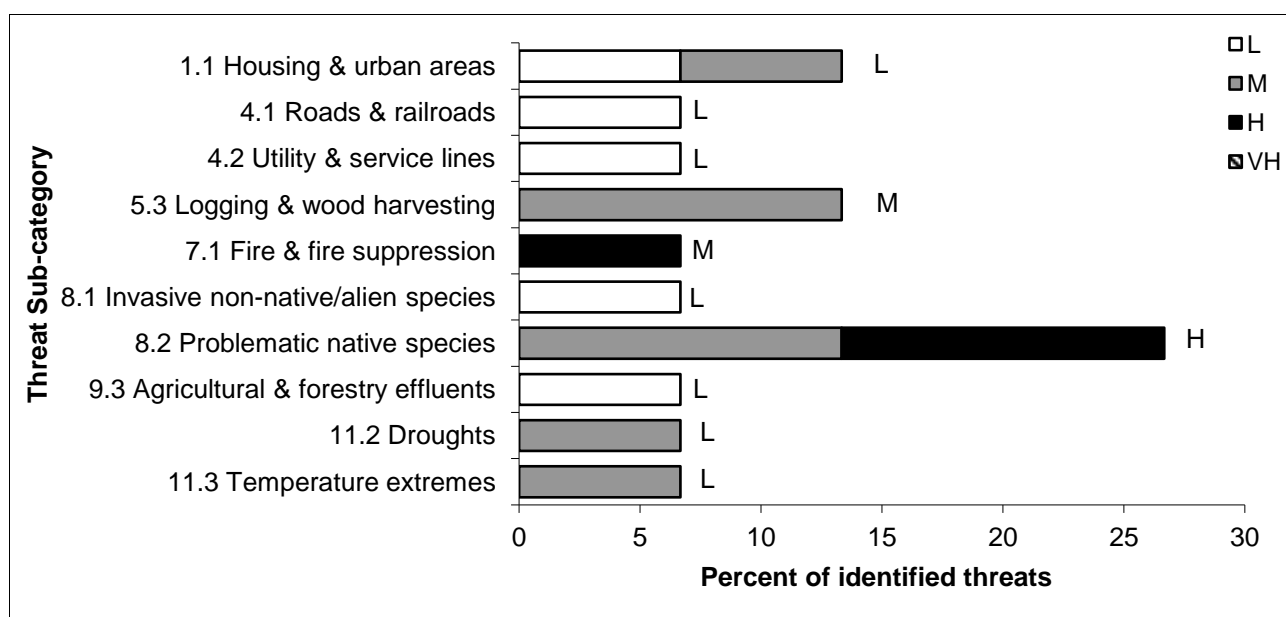


Figure 13. Percent of identified threats to priority species in shrub and early successional habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in shrub and early successional habitat (for example, if 100 threats were identified in total for all priority species in shrub and early successional habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in shrub and early successional habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *8.2 Problematic native species* refers primarily to effects of locally overabundant deer. *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

Table 10. Threats addressed, conservation objectives, recommended actions and priority species affected for shrub and early successional habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of suitable early seral habitat due to urban development, and fire suppression.	1.1 Housing & urban areas 7.1 Fire & fire suppression	Maintain key habitat features in forests, including deciduous shrub layers in successional openings.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation. 1.3 Ensure the continuation of natural processes that maintain bird habitat.	Manage landscapes to mimic, retain or restore pre-settlement proportions and distribution of forest types, structural stages and habitat components.	5.3 Private sector standards and codes	Common Nighthawk, Spotted Towhee, Willow Flycatcher
Mechanical thinning reduces deciduous cover in managed, regenerating clearcuts.	5.3 Logging & wood harvesting	Maintain key habitat features in forests, including deciduous shrub layers in successional openings.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Avoid large clearcuts, and use harvest techniques such as selective harvest and partial retention that mimic natural disturbance regimes. Maintain a diversity of structural stages, including early seral stages, and important habitat components, such as deciduous shrub cover, within forests. Confine mechanical control of shrubs competing with regenerating forest to the area immediately surrounding affected trees so some shrub cover is maintained for wildlife.	5.3 Private sector standards and codes	MacGillivray's Warbler, Orange-crowned Warbler
Degradation and loss of understory vegetation caused by introduced and/or	8.1 Invasive non-native/alien species 8.2 Problematic native species	Ensure introduced and/or overabundant deer are not negatively impacting priority species.	3.6 Reduce overabundant species.	Remove, reduce or control the population of introduced deer on the Haida Gwaii archipelago to maintain natural undergrowth and ground vegetation. This could be achieved in part by eliminating or increasing bag limits. In other areas where overabundant native deer are	2.2 Invasive/problematic species control 2.3 Habitat and natural process	MacGillivray's Warbler, Orange-crowned Warbler, Spotted Towhee,

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 10 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
overabundant deer.				negatively impacting understory vegetation (e.g., Gulf Islands), conduct site-specific deer population control to maintain densities <0.1 deer/ha. Monitor deer density and browse intensity to identify problem areas and to evaluate the effectiveness of population control measures.	restoration 5.2 Policies and regulations 8.2 Monitoring	Willow Flycatcher

Herbaceous

The herbaceous habitat class includes agricultural areas such as pastures and crops, artificial grasslands such as airports and parks, and natural grasslands, such as Garry Oak meadows (Fig. 14).

Agricultural lands cover approximately 0.7% of BCR 5, and are largely restricted to the low elevation plateaus and floodplains of the lower Fraser Valley and the east coast of Vancouver Island (Martell 2005). Grasslands and agricultural areas are used by 25 priority species in BCR 5 (14 landbirds, 9 waterfowl and 2 shorebirds; Table 11). Birds using grassland and agricultural areas in BCR 5 are highly threatened, as 68% of the priority species using these habitats are considered at risk, either federally or provincially. Three priority species—Horned Lark (*strigata*), Western Bluebird and Western Meadowlark—no longer breed in the region and occur only as occasional non-breeding individuals or small wintering populations. Primary threats to priority species in agricultural areas include loss of suitable habitat to urban/industrial development, agricultural intensification and changes to unsuitable crop types (i.e., greenhouses, berries), and exposure to pesticides (Fig. 15). Key actions to address these threats include increasing the use of beneficial management practices in agriculture to preserve biodiversity and wildlife values, minimizing use of pesticides through integrated pest management, and use of conservation covenants and other stewardship agreements to preserve key habitat types such as pastures and hayfields on the landscape (Table 12).

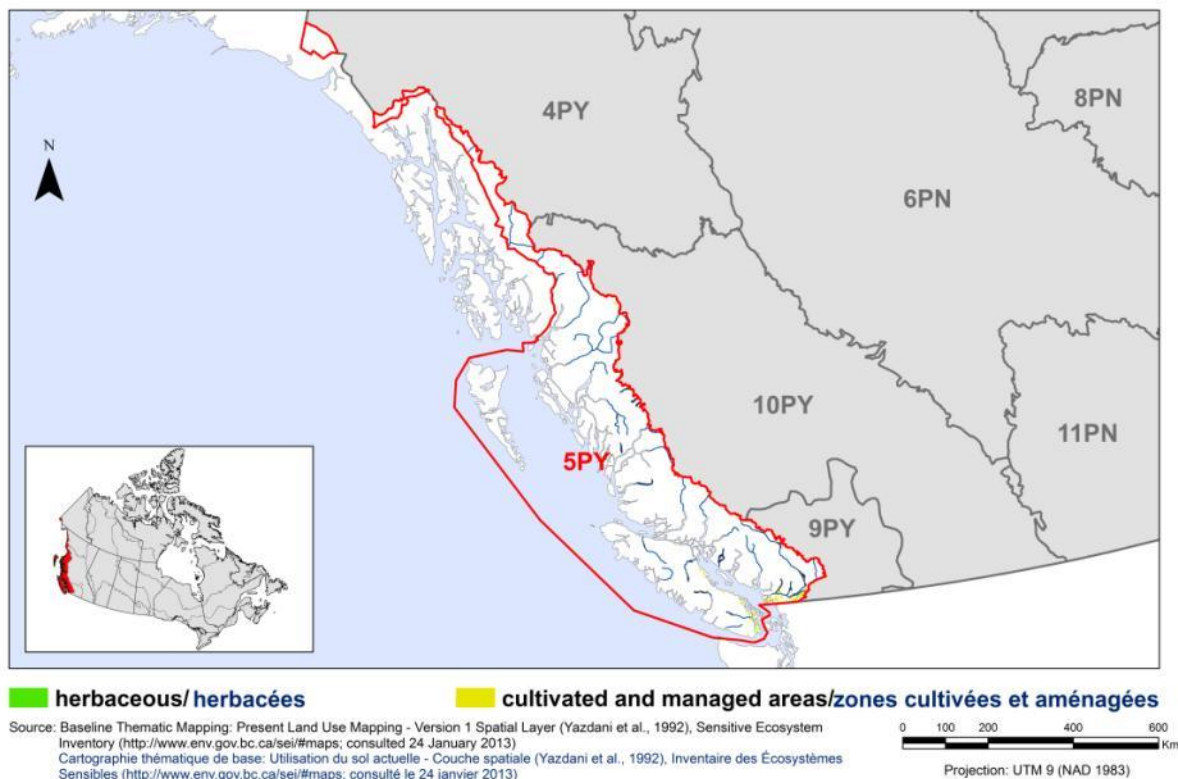


Figure 14. Map of herbaceous habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Garry Oak

Garry Oak, a unique ecosystem that occurs nowhere else in Canada, is restricted to the drier rain-shadow areas of Vancouver Island and the Gulf Islands (B.C. Ministry of Forests 1999a). Garry Oak trees form an open canopy over a diverse ground cover of grasses, wildflowers, herbs and endemic mosses. This fire-maintained system is highly imperiled. Ninety percent (90%) of the original extent of Garry Oak parkland has been lost to agriculture or urban/industrial development. For example, on Vancouver Island only 1,589 ha remains today of approximately 15,250 ha of Garry Oak present pre-European settlement. Much of what remains is highly fragmented and degraded by numerous invasive plant species; fire suppression also prevents regeneration of remaining Garry Oak habitats (Martell 2005; Lea 2006).

Five priority species, all landbirds, were identified as using Garry Oak habitats (Table 11). These priority species are not restricted solely to Garry Oak habitat, and typically occur (or occurred) more broadly throughout open forest (e.g., Cassin's Vireo, Hutton's Vireo) and grassland/agricultural areas (e.g., Western Bluebird) within the Georgia Basin. However Garry Oak habitats remain important to these priority bird species, and are critical to a wide diversity of plant and invertebrate species. Two of the five priority bird species that use Garry Oak habitat, Lewis's Woodpecker and Western Bluebird, no longer breed in the region and now occur only as occasional non-breeding individuals.

The primary threats to priority species that use Garry Oak habitats include historical and current loss and degradation of habitat due to urban and industrial development, historical and current loss of nesting sites due to timber cutting, competition with invasive and introduced species, and habitat degradation and loss due to fire suppression (Fig. 15). Key actions to address these threats include the protection and restoration of remaining Garry Oak habitat, periodic burning of Garry Oak habitat to maintain native ground cover and prevent conifer encroachment, and control of invasive species (Table 12).

Table 11. Priority species that use herbaceous habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
GRASSLAND & AGRICULTURAL AREAS							
American Golden-Plover	hayfield/tame pasture, row crop		Migrant (no population objective)	Y	Y		
American Wigeon	hayfield/tame pasture		Maintain current				Y
Barn Owl	old field, hayfield/tame pasture	Cavities, nestboxes	Assess / Maintain	Y			
Barn Swallow	native grassland, hayfield/tame pasture	man-made ledges, openings/clearings	Increase 100%	Y	Y		
Cackling Goose	hayfield/tame pasture, row crop, old field		Assess / Maintain	Y			Y
Canada Goose (Dusky)	hayfield/tame pasture, row crop, old field		Assess / Maintain	Y			Y
Canada Goose (Pacific)	hayfield/tame pasture, row crop, old field		Maintain current				Y
Common Nighthawk	old field, native grassland, hayfield/tame pasture	recent burns, clearcuts, rocky clearings, outcrops/bluffs	Assess / Maintain	Y			
Greater White-fronted Goose	hayfield/tame pasture, row crop		Assess / Maintain				Y
Gyr Falcon	hayfield/tame pasture		Assess / Maintain	Y			
Horned Lark (<i>strigata</i>)	old field, native grassland		Recovery objective	Y			
Lesser Snow Goose	hayfield/tame pasture, row crop		Maintain current				Y
Long-billed Curlew	native grassland, hayfield/tame pasture, row crop, oldfield		Recovery objective	Y	Y		
Northern Harrier	old field, native grasslands		Assess / Maintain		Y		
Northern Pintail	native grassland, hayfield/tame pasture, row crop, oldfield		Maintain current				Y
Peregrine Falcon (<i>anatum</i>)	hayfield, tame pasture	cliffs	Assess / Maintain	Y			
Rough-legged Hawk	old field, native grasslands, hayfield/tame pasture		Assess / Maintain	Y			
Short-eared Owl	native grasslands, old field		Assess / Maintain	Y			
Snowy Owl	old field, native grasslands, hayfield/tame pasture		Assess / Maintain	Y			

Table 11 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Trumpeter Swan	row crop, hayfield/tame pasture		Maintain current				Y
Tundra Swan	row crop, hayfield/tame pasture		Assess / Maintain	Y			Y
Vesper Sparrow (<i>affinis</i>)	old field		Recovery objective	Y			
Violet-green Swallow	hayfield, pasture	cavities, cliffs	Assess / Maintain			Y	
Western Bluebird	old field	cavities, snags, old burns	Increase ¹	Y	Y		
Western Meadowlark	native grasslands, old field, hayfield/tame pasture		Increase ¹	Y			
GARRY OAK							
Cassin's Vireo	Garry Oak		Increase 50%		Y		
Hutton's Vireo	Garry Oak	openings/clearings	Maintain current			Y	
Lewis's Woodpecker	Garry Oak	snags, recent burns, openings/clearings, low stem density	Increase ¹	Y			
Western Bluebird	Garry Oak	cavities, snags, old burns	Increase ¹	Y	Y		
Western Wood-Pewee	Garry Oak	recent burns, openings/clearings	Increase 100%		Y		

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

¹ The interim population objective is to increase the numbers of birds in the BCR, with a future goal of re-establishing a breeding population.

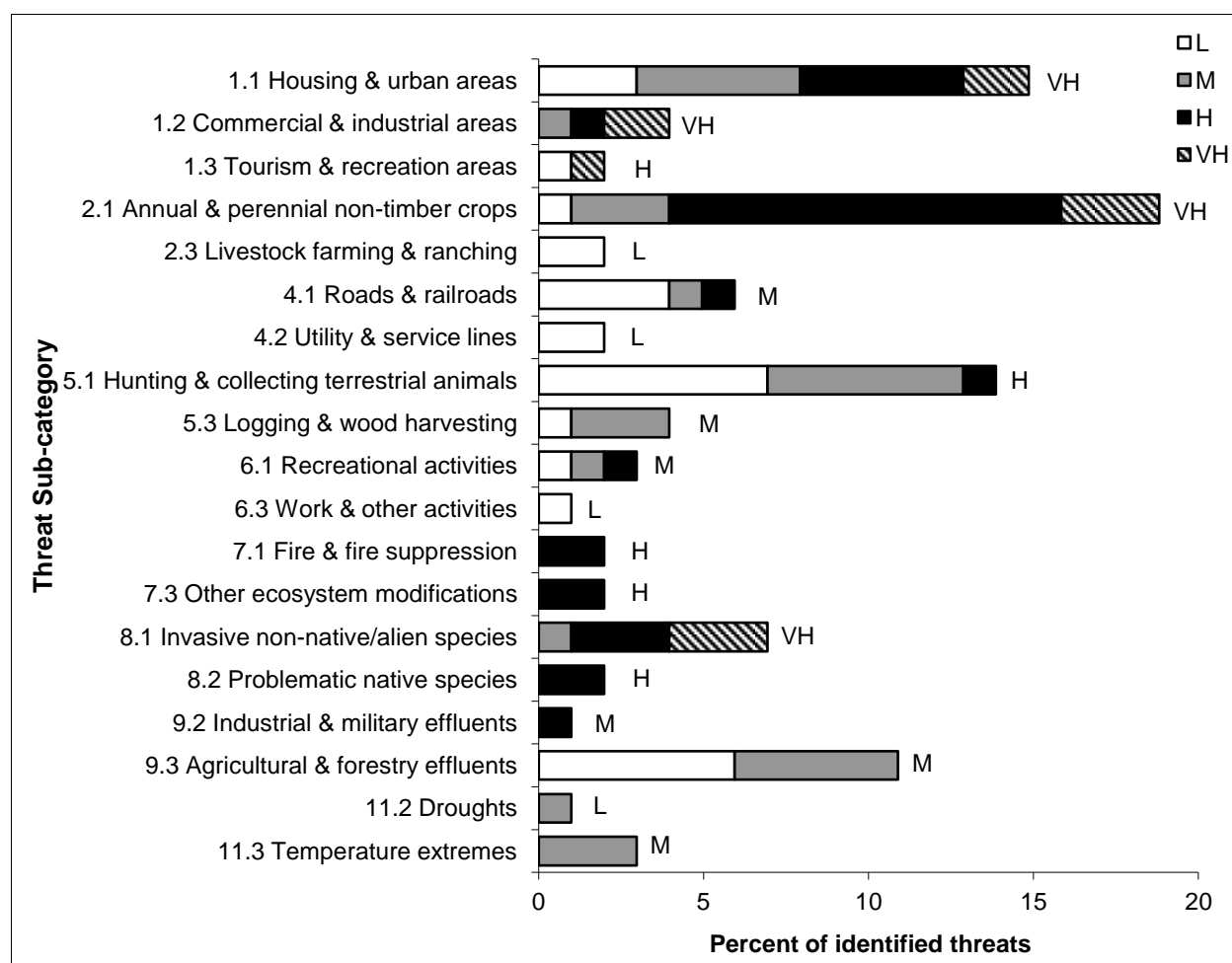


Figure 15. Percent of identified threats to priority species in herbaceous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in herbaceous habitat (for example, if 100 threats were identified in total for all priority species in herbaceous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in herbaceous habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* refers primarily to lead poisoning of waterfowl from ingestion of lead shot, but also includes hunting and illegal harvest. *8.1 Invasive non-native/alien species* and *8.2 Problematic native species* includes predation by domestic cats and competition with native and introduced species (House Wren, House Sparrow, European Starling) for nesting cavities. *9.3 Agricultural and forestry effluents* refers to effects of pesticide use.

Table 12. Threats addressed, conservation objectives, recommended actions and priority species affected for herbaceous habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
GRASSLANDS AND AGRICULTURAL AREAS						
Loss of grassland and agricultural habitat to urban, industrial and recreational development. Loss of suitable crop types to agricultural intensification (e.g., berry crops, greenhouses).	1.1 Housing & urban areas 1.2 Commercial & industrial areas 1.3 Tourism & recreation areas 2.1 Annual & perennial non-timber crops, 2.3 Livestock farming & ranching	Maintain the quantity, quality and diversity of herbaceous habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.2 Maintain the size, shape and configuration of habitat within the natural range of variation.	Identify, protect and manage agricultural habitat for priority species through various methods including land acquisition, conservation easements, stewardship agreements or establishment of formal parks or management areas. Secure and protect any remaining natural grassland habitat. Manage agricultural areas to maintain pasture and old field habitats. Maintain key features such as hedgerows, timber stands and snags.	1.1 Site/area protection 2.1 Site/area management 5.3 Private sector standards and codes	American Golden-Plover, American Wigeon, Barn Owl, Barn Swallow, Common Nighthawk, Horned Lark (<i>strigata</i>), Lesser Snow Goose, Long-billed Curlew, Northern Pintail, Rough-legged Hawk, Short-eared Owl, Trumpeter Swan, Tundra Swan, Vesper Sparrow (<i>affinis</i>), Western Bluebird, Western Meadowlark
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate and rodent species. If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Barn Swallow, Common Nighthawk, Northern Harrier, Violet-green Swallow
Habitat degradation by introduced species.	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing future introductions.	3.5 Prevent and control the spread of invasive and exotic species.	Eliminate or control introduced plant species occurring in estuaries and beach/dune habitat. Increase public awareness of invasive plant species and measures to control their spread (such as regular cleaning of vehicles and	2.2 Invasive/problematic species control 4.3 Awareness and communications	Horned Lark (<i>strigata</i>)

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 12 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
				equipment, and using only native species for gardening, landscaping and re-vegetation purposes), to prevent establishment of additional invasive species.		
Decreased availability of nest cavities due to competition from European Starlings, House Sparrows, and House Wrens.	8.1 Invasive non-native/alien species	Ensure that nest site competition is not limiting populations of priority species.	3.1 Reduce competition with invasive species.	<p>Retain all cavity-bearing trees and snags as nesting habitat.</p> <p>In areas where cavities are limiting, consider initiating a long-term, well-managed nest-box program. To reduce exclusion by House Wrens, nest boxes will need annual maintenance and monitoring. Annual nest box cleaning should occur before March.</p> <p>Reduce and control European Starling and House Sparrow populations. This can be achieved in part by designing new structures and retrofitting existing structures to exclude nesting sites for these species.</p>	2.2 Invasive/problematic species control 2.3 Habitat and natural process restoration 3.2 Species recovery	Violet-green Swallow, Western Bluebird
Disturbance from recreational activities at roosting, foraging and nesting areas.	6.1 Recreational activities	Avoid disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	<p>Increase public awareness of target groups of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p> <p>Consider establishment of seasonal buffer zones or closures around key areas used by Trumpeter Swans.</p> <p>For Vesper Sparrow, implement public education and stewardship initiatives in areas containing critical habitat or potential critical habitat for this species.</p>	2.1 Site/area management 4.3 Awareness and communications	Trumpeter Swan, Vesper Sparrow (<i>affinis</i>)

Table 12 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Human disturbance at or development near Peregrine Falcon nest sites may lead to nest abandonment.	6.1 Recreational activities 6.3 Work & other activities	Avoid disturbance of nesting raptors.	4.1 Reduce disturbance from human recreation. 4.2 Reduce disturbance from industrial or work activity.	Maintain an undisturbed, naturally vegetated buffer of at least 50m (urban), 200m (rural) or 500m (undeveloped areas) from the base of Peregrine Falcon nesting cliffs or around other Peregrine Falcon nest sites. Raise public awareness of raptors and their habitat and nesting needs. Continue to enforce British Columbia's <i>Wildlife Act</i> regulations around disturbance at Peregrine Falcon nests.	2.1 Site/area management 5.4 Compliance and enforcement	Peregrine Falcon (<i>anatum</i>)
Mortality from hunting.	5.1 Hunting & collecting terrestrial animals	Manage hunting mortality to maintain game bird populations.	7.2 Improve harvest monitoring.	Continue to enforce legal bag and possession limits. Where possible, use adaptive management to ensure viable population levels. Promote increased hunter skill in waterfowl identification (avoid Cackling Goose or Dusky Canada Goose being mistaken for Pacific Canada Goose).	3.1 Species management 4.2 Training communications 5.4 Compliance and enforcement	Cackling Goose, Canada Goose (Dusky)
Nests destroyed by haying, mowing and harvesting practices.	2.1 Annual & perennial non-timber crops 2.3 Livestock farming & ranching	Prevent destruction of bird nests, in accordance with federal and provincial legislation.	2.9 Reduce nest destruction.	Avoid use of heavy equipment in fields supporting breeding grassland birds during the breeding season. Delay spring mowing of hayfields until mid or late July. To minimize risk of affecting any late nesters, mow or plough from the center of the field outwards and slow equipment if birds are flushed to give adults and flightless/newly fledged young time to escape.	2.1 Site/area management 5.3 Private sector standards and codes	Northern Harrier, Short-eared Owl, Vesper Sparrow (<i>affinis</i>), Western Meadowlark

Table 12 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Removal of nests by landowners. Loss of nesting sites (building modification, building removal).	5.1 Hunting & collecting terrestrial animals 7.3 Other ecosystem modifications	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	1.4 Maintain important habitat features on the landscape. 2.9 Reduce nest destruction.	Research is needed to quantify the distribution and intensity of nest removal and assess the threat this behaviour poses to Barn Swallow populations. Increase public awareness of the species, its benefits, and current legal protection to increase stewardship and eliminate destruction of nests. Encourage landowners to incorporate nesting ledges on out-buildings in habitat suitable for Barn Swallows.	4.3 Awareness and communications 5.4 Compliance and enforcement 8. 1 Research	Barn Swallow
Loss of Barn Owl nesting sites due to modernization of buildings.	7.3 Other ecosystem modifications	Ensure that suitable nest sites are not limiting Barn Owl populations.	1.4 Maintain important habitat features on the landscape.	Increase public awareness of the Barn Owl and encourage landowners to install nest boxes when renovating, removing old, or building new farm out-buildings in habitat suitable for Barn Owls. Encourage and support well planned nest box projects and monitoring programs.	3.2 Species recovery 4.3 Awareness and communications	Barn Owl
GARRY OAK						
Loss of habitat to current and historical development, agricultural conversion and timber harvest.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 2.1 Annual & perennial non-timber crops, 2.3 Livestock farming & ranching 5.3 Logging & wood harvesting	Maintain the quantity, quality and diversity of Garry Oak habitat.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation. 1.4 Maintain important habitat features on the landscape.	Protect, maintain and restore all remaining Garry Oak habitat. Maintain all cavity-bearing trees and snags, and prevent the cutting or removal of Garry Oaks.	1.1 Site/area protection 2.3 Habitat and natural process restoration 5.2 Policies and regulations	Cassin's Vireo, Hutton's Vireo, Lewis's Woodpecker, Western Bluebird, Western Wood-Pewee

Table 12 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Forest encroachment due to fire suppression.	7.1 Fire & fire suppression	Maintain the quantity, quality and diversity of Garry Oak habitat.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	Wherever possible, mimic historical fire regimes with controlled, low intensity burns outside of the breeding season to maintain fire-dependant Garry Oak habitats.	2.3 Habitat and natural process restoration	Western Bluebird, Lewis's Woodpecker
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate and rodent species. If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Hutton's Vireo, Lewis's Woodpecker
Decreased availability of nest cavities due to competition from European Starlings, House Sparrows, and House Wrens.	8.1 Invasive non-native/alien species 8.2 Problematic native species	Ensure that nest site competition is not limiting Lewis's Woodpecker and Western Bluebird populations.	3.1 Reduce competition with invasive species.	Retain all cavity-bearing trees and snags as nesting habitat. In areas where cavities are limiting, consider initiating a long-term, well-managed nest-box program. To reduce exclusion by House Wrens, nest boxes will need annual maintenance and monitoring. Annual nest box cleaning should occur before March. Reduce and control European Starling and House Sparrow populations. This can be achieved in part by designing new structures and retrofitting existing structures to exclude nesting sites for these species.	2.2 Invasive/problematic species control 2.3 Habitat and natural process restoration 3.2 Species recovery	Lewis's Woodpecker, Western Bluebird

Urban

The urban habitat class consists of urban, suburban and industrial areas where developments such as buildings, roads, parking lots and other impervious surfaces are common (Fig. 16). Urban areas cover 1.1% of the terrestrial area of BCR 5 (Martell 2005). BCR 5 contains Vancouver, which is Canada's third-largest urban area in terms of population size (population 2,117,000 as of 2006; Statistics Canada 2008). The majority of British Columbia's population (over 3 million; Statistics Canada 2008) lives in or near Vancouver, Victoria, and the east coast of Vancouver Island. Only four priority species were identified as using urban habitats in BCR 5: Barn Owl, Barn Swallow, Cooper's Hawk, and Northwestern Crow (Table 13).

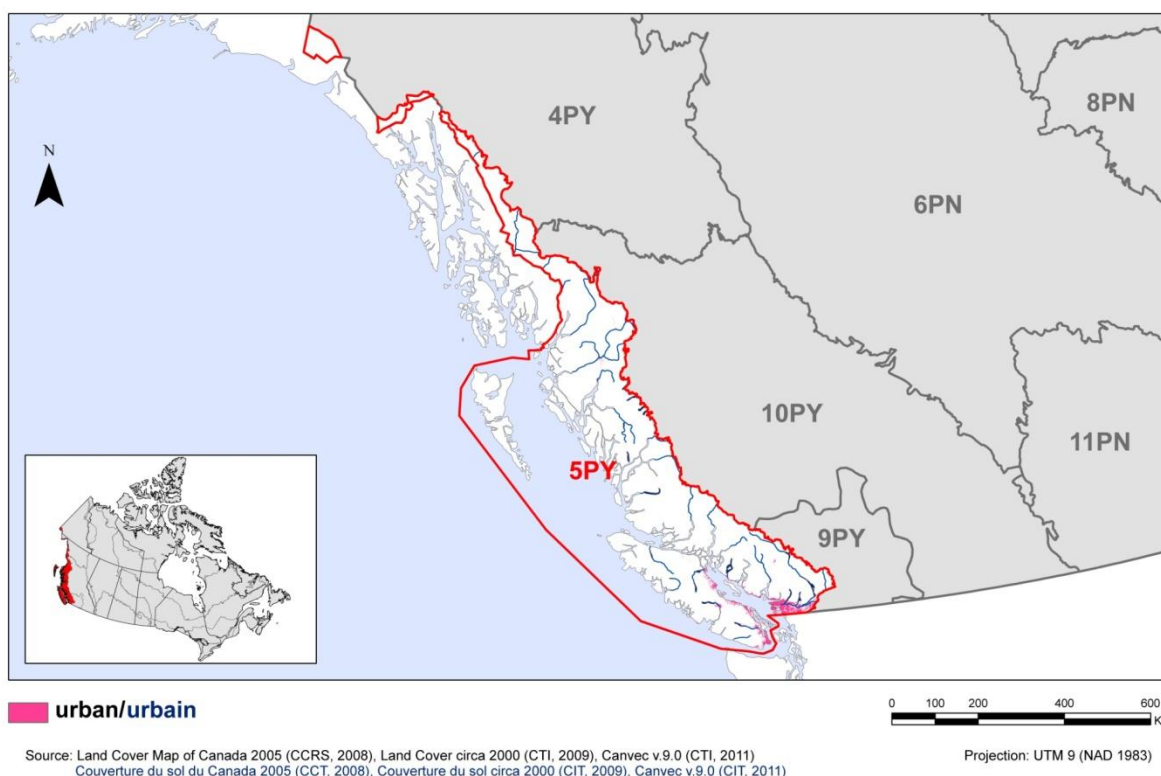


Figure 16. Map of urban habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Primary threats to priority species in urban habitats include loss of foraging habitat and nesting sites due to continuing development, loss of prey and secondary poisoning from pesticide use, and mortality due to collisions with vehicles and buildings (Fig. 17). No threats were identified for the Northwestern Crow. Key actions to address these threats include managing landscapes to provide habitat for Cooper's Hawks and Barn Owls, increasing public awareness of Barn Swallows to reduce persecution, and reducing use of pesticides. Conservation objectives and recommended actions relating to collision mortality and pesticide poisoning are presented separately in the Widespread Issues section (Table 14).

Table 13. Priority species that use urban habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Barn Owl	-	cavities, nest boxes	Assess / Maintain	Y			
Barn Swallow	-	man-made ledges, openings/clearings	Increase 100%	Y	Y		
Cooper's Hawk	-	cottonwood riparian, veteran trees	Increase 100%		Y		
Northwestern Crow	-		Assess / Maintain			Y	

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

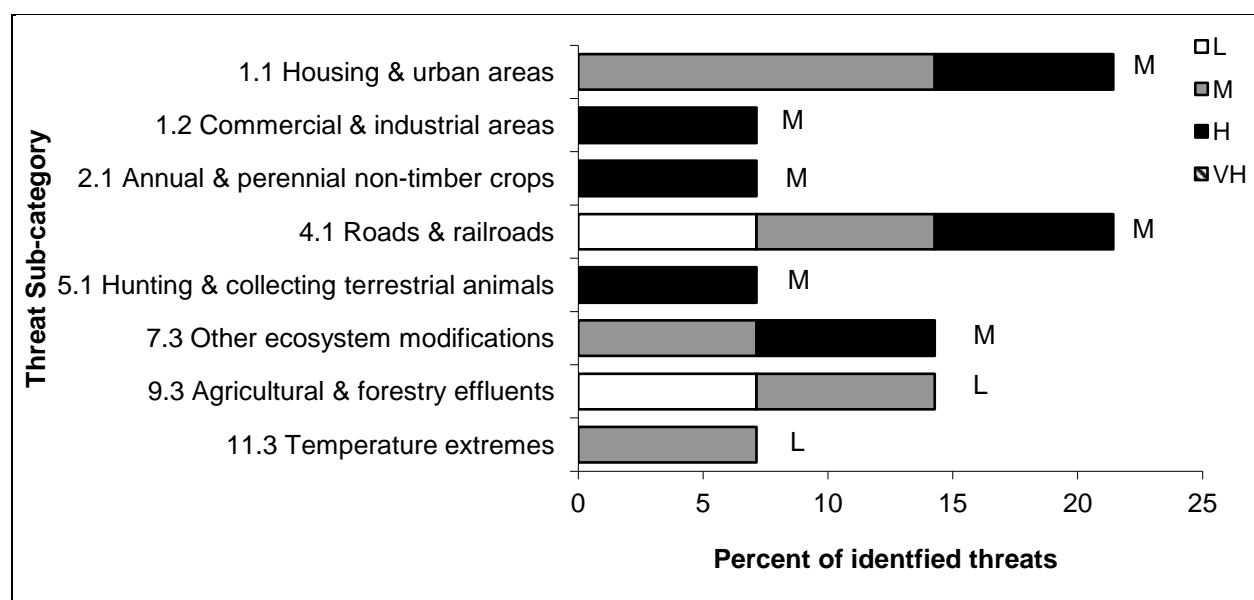


Figure 17. Percent of identified threats to priority species in urban habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in urban habitat (for example, if 100 threats were identified in total for all priority species in urban habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in urban habitat is shown at the end of each bar (also presented in Table 4).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* refers to removal of nests from buildings, and *7.3 Other ecosystem modifications* refers to loss of nesting sites.

Table 14. Threats addressed, conservation objectives, recommended actions and priority species affected for urban habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of foraging habitat to urban, industrial and agricultural conversion. Loss of Barn Owl nesting sites due to modernization of buildings.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 7.3 Other ecosystem modifications	Protect, maintain and enhance high quality nesting and foraging habitat for Barn Owls.	1.4 Maintain important habitat features on the landscape.	Determine the amount of foraging area needed to sustain nesting Barn Owls in urban areas. Identify, protect and manage critical foraging sites for Barn Owls through various methods including land acquisition, conservation easements, stewardship agreements or establishment of formal parks or management areas. Increase public awareness of the Barn Owl and encourage landowners to install nest boxes when renovating, removing old, or building new farm out-buildings in habitat suitable for Barn Owls. Encourage and support well planned nest box projects and monitoring programs.	1.1 Site/area protection 3.2 Species recovery 4.3 Awareness and communications 8.1 Research	Barn Owl
Loss of nesting/roosting /perching trees to development.	1.1 Housing & urban areas	Maintain required habitat features for urban raptors.	1.4 Maintain important habitat features on the landscape.	Retain all trees used or suspected of being used as nesting sites by raptors. Maintain stands of deciduous and coniferous trees with interlocking canopy in woodlots, greenbelts, riparian corridors, and parks/recreation areas, particularly large trees. Manage these areas to ensure a future supply of nesting trees. Raise public awareness of raptors and their habitat and nesting needs, and encourage landowners to retain trees as raptor habitat.	2.1 Site/area management 4.3 Awareness and communications	Cooper's Hawk

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 14 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Removal of Barn Swallow nests by landowners. Loss of nesting sites (building modification, building removal).	5.1 Hunting & collecting terrestrial animals 7.3 Other ecosystem modifications	Prevent destruction of bird nests, in accordance with the <i>Migratory Birds Convention Act</i> .	1.4 Maintain important habitat features on the landscape.	Research is needed to quantify the distribution and intensity of nest removal and assess the threat this behaviour poses to Barn Swallow populations. Increase public awareness of the species, its benefits, and current legal protection to increase stewardship and eliminate destruction of nests. Encourage landowners to incorporate nesting ledges on out-buildings in habitat suitable for Barn Swallows.	8.1 Research 4.3 Awareness and communications 5.4 Compliance and enforcement	Barn Swallow
Reduction in prey availability due to pesticide use.	9.3 Agricultural & forestry effluents	Adopt integrated pest management to minimize use of pesticides.	5.1 Maintain natural food webs and prey sources.	Avoid use of pesticides. When necessary, use only as part of an integrated pest management system to minimize destruction of non-target invertebrate species. If available, use biological control for specific noxious species, rather than chemical control.	5.3 Private sector standards and codes	Barn Swallow

Wetland

The wetland habitat class includes bogs, swamps, marshes, fens, and shallow open water (largely non-vegetated surface, but <2m deep; Fig. 18). These areas cover about 1.5% of BCR 5 (Martell 2005). However, their small extent belies their importance, as wetlands are extremely diverse and productive habitats. Fourteen (14) priority species (6 waterbirds, 5 waterfowl, and 3 landbirds) were identified as using wetland habitats in BCR 5 (Table 15).

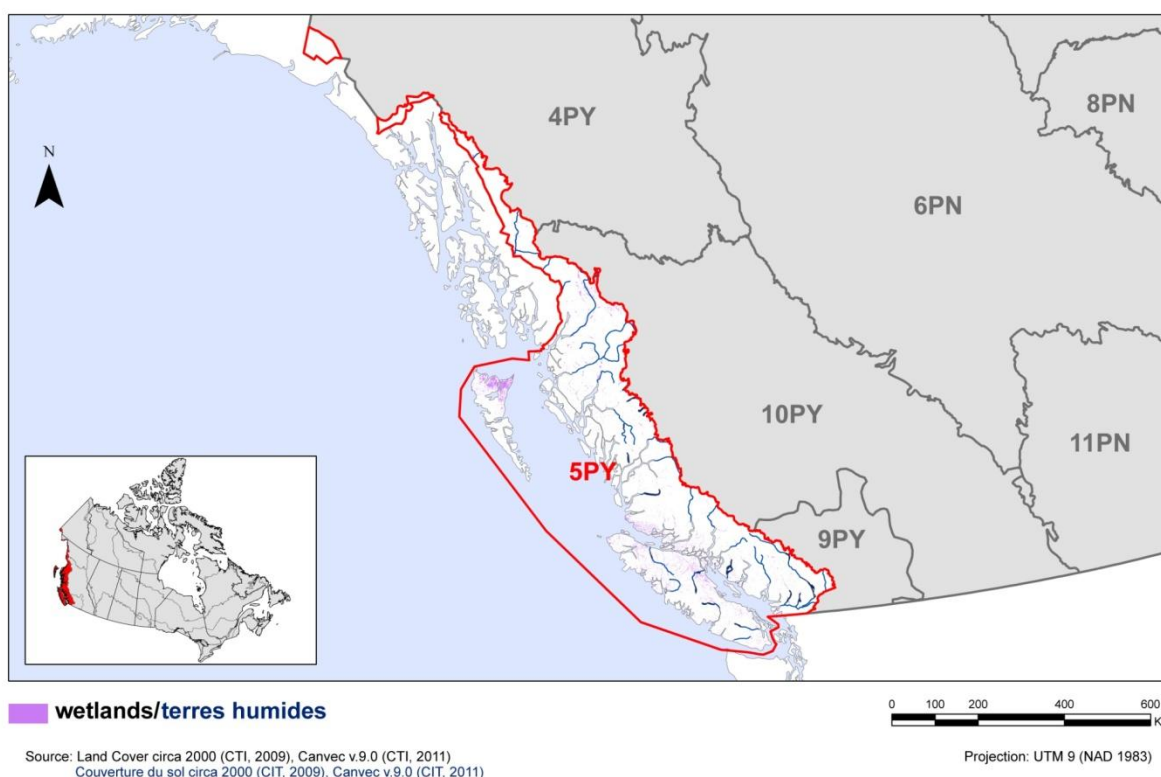


Figure 18. Map of wetland habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Large quantities of wetland habitat have been lost in the past due to drainage or filling for agriculture or urban and industrial development. Agriculture, urban development and forestry can also negatively impact remaining wetlands by altering local hydrology. Pressures have been particularly intense in the lower Fraser Valley. For example, approximately 80% of the wetlands in the Greater Vancouver Regional District had been lost to agriculture or urban development by 1930, and gradual losses continue today (Eriksson et al. 2009). Species using wetland habitat are threatened by historical and ongoing loss of habitat to urban/industrial development and agricultural conversion, and eutrophication of wetlands (Fig. 19). Some species are also threatened by exposure to environmental contaminants such as pesticides and lead. Key actions to address these threats include avoiding further loss of wetland habitat to development, and increasing the use of beneficial management practices for biodiversity and

bird conservation in agriculture, including the use of integrated pest management to minimize use of pesticides and establishment and maintenance of suitable vegetated buffers to maintain water quality (Table 16).

Table 15. Priority species that use wetland habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
American Bittern	marsh, swamp		Assess / Maintain	Y			
Black Tern	marsh		Increase 50%		Y	Y	
Black-crowned Night-Heron	marsh		Assess / Maintain	Y		Y	
Blue-winged Teal	marsh	sheltered shoreline	Assess / Maintain				Y
Cinnamon Teal	marsh		Assess / Maintain				Y
Great Blue Heron (<i>fannini</i>)	marsh	sheltered shoreline, cottonwood riparian, veteran trees	Assess / Maintain	Y			
Green Heron	marsh, swamp		Assess / Maintain	Y			
Green-winged Teal	marsh		Assess / Maintain				Y
Mallard	marsh		Assess / Maintain				Y
Northern Harrier	marsh		Assess / Maintain		Y		
Northern Shoveler	marsh	sheltered shoreline	Assess / Maintain				Y
Rough-legged Hawk	marsh		Assess / Maintain	Y			
Rusty Blackbird	marsh, bog, fen, swamp	forested wetlands, bogs, openings	Assess / Maintain	Y	Y		
Wilson's Phalarope	marsh		Migrant (no population objective)		Y		

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

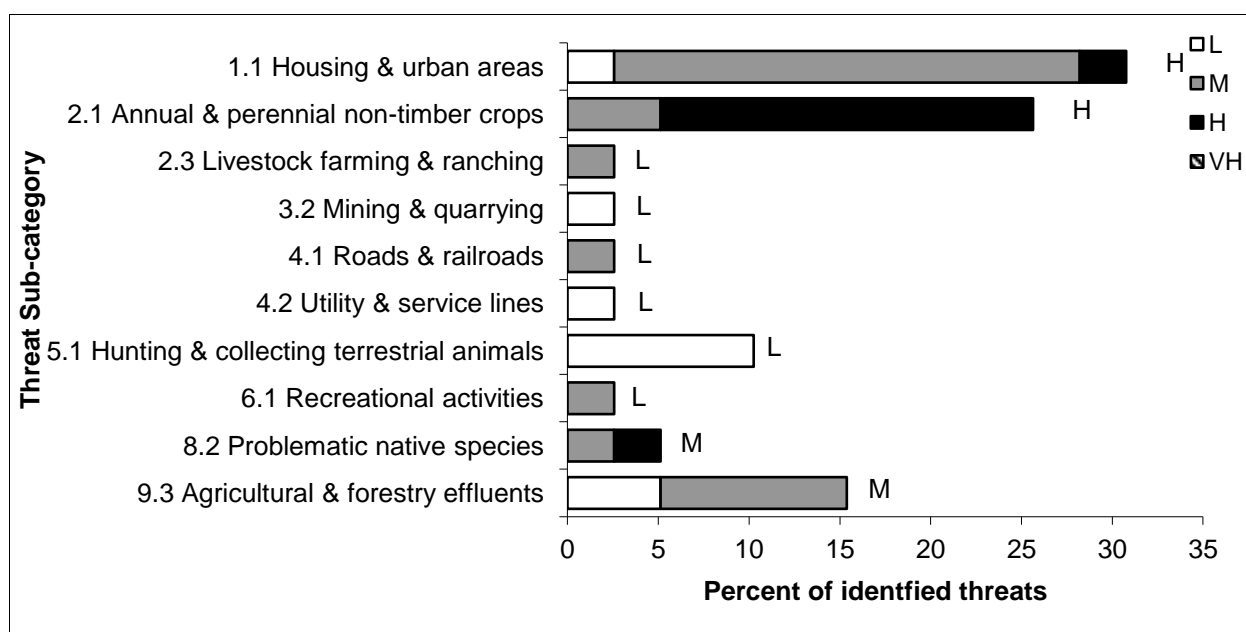


Figure 19. Percent of identified threats to priority species in wetland habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in wetland habitat (for example, if 100 threats were identified in total for all priority species in wetland habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in wetland habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* refers to lead poisoning of waterfowl due to ingestion of lead shot, *8.2 Problematic native species* refers to competition with Red-winged Blackbird and predation by Bald Eagles, and *9.3 Agricultural and forestry effluents* includes wetland eutrophication and effects of pesticide use.

Table 16. Threats addressed, conservation objectives, recommended actions and priority species affected for wetland habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Wetland loss due to urban development and agricultural intensification.	1.1 Housing & urban areas 2.1 Annual & perennial non-timber crops	Maintain and enhance the quantity and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Secure and manage wetlands for priority birds through various methods including land acquisition, conservation easements, stewardship agreements or establishment of formal parks, protected areas, or management areas.	1.1 Site/area protection	American Bittern, Black Tern, Blue-winged Teal, Cinnamon Teal, Great Blue Heron (<i>fannini</i>), Green Heron, Green-winged Teal, Mallard, Northern Shoveler, Rough-legged Hawk, Wilson's Phalarope
Degradation of wetlands due to agriculture and livestock activity.	2.1 Annual & perennial non-timber crops 2.3 Livestock farming & ranching	Maintain and enhance the quantity and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Maintain/restore suitable riparian buffers around wetlands to reduce erosion and runoff, and provide foraging and nesting habitat for birds. Avoid grazing near wetlands during the breeding season.	2.1 Site/area management 2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	American Bittern, Black Tern, Blue-winged Teal, Cinnamon Teal, Green Heron, Green-winged Teal, Mallard, Northern Harrier, Northern Shoveler, Rough-legged Hawk
Eutrophication of wetlands.	9.3 Agricultural & forestry effluents	Maintain and enhance the quantity and diversity of wetland habitats, in support of the Federal Policy on Wetland Conservation.	1.5 Reduce habitat degradation from contaminants.	Maintain unfertilized buffer areas around wetlands and riparian areas. Manage runoff to avoid contamination of surface water by silage, manure or fertilizer. Use fertilizer application practices that reduce the risk of direct drift into water courses or indirect drift into runoff flows that enter aquatic habitats.	2.1 Site/area management 5.3 Private sector standards and codes	American Bittern, Black Tern
Loss of nesting habitat due to	1.1 Housing & urban areas	Ensure that nesting habitat	1.4 Maintain important	Within the Fraser Valley, maintain woodlots with mature trees within 3km of suitable heron	2.1 Site/area management	Great Blue Heron (<i>fannini</i>)

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 16 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
urban development.		availability is not limiting Great Blue Heron (<i>fannini</i>) populations.	habitat features on the landscape.	foraging habitat. Establish visual barriers (e.g., tall vegetation) and reduced-activity buffer zones around heron nesting areas to prevent disturbance.		
Forestry practices encourage spread of Red-winged Blackbird into Rusty Blackbird habitat.	8.2 Problematic native species	Ensure that competition is not limiting Rusty Blackbird populations.	3.2 Reduce competition with problematic native species.	Research is required to determine if competition with Red-winged Blackbirds is limiting Rusty Blackbird populations and identify possible mitigation measures. In the interim, maintain unharvested buffers of contiguous forest around bogs used by breeding Rusty Blackbird.	2.1 Site/area management 8.1 Research	Rusty Blackbird
Predation on nesting Great Blue Heron (<i>fannini</i>) by Bald Eagles.	8.2 Problematic native species	Determine if Bald Eagle predation is negatively impacting Great Blue Heron populations.	7.1 Improve population/demographic monitoring.	Research is required to determine if anthropogenic factors are increasing nest predation on Great Blue Herons by Bald Eagles, assess the degree of threat to herons from this predation, and identify potential mitigation strategies.	8.1 Research	Great Blue Heron (<i>fannini</i>)
Human disturbance at nesting colonies may lead to reduced productivity or colony abandonment.	6.1 Recreational activities	Avoid human disturbance of nesting priority species.	4.1 Reduce disturbance from human recreation.	Limit access to active colonies through creation of buffer zones, seasonal trail closures and limiting events. Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.	2.1 Site/area management 4.3 Awareness and communications 5.2 Policies and regulations	Great Blue Heron (<i>fannini</i>)

Waterbodies, Snow and Ice

Freshwater

The waterbodies, snow and ice habitat class includes standing and flowing water such as reservoirs, lakes, ponds, rivers and streams, as well as areas where snow and/or ice covers the ground for the majority of the year (Fig. 20). Permanent snow and ice are not considered bird habitat *per se* in BCR 5, so the following section focuses on reservoirs, lakes, ponds, streams and rivers.

Freshwater waterbodies cover approximately 2% of BCR 5 (Martell 2005). Ten (10) priority species were identified as using freshwater habitat, including 3 landbirds, 3 waterbirds and 4 waterfowl (Table 17).

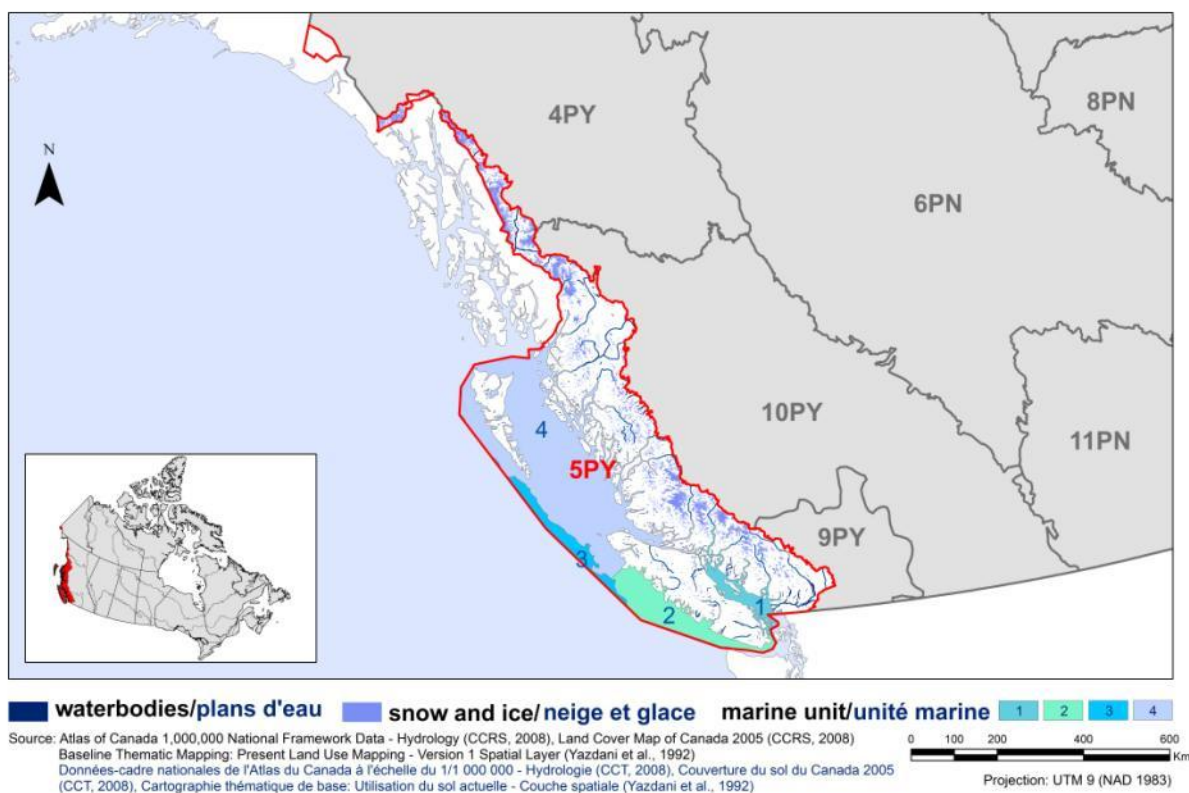


Figure 20. Map of waterbodies, snow and ice habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Primary threats to priority species using freshwater habitats include loss and degradation of habitat due to urban and industrial development, changes in hydrology and water quality due to large-scale timber harvest and hydroelectric development, and exposure to environmental contaminants such as pesticides and lead. Human disturbance also reduces habitat suitability (Fig. 21). Key actions to address these threats include the establishment and maintenance of naturally-vegetated buffers around waterbodies to maintain wildlife habitat, management of

timber harvest and associated activities to avoid runoff, and the careful siting and management of hydroelectric developments to maintain natural hydrological regimes (Table 18). Creation of restricted-access buffer zones around key areas and increasing public awareness of the effects of human disturbance on birds would also be beneficial. Objectives and recommended actions to address environmental contaminants (pesticides, PCBs, lead, other heavy metals, etc.) are presented separately in the [Widespread Issues](#) section.

Table 17. Priority species that use freshwater habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Bald Eagle	lake, river	veteran trees	Assess / Maintain			Y	
Belted Kingfisher	lake, river	burrows	Assess / Maintain			Y	
Black Swift	stream, river	waterfalls, cliffs/canyons	Increase 100%		Y	Y	
Black-crowned Night-Heron	lake, pond		Assess / Maintain	Y		Y	
Canvasback	pond, lake		Assess / Maintain				Y
Common Loon	lake		Assess / Maintain			Y	
Greater Scaup	lake, pond		Increase				Y
Green Heron	lake, river, pond		Assess / Maintain	Y			
Harlequin Duck	stream, river	exposed and sheltered (rocky) shorelines	Assess / Maintain				Y
Lesser Scaup	lake, pond		Increase				Y

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

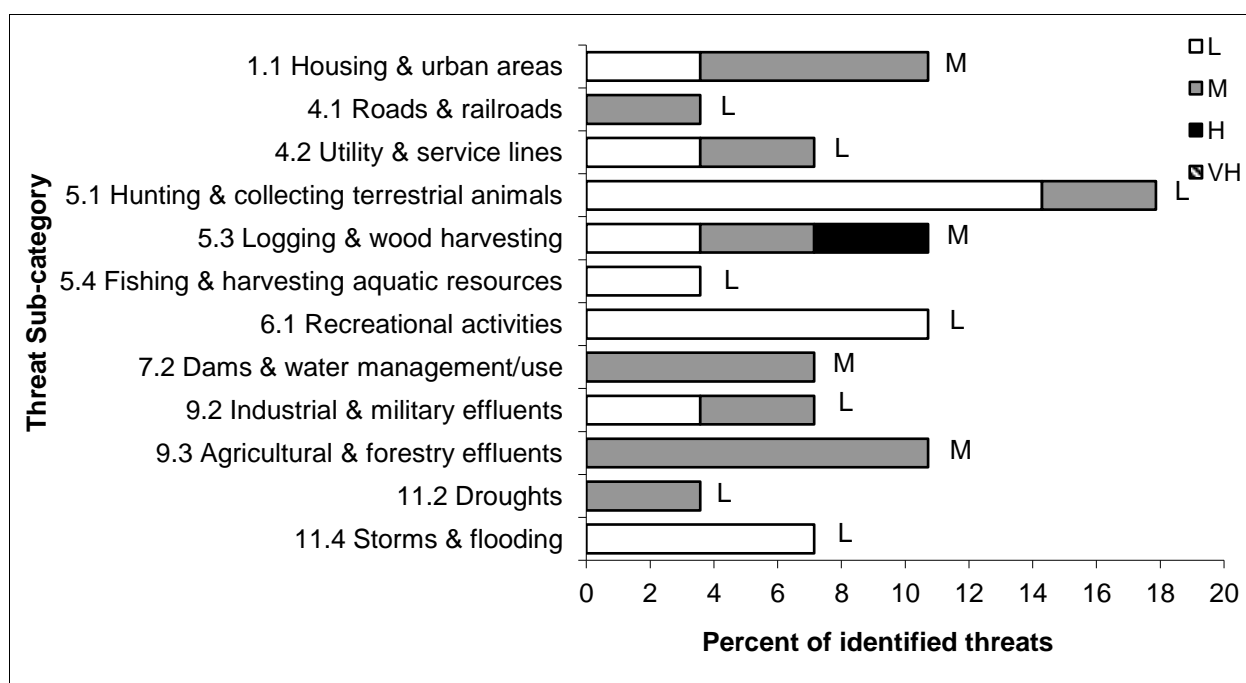


Figure 21. Percent of identified threats to priority species in freshwater habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in freshwater habitat (for example, if 100 threats were identified in total for all priority species in freshwater habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in freshwater habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* includes hunting mortality and poisoning from lead shot. *5.4 Fishing and harvesting aquatic resources* refers to lead poisoning from sinkers/jigs. *9.2 Industrial and military effluents* refers to heavy metals and PCBs. *9.3 Agricultural and forestry effluents* refers to pesticides.

Table 18. Threats addressed, conservation objectives, recommended actions and priority species affected for freshwater habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of lake/pond habitat and associated emergent vegetation due to urban development.	1.1 Housing & urban areas	Maintain the quantity, quality and diversity of lakes, ponds, and associated riparian habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Avoid draining waterbodies of any size. Maintain undisturbed and undeveloped buffer zones around waterbodies of all types (minimum 30m in urban areas, 100m in rural areas and 150m in undeveloped areas). Retain natural vegetation in these buffer zones. Maintain natural shoreline vegetation and emergent vegetation in the water, and minimize water access points.	1.2 Resource and habitat protection 2.1 Site/area management 5.3 Private sector standards and codes	Canvasback, Common Loon
Loss of perching, roosting and nesting habitat to urban development.	1.1 Housing & urban areas	Maintain the quantity, quality and diversity of lakes, ponds, and associated riparian habitats.	1.4 Maintain important habitat features on the landscape.	In suburban and urban areas, maintain existing large veteran trees within or near riparian areas to provide perching, roosting and nesting habitat for Bald Eagles. Protect all trees that are being used or are suspected of being used by nesting Bald Eagles.	1.2 Resource and habitat protection 2.1 Site/area management	Bald Eagle
Habitat loss due to increased siltation and removal of riparian vegetation during logging.	5.3 Logging & wood harvesting	Maintain the quantity, quality and diversity of streams, rivers, and associated riparian habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	In watersheds suitable for Harlequin Ducks, follow Beneficial management practices to minimize runoff, including routing roads through upland areas rather than through streamside zones and wet areas. Install and maintain appropriate erosion control measures to avoid runoff into watercourses. Retain natural riparian vegetation in buffer strips (>30m wide) on either side of the watercourse. Retain riparian and upland vegetation in >300m wide buffer strips along at least 10% of stream length to maintain wildlife habitat. Employ British Columbia's Riparian Areas Regulation for fish habitat where applicable.	5.3 Private sector standards and codes 5.4 Compliance and enforcement	Harlequin Duck

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 18 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of breeding habitat to hydroelectric development.	7.2 Dams & water management/use	Maintain natural hydrologic regimes.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	<p>In watersheds suitable for Harlequin Ducks, maintain the natural range of variation in water flow, water levels and flood frequency in rivers and streams. On controlled streams, mimic historical hydrological regimes as closely as possible. At a minimum, maintain recommended instream flow thresholds.</p> <p>Conduct research to determine the impacts of altered streamflow on nesting density and success of Harlequin Ducks.</p>	<p>1.2 Resource and habitat protection</p> <p>5.3 Private sector standards and codes</p> <p>8.1 Research</p>	Harlequin Duck
Altered hydrologic regimes due to large-scale timber harvest or hydroelectric developments reduce the suitability of waterfall nesting sites.	<p>5.3 Logging & wood harvesting</p> <p>7.2 Dams & water management/use</p>	Maintain natural hydrologic regimes.	1.3 Ensure the continuation of natural processes that maintain bird habitat.	<p>Conduct inventories of Black Swift nest sites in BCR 5. Develop and implement monitoring programs to determine population trends.</p> <p>Locate hydroelectric developments to minimize reduction of flow at waterfalls. Manage timber harvest to ensure that natural hydrological cycles are maintained at known Black Swift nest sites.</p> <p>Initiate research to determine the impacts of altered streamflow on nesting density and success of Black Swift.</p>	<p>5.2 Policies and regulations</p> <p>8.1 Research</p> <p>8.2 Monitoring</p>	Black Swift
Human disturbance at foraging and nesting areas.	6.1 Recreational activities	Avoid human disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	<p>Ensure commercial tourism operators are following backcountry tourism/commercial recreation wildlife guidelines and encourage members of the public to do so as well.</p> <p>Use a combination of buffer zones and seasonal closures around key breeding and foraging areas to prevent disturbance of birds. Reduce or avoid activities such as rafting, boating or fishing on stream reaches used by breeding Harlequin Ducks, particularly narrower streams.</p> <p>Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p>	<p>2.1 Site/area management</p> <p>4.3 Awareness and communications</p> <p>5.3 Private sector standards and codes</p>	Common Loon, Green Heron, Harlequin Duck

Marine

The waterbodies, snow and ice habitat class also includes oceanic habitats. BCR 5 encompasses the Pacific Ocean out to the limit of Canada's exclusive economic zone, and this marine area is represented by the Strait of Georgia, Southern Shelf, Northern Shelf and Offshore Pacific Marine Biogeographic Units. Marine habitats in BCR 5 range from nearshore habitats to pelagic waters beyond the continental shelf. Nearshore conditions vary from the low productivity of the northern fjords to the highly productive Vancouver Island shelf and Strait of Georgia. Offshore areas also include areas of high productivity around upwellings near the continental shelf break. Both nearshore and offshore habitats are important for commercial fishing and include major transportation corridors for British Columbia's busy shipping industry (Martell 2005). Very little (0.5%) of Canada's Pacific ocean is currently protected, and most of the existing protected area is shallow waters adjacent to the coast (BC Ministry of the Environment 2006). Forty-two priority species (33 waterbirds, 7 waterfowl, and 1 shorebird) were identified as using marine habitats in BCR 5 (Table 19). Twenty-three of these (56%) are considered at risk, either provincially or federally.

Major threats to priority species in Canada's Pacific Ocean include oil spills, potential impacts of commercial fisheries on the availability of prey, entanglement in fishing gear, ingestion of plastic debris, and changes in productivity and altered oceanic food webs due to climate change (Fig. 22). Key actions to address these threats include the use of avian bycatch mitigation measures in longline and gillnet fisheries, research to determine the effects of commercial fisheries on seabirds and consideration for marine birds in fisheries management, and reducing the amount of plastic waste in the marine environment (Table 20). Further information on the expected effects of climate change in BCR 5 can be found in the [Widespread Issues](#) section, as well as objectives and actions associated with oil spills and climate change.

Table 19. Priority species that use marine habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Ancient Murrelet	continental shelf waters, pelagic waters	burrows	Assess / Maintain	Y	Y	Y	
Barrow's Goldeneye	nearshore waters	cavities	Maintain current				Y
Black Scoter	nearshore waters	shellfish beds	Increase				Y
Black-footed Albatross	continental shelf waters, pelagic waters		Assess / Maintain	Y	Y	Y	
Brandt's Cormorant	nearshore waters	kelp	Assess / Maintain	Y	Y	Y	
Bufflehead	nearshore waters	cavities	Maintain current				Y
Buller's Shearwater	continental shelf waters, pelagic waters		Assess / Maintain	Y			
California Gull	nearshore waters, continental shelf waters and pelagic waters	exposed and sheltered (rocky) shoreline	Assess / Maintain	Y		Y	
Caspian Tern	nearshore waters		Assess / Maintain	Y			
Cassin's Auklet	continental shelf waters, pelagic waters	burrows	Assess / Maintain	Y		Y	
Common Goldeneye	nearshore waters	cavities	Assess / Maintain				Y
Common Loon	nearshore waters, continental shelf waters		Assess / Maintain			Y	
Common Murre	nearshore waters, continental shelf waters, pelagic waters	cliffs, rock outcrops	Assess / Maintain	Y		Y	
Common Tern	nearshore waters	kelp	Migrant (no population objective)			Y	
Double-crested Cormorant	nearshore waters	rock outcrops	Assess / Maintain	Y			
Flesh-footed Shearwater	continental shelf waters, pelagic waters		Assess / Maintain	Y			
Glaucous-winged Gull	nearshore waters, continental shelf waters	rock outcrops	Assess / Maintain			Y	
Greater Scaup	nearshore waters		Increase				Y
Heermann's Gull	nearshore waters, continental shelf waters	kelp	Assess / Maintain			Y	
Horned Grebe	nearshore waters		Assess / Maintain	Y			
Horned Puffin	continental shelf waters, pelagic waters	cliffs	Assess / Maintain	Y	Y	Y	
Laysan Albatross	continental shelf waters, pelagic waters		Assess / Maintain	Y	Y	Y	
Leach's Storm-Petrel	pelagic waters	burrows	Assess / Maintain		Y		
Lesser Scaup	nearshore waters		Increase				Y
Manx Shearwater	nearshore waters, continental shelf waters, pelagic waters		Assess / Maintain		Y	Y	
Marbled Murrelet	nearshore waters, continental shelf waters, pelagic waters		Recovery objective	Y	Y	Y	
Northern Fulmar	continental shelf waters, pelagic waters	cliffs	Assess / Maintain	Y			
Pelagic Cormorant	nearshore waters	cliffs	Assess / Maintain		Y	Y	
Pigeon Guillemot	nearshore waters, continental shelf waters	burrows	Assess / Maintain			Y	

Table 19 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Pink-footed Shearwater	continental shelf waters, pelagic waters		Recovery objective	Y	Y		
Red-necked Phalarope	nearshore, continental shelf waters, pelagic waters	kelp	Assess / Maintain	Y			
Rhinoceros Auklet	continental shelf waters, pelagic waters	burrows	Assess / Maintain			Y	
Short-tailed Albatross	continental shelf waters, pelagic waters		Recovery objective	Y	Y		
Surf Scoter	nearshore waters	shellfish beds	Increase	Y			Y
Thayer's Gull	nearshore waters, and continental shelf waters		Assess / Maintain			Y	
Thick-billed Murre	nearshore waters, continental shelf waters, pelagic waters	cliffs, rock outcrops	Assess / Maintain	Y		Y	
Tufted Puffin	continental shelf waters, pelagic waters	burrows	Assess / Maintain	Y		Y	
Western Grebe	nearshore waters		Increase 100%	Y		Y	
Western Gull	nearshore waters, continental shelf waters		Assess / Maintain			Y	
White-winged Scoter	nearshore waters		Increase				Y
Xantus's Murrelet	continental shelf waters, pelagic waters		Assess / Maintain		Y	Y	
Yellow-billed Loon	nearshore waters, continental shelf waters	sheltered waters	Assess / Maintain	Y			

Note: Reasons for inclusion in the priority species list are as follows. At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

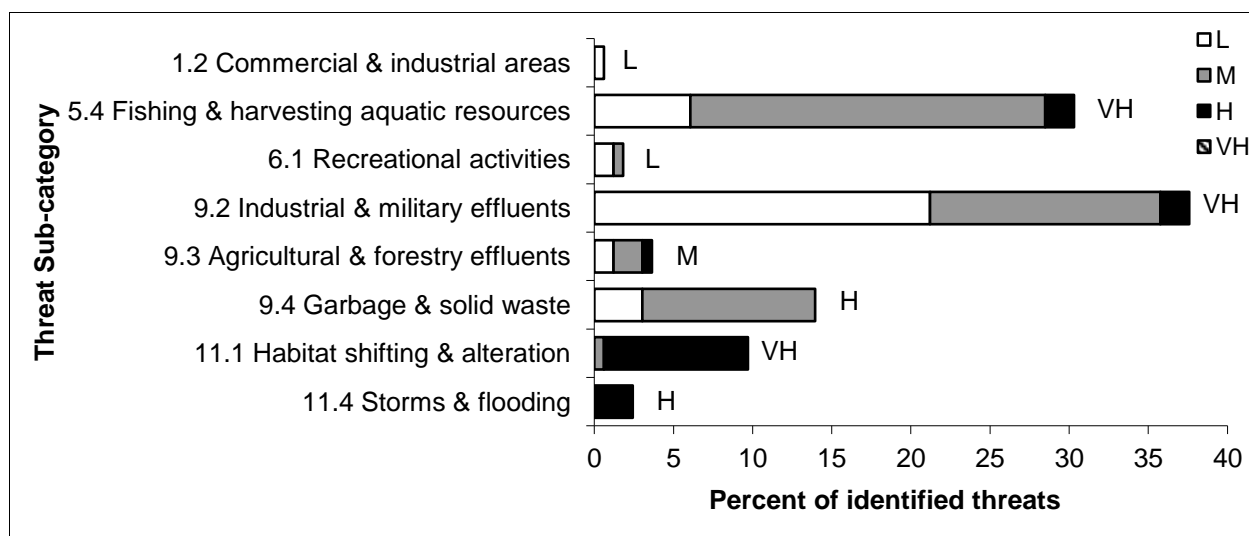


Figure 22. Percent of identified threats to priority species in marine habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in marine habitat (for example, if 100 threats were identified in total for all priority species in marine habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in marine habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: The overall rolled-up magnitude of the threat is shown at the end of each bar. Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. 5.4 *Fishing and harvesting aquatic resources* refers primarily to fisheries bycatch and effects of commercial fisheries on prey stocks. 9.2 *Industrial and military effluents* includes oil spills and contaminants such as heavy metals and PCBs. 9.3 *Agricultural and forestry effluents* refers to pesticides, and 9.4 *Garbage and solid waste* refers to ingestion of plastic debris.

Table 20. Threats addressed, conservation objectives, recommended actions and priority species affected for marine habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Mortality due to entanglement in gillnets.	5.4 Fishing & harvesting aquatic resources	Eliminate accidental bird mortality in gillnet fisheries, in accordance with the <i>Migratory Birds Convention Act</i> .	2.4 Reduce incidental mortality.	Implement bycatch mitigation measures such as visual net panels and spatial and temporal management of net deployment. Encourage collection and removal of derelict fishing gear. Monitor and assess the effectiveness of mitigation measures for each fishery. Research and develop fishery-specific mitigation measures.	5.2 Policies and regulations 5.3 Private sector standards and codes 8.1 Research 8.2 Monitoring	Ancient Murrelet, Brandt's Cormorant, California Gull, Cassin's Auklet, Common Murre, Double-crested Cormorant, Horned Grebe, Horned Puffin, Manx Shearwater, Marbled Murrelet, Pelagic Cormorant, Pigeon Guillemot, Rhinoceros Auklet, Surf Scoter, Thayer's Gull, Thick-billed Murre, Tufted Puffin, Western Grebe, Western Gull, Xantus's Murrelet
Mortality due to entanglement in longlines.	5.4 Fishing & harvesting aquatic resources	Eliminate accidental bird mortality in longline fisheries, in accordance with the <i>Migratory Birds Convention Act</i> .	2.4 Reduce incidental mortality.	Implement, monitor and enforce bycatch mitigation measures such as increasing bait sink rates and installing bird scaring devices such as lines, streamers and curtains. Monitor and assess the effectiveness of mitigation measures for each fishery. Research and develop fishery specific mitigation measures.	5.2 Policies and regulations 5.3 Private sector standards and codes 8.1 Research 8.2 Monitoring	Black-footed Albatross, California Gull, Glaucous-winged Gull, Laysan Albatross, Northern Fulmar, Pink-footed Shearwater, Short-tailed Albatross
Ingestion of plastic waste by priority species.	9.4 Garbage & solid waste	Reduce the amount of plastic waste available for ingestion in marine environments.	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Determine the extent and impact of plastic ingestion on adult survival and reproductive success. Monitor levels of plastic pollution in the environment and determine sources. Support compliance with international laws (such as MARPOL Annex 5) banning the dumping of garbage at sea.	4.3 Awareness and communications 5.2 Policies and regulations 5.4 Compliance and enforcement 8.1 Research	Ancient Murrelet, Black-footed Albatross, Buller's Shearwater, California Gull, Cassin's Auklet, Common Murre, Flesh-footed Shearwater, Glaucous-winged Gull, Heermann's Gull, Horned Puffin, Laysan Albatross, Leach's Storm-Petrel, Manx Shearwater, Northern Fulmar, Pigeon Guillemot, Pink-

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 20 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
				<p>Encourage and support education programs that reduce plastic waste in marine environments.</p> <p>Encourage and support the adoption of "Zero Waste" strategies by municipal, provincial, national and international governments.</p>	8.2 Monitoring	<p>footed Shearwater, Red-necked Phalarope, Rhinoceros Auklet, Short-tailed Albatross, Thayer's Gull, Thick-billed Murre, Tufted Puffin, Western Gull</p>
Commercial fisheries may reduce prey stocks.	5.4 Fishing & harvesting aquatic resources	Ensure that competition with commercial fisheries is not limiting populations of priority bird species.	5.3 Reduce human competition for food resources or foraging sites.	<p>Research is required to determine if direct or indirect competition with commercial fisheries for prey is limiting seabird species.</p> <p>Determine the degree of overlap between commercial fisheries and the foraging needs of priority bird species.</p> <p>Include consideration of marine birds in the management of commercial fisheries.</p>	<p>5.2 Policies and regulations</p> <p>5.3 Private sector standards and codes</p> <p>8.1 Research</p>	<p>Black-footed Albatross, Brandt's Cormorant, Buller's Shearwater, Caspian Tern, Common Loon, Common Murre, Double-crested Cormorant, Flesh-footed Shearwater, Horned Puffin, Laysan Albatross, Manx Shearwater, Marbled Murrelet, Northern Fulmar, Pelagic Cormorant, Pigeon Guillemot, Pink-footed Shearwater, Rhinoceros Auklet, Short-tailed Albatross, Thick-billed Murre, Tufted Puffin, Western Grebe, Xantus's Murrelet, Yellow-billed Loon</p>
Human disturbance at roosting and foraging areas.	6.1 Recreational activities	Avoid human disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	<p>Ensure commercial tourism operators are following backcountry tourism/commercial recreation wildlife guidelines and encourage members of the public to do so as well.</p> <p>Increase public awareness of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p>	<p>4.3 Awareness and communications</p> <p>5.3 Private sector standards and codes</p>	<p>Ancient Murrelet, Lesser Scaup, Marbled Murrelet</p>

Coastal

BCR 5 includes all 29,000 km of British Columbia's coastline (Fig. 23). In BCR 5, the coastal habitat class encompasses a wide variety of shoreline habitats, from steep, rugged cliffs and exposed rocky islands to sandy beaches, estuaries, saltmarshes, and mudflats. BCR 5's many remote islands and seaside cliffs provide nesting habitat for over 5 million seabirds at approximately 500 sites (Martell 2005), and rocky shorelines and coastal waters are used by a wide variety of shorebirds, waterbirds and seaducks. While BCR 5's shoreline is dominated by steep rocky shores and deep fjords, there are also over 440 estuaries, occupying about 2.3% of BCR 5's coastline (Austin et al. 2008). These estuaries provide important habitat for many waterfowl, waterbirds and shorebirds. Mudflats, sand flats, beaches and dunes provide critical stopover habitat for millions of migrating shorebirds, particularly the Fraser River estuary, which is a site of hemispheric importance under the [Western Hemisphere Shorebird Reserve Network](#), an [Important Bird Area](#), and contains a [Ramsar site](#). The diversity of coastal habitats and their importance to birds in BCR 5 is reflected in the fact that almost half of all priority species in BCR 5 (68 of 139, or 49%; Table 21) use coastal habitat, including landbirds (11 species), waterbirds (22), shorebirds (17) and waterfowl (18). Thirty of these (44%) are considered at risk, either federally or provincially. One species, the Horned Lark (*strigata*; federally Endangered), no longer has a breeding population in BCR 5 and occurs only as occasional non-breeding individuals.

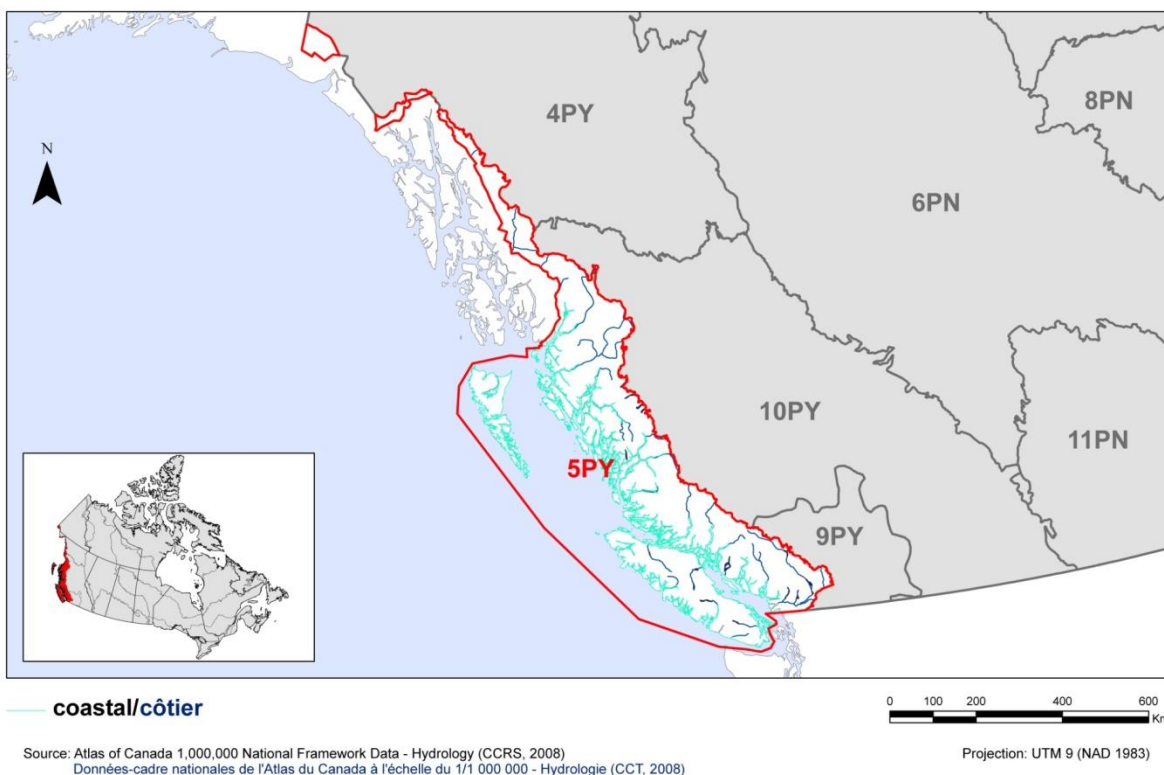


Figure 23. Map of coastal habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Many species are threatened by the loss of important breeding, wintering, and stopover habitat due to development of coastal areas (Fig. 24). Some regions of BCR 5's coasts are under intense development pressure, particularly the Strait of Georgia. Approximately 23% of the nearshore habitat around the Georgia Basin—which includes BCR 5's most important estuarine and shorebird stopover habitat—has been urbanized, and much of the estuarine habitat has been dyked, drained, and converted to agriculture (Austin et al. 2008). Sea-level rise due to climate change will have negative impacts in coming years on mudflats, sandflats, beaches, saltmarshes, and estuaries, and the species reliant on these habitats. The Fraser River delta is particularly at risk, as valuable tidal habitat will be squeezed between the rising waters and coastal dykes; significant amounts of habitat will inevitably be lost (Bornhold 2008, Thomson et al. 2008).

Birds are also threatened by excessive human disturbance at important breeding, stopover, and wintering sites. Invasive species pose a number of significant threats, from degradation of mudflats due to invasive *Spartina* to the potential for introduced predators on historically predator-free nesting islands to decimate entire seabird colonies. Priority species in coastal environments are also threatened by the potential for catastrophic oil spills, and other environmental contaminants such as plastic waste, PCBs, lead, and pesticides.

Key actions to address these threats include the protection of key areas of coastal habitat, the eradication or control of invasive species, including removal of all introduced predators from seabird nesting colonies, and reducing the amount of plastic waste in the environment (Table 22). Increasing public awareness of the effects of disturbance on priority species and establishing/maintaining buffer zones around bird colonies and key foraging, stopover and roosting sites would also be beneficial. Conservation objectives and recommended actions addressing effects of climate change and environmental contaminants such as oil, lead, PCBs and pesticides are presented in the [Widespread Issues](#) section.

Table 21. Priority species that use coastal habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
American Golden-Plover	tidal flats, beaches		Migrant (no population objective)	Y	Y		
American Wigeon	estuaries, tidal flats, eelgrass		Maintain current				Y
Bald Eagle	estuaries, tidal flats, rocky shoreline	veteran trees	Assess / Maintain			Y	
Belted Kingfisher	estuaries, rocky shoreline	burrows	Assess / Maintain			Y	
Black Oystercatcher	rocky shoreline	exposed and sheltered shoreline	Assess / Maintain		Y	Y	
Black Scoter	rocky shoreline	shellfish beds	Increase				Y
Black Turnstone	rocky shoreline	exposed shoreline	Assess / Maintain		Y	Y	
Black-bellied Plover	tidal flats, beach/dunes		Assess / Maintain			Y	
Blue-winged Teal	estuaries, saltmarsh	sheltered shoreline	Assess / Maintain				Y
Brandt's Cormorant	marine islands	kelp	Assess / Maintain	Y	Y	Y	
Brant (Black)	tidal flats, estuaries, beach/dunes, eelgrass		Maintain current	Y			Y
Brant (Western High Arctic)	tidal flats, estuaries, beach/dunes, eelgrass		Assess / Maintain	Y			Y
Cackling Goose	estuaries, saltmarsh, tidal flats		Assess / Maintain	Y			Y
California Gull	rocky shoreline, tidal flats, estuaries	exposed and sheltered shoreline	Assess / Maintain	Y		Y	
Canada Goose (Dusky)	estuaries, saltmarsh, tidal flats		Assess / Maintain	Y			Y
Canada Goose (Pacific)	estuaries, saltmarsh		Maintain current				Y
Canvasback	estuaries		Assess / Maintain				Y
Caspian Tern	beach/dunes, tidal flats, estuaries		Assess / Maintain	Y			
Cassin's Auklet	marine islands	burrows	Assess / Maintain	Y		Y	
Common Murre	marine islands	cliffs, rocky outcrops	Assess / Maintain	Y		Y	
Common Tern	beaches, tidal flats, estuaries	kelp	Migrant (no population objective)			Y	
Double-crested Cormorant	marine islands		Assess / Maintain	Y			
Dunlin	tidal flats		Assess / Maintain			Y	
Glaucous-winged Gull	tidal flats, estuaries, beach/dunes, rocky shoreline		Assess / Maintain			Y	
Great Blue Heron (<i>fannini</i>)	tidal flats, estuaries, saltmarsh	sheltered shoreline, cottonwood riparian, veteran trees	Assess / Maintain	Y			

Table 21 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Greater White-fronted Goose	estuaries, tidal flats		Assess / Maintain				Y
Green-winged Teal	tidal flats, estuaries		Assess / Maintain				Y
Gyrfalcon	estuaries, tidal flats		Assess / Maintain	Y			
Harlequin Duck	rocky shoreline	exposed and sheltered (rocky) shorelines	Assess / Maintain				Y
Heermann's Gull	beach/dunes, rocky shoreline	kelp	Assess / Maintain			Y	
Horned Grebe	estuaries		Assess / Maintain	Y			
Horned Lark (<i>strigata</i>)	estuaries		Recovery objective	Y			
Horned Puffin	marine islands	cliffs	Assess / Maintain	Y	Y	Y	
Leach's Storm-Petrel	marine islands	burrows	Assess / Maintain		Y		
Lesser Snow Goose	estuaries		Maintain current				Y
Long-billed Curlew	tidal flats, estuaries		Recovery objective	Y	Y		
Mallard	estuaries		Assess / Maintain				Y
Marbled Godwit	tidal flats, estuaries, beach/dunes		Assess / Maintain		Y		
Northern Fulmar	marine islands	cliffs	Assess / Maintain	Y			
Northern Pintail	estuaries, tidal flats, eelgrass		Maintain current				Y
Northern Shoveler	estuaries	sheltered shoreline	Assess / Maintain				Y
Northwestern Crow	estuaries, tidal flats, rocky shoreline		Assess / Maintain			Y	
Pelagic Cormorant	marine islands	cliffs	Assess / Maintain		Y	Y	
Peregrine Falcon (<i>anatum</i>)	estuaries, tidal flats, rocky shoreline	cliffs	Assess / Maintain	Y			
Peregrine Falcon (<i>pealei</i>)	estuaries, tidal flats, rocky shoreline	cliffs, seabird colonies	Assess / Maintain	Y			
Pigeon Guillemot	marine islands	burrows	Assess / Maintain			Y	
Purple Martin	estuaries	cavities, nest boxes	Assess / Maintain	Y			
Red Knot	tidal flats		Migrant (no population objective)	Y	Y	Y	
Rhinoceros Auklet	marine islands	burrows	Assess / Maintain			Y	
Rock Sandpiper	rocky shoreline		Assess / Maintain			Y	
Ruddy Turnstone	rocky shoreline, beach/dunes, tidal flats		Assess / Maintain		Y		
Sanderling	beach/dunes, tidal flats		Assess / Maintain		Y		
Short-billed Dowitcher	estuaries, tidal flats		Assess / Maintain	Y		Y	
Short-eared Owl	estuaries, saltmarsh		Assess / Maintain	Y			
Snowy Owl	estuaries, tidal flats		Assess / Maintain	Y			

Table 21 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Surfbird	rocky shoreline		Assess / Maintain		Y		
Thayer's Gull	estuaries, saltmarsh, tidal flats		Assess / Maintain			Y	
Thick-billed Murre	marine islands	cliffs	Assess / Maintain	Y		Y	
Trumpeter Swan	estuaries		Maintain current				Y
Tufted Puffin	marine islands	burrows	Assess / Maintain	Y		Y	
Tundra Swan	estuaries		Assess / Maintain	Y			Y
Violet-green Swallow	estuaries	cavities, cliffs, nest boxes	Assess / Maintain			Y	
Wandering Tattler	tidal flats, beach/dunes, rocky shoreline	exposed shoreline	Migrant (no population objective)	Y			
Western Gull	tidal flats, beach/dunes, rocky shoreline		Assess / Maintain			Y	
Western Sandpiper	tidal flats, beach/dunes		Assess / Maintain			Y	
Whimbrel	tidal flats, estuaries, beach/dunes, rocky shoreline		Migrant (no population objective)		Y		
Wilson's Phalarope	estuaries		Migrant (no population objective)		Y		

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

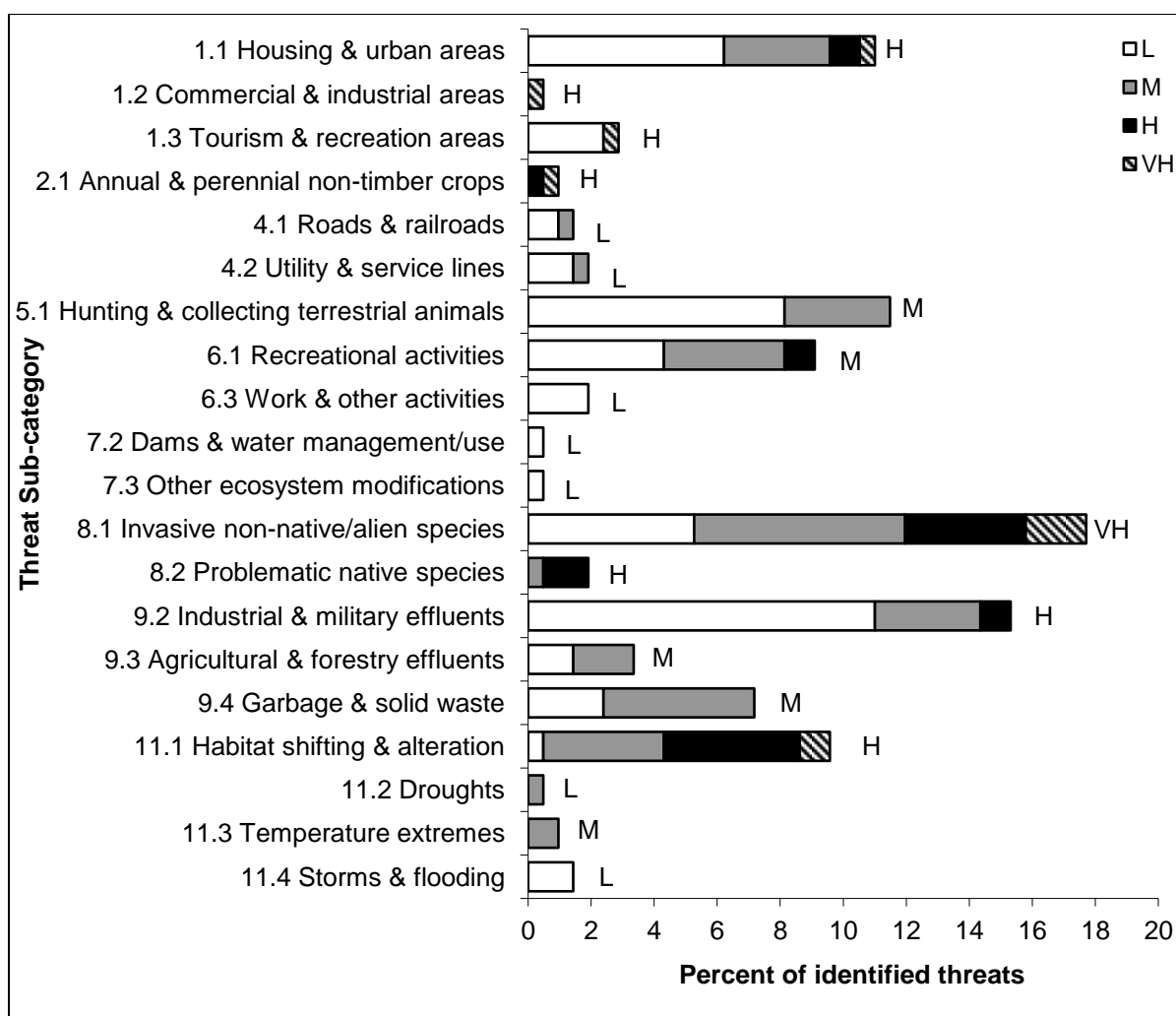


Figure 24. Percent of identified threats to priority species in coastal habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal habitat (for example, if 100 threats were identified in total for all priority species in coastal habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in coastal habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *5.1 Hunting and collecting terrestrial animals* includes hunting, illegal harvest, and lead poisoning from ingestion of lead shot. *7.3 Other ecosystem modifications* refers to loss of nesting sites. *8.1 Invasive non-native/alien species* includes effects of introduced mammalian predators on seabird colonies and *Spartina* invasion of mudflats. *8.2 Problematic native species* includes disturbance and predation by Bald Eagles. *9.2 Industrial and military effluents* includes oil spills and PCBs, *9.3 Agricultural and forestry effluents* refers to pesticides, and *9.4 Garbage and solid waste* refers to ingestion of plastic debris.

Table 22. Threats addressed, conservation objectives, recommended actions and priority species affected for coastal habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss or degradation of coastal habitats to a suite of human activity.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 1.3 Tourism & recreation areas 2.1 Annual & perennial non-timber crops 7.2 Dams & water management/use	Maintain and enhance the quality and diversity of coastal habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Secure and manage key areas of coastal habitat for priority birds through various methods including land acquisition, conservation easements, stewardship agreements or establishment of formal parks, protected areas, or management areas. Priority areas include important stopover and wintering habitat such as estuaries, tidal sand/mud flats such as Robert's Bank, Boundary Bay, and the Tofino Mudflats, and herring spawn sites. Conduct regular surveys of all coastal habitats (including rocky shoreline habitats) to identify and map areas where large numbers or a wide diversity of priority species congregate. Consider protection of these areas. Expand the extent and protection of existing Important Bird Areas.	1.1 Site/area protection	American Golden-Plover, Bald Eagle, Black-bellied Plover, Black Oystercatcher, Black Turnstone, Brant (Black), Brant (Western High Arctic), Dunlin, Great Blue Heron (<i>fannini</i>), Horned Grebe, Horned Lark (<i>strigata</i>), Long-billed Curlew, Red Knot, Ruddy Turnstone, Sanderling, Short-billed Dowitcher, Short-eared Owl, Surfbird, Wandering Tattler, Western Sandpiper, Whimbrel, Wilson's Phalarope
Predation of priority species by introduced mammalian predators. Reduced prey base due to introduced mammalian predators (Peregrine	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing future introductions.	3.5 Prevent and control the spread of invasive and exotic species. 5.1 Maintain natural food webs and prey sources.	Remove all introduced predators (rats, mink, raccoons) from all currently active and historical seabird colonies. Establish regular monitoring of colonies for introduced predators. Increase public and industry awareness of the impacts of introduced predators on seabird colonies and encourage the adoption of beneficial management practices to prevent future introductions or re-introductions of rats to rat-free areas.	2.2 Invasive/problematic species control 4.3 Awareness and communications 8.2 Monitoring	Black Oystercatcher, Cassin's Auklet, Common Murre, Double-crested Cormorant, Horned Puffin, Leach's Storm-Petrel, Northern Fulmar, Pelagic Cormorant, Peregrine Falcon (<i>pealei</i>), Pigeon Guillemot, Rhinoceros Auklet, Thick-billed Murre, Tufted Puffin

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Falcon [<i>pealei</i>])						
Habitat degradation by introduced plant species.	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing future introductions.	3.5 Prevent and control the spread of invasive and exotic species.	<p>Conduct regular inventories of the location and extent of <i>Spartina</i> in BCR 5, including monitoring for new infestations. Wherever possible, remove <i>Spartina</i> via herbicide application and/or mechanical removal. Removal should take place as quickly as possible.</p> <p>Educate the public and research community on how <i>Spartina</i> threatens shorebird habitat, and how to identify and report <i>Spartina</i> occurrences.</p> <p>Conduct research to determine the most effective methods for removing <i>Spartina</i> and limiting <i>Spartina</i> dispersal.</p>	2.3 Habitat and natural process restoration 4.3 Awareness and communications 8.1 Research 8.2 Monitoring	American Golden-Plover, American Wigeon, Black-bellied Plover, Brant (Black), Brant (Western High Arctic), Cackling Goose, Canada Goose (Dusky), Canada Goose (Pacific), Dunlin, Green-winged Teal, Long-billed Curlew, Mallard, Marbled Godwit, Northern Pintail, Red Knot, Ruddy Turnstone, Sanderling, Short-billed Dowitcher, Western Sandpiper, Whimbrel
Habitat degradation by introduced plant species.	8.1 Invasive non-native/alien species	Eliminate or control invasive species while preventing future introductions.	3.5 Prevent and control the spread of invasive and exotic species.	<p>Eliminate or control introduced plant species occurring in estuaries and beach/dune habitat.</p> <p>Increase public awareness of invasive plant species and measures to control their spread (such as regular cleaning of vehicles and equipment, and using only native species for gardening, landscaping and re-vegetation purposes) to prevent establishment of additional invasive species.</p>	2.2 Invasive/problematic species control 4.3 Awareness and communications	Horned Lark (<i>strigata</i>)
Loss of nesting habitat due to urban development.	1.1 Housing & urban areas	Ensure that nesting habitat availability is not limiting Great Blue Heron (<i>fannini</i>) populations.	1.4 Maintain important habitat features on the landscape.	Within the Fraser Valley, maintain woodlots with mature trees within 3km of suitable heron foraging habitat. Establish visual barriers (e.g., tall vegetation) and reduced-activity buffer zones around heron nesting areas to prevent disturbance.	2.1 Site/area management	Great Blue Heron (<i>fannini</i>)

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Human disturbance at nesting colonies may increase reproductive failure or nest/colony abandonment.	6.1 Recreational activities 6.3 Work and other activities	Avoid disturbance of priority species at nesting colonies.	4.1 Reduce disturbance from human recreation. 4.2 Reduce disturbance from industrial or work activity. 4.3 Reduce disturbance from research.	<p>Increase public awareness among target groups (including all recreational users of coastal habitat and commercial/industrial operations near bird colonies) of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p> <p>Ensure commercial tourism operators are following backcountry tourism/commercial recreation wildlife guidelines and encourage members of the public to do so as well.</p> <p>Establish buffer zones or seasonal closures around seabird and heron breeding colonies to prevent disturbance.</p>	2.1 Site/area management 4.3 Awareness and communications 5.3 Private sector standards and codes	Brandt's Cormorant, Caspian Tern, Cassin's Auklet, Double-crested Cormorant, Great Blue Heron (<i>fannini</i>), Pelagic Cormorant, Pigeon Guillemot, Rhinoceros Auklet
Human disturbance at nest sites, foraging and roosting areas. Human disturbance at staging and overwintering areas.	6.1 Recreational activities	Avoid disturbance of priority species and prevent changes in habitat use due to disturbance.	4.1 Reduce disturbance from human recreation.	<p>Increase public awareness of all recreational users of coastal habitat of the impacts of human disturbance on priority species, and methods to minimize such disturbance.</p> <p>Use a combination of buffer zones and site closures to reduce public access to key habitat areas, such as Black Oystercatcher breeding sites, estuaries used by wintering waterfowl, and beaches, sandflats and mudflats used as stopover or wintering sites by shorebirds.</p> <p>Designate parks and other management areas as "On leash area only" where off leash dogs are a disturbance problem.</p>	2.1 Site/area management 4.3 Awareness and communications	Black-bellied Plover, Black Oystercatcher, Black Turnstone, Brant (Black), Brant (Western High Arctic), Dunlin, Sanderling, Surfbird, Trumpeter Swan, Western Sandpiper

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
Human disturbance at or development near Peregrine Falcon nest sites may lead to nest abandonment.	6.1 Recreational activities 6.3 Work and other activities	Avoid disturbance of nesting raptors.	4.1 Reduce disturbance from human recreation. 4.2 Reduce disturbance from industrial or work activity.	Maintain an undisturbed, naturally vegetated buffer of at least 50m (urban), 200m (rural) or 500m (undeveloped areas) from the base of Peregrine Falcon nesting cliffs or around other Peregrine Falcon nest sites. Raise public awareness of raptors and their habitat and nesting needs. Continue to enforce British Columbia's <i>Wildlife Act</i> regulations around disturbance at Peregrine Falcon nests.	5.3 Private sector standards and codes 5.4 Compliance and enforcement	Peregrine Falcon (<i>anatum</i>), Peregrine Falcon (<i>pealei</i>)
Competition from House Sparrow and European Starling.	8.1 Invasive non-native/alien species	Ensure nest site competition is not limiting populations of priority species.	3.1 Reduce competition with invasive species.	Retain cavity-bearing trees and snags as nesting habitat. In areas where cavities are limiting, consider initiating a long-term, well-managed nest-box program (particularly for Purple Martin). Reduce and control European Starling and House Sparrow populations. This can be achieved in part by designing new structures and retrofitting existing structures to exclude nesting sites for these species.	2.2 Invasive/problematic species control 2.3 Habitat and natural process restoration 3.2 Species recovery	Purple Martin, Violet-green Swallow
Predation or disturbance of priority species by Bald Eagles.	8.2 Problematic native species	Determine if Bald Eagle predation/disturbance is negatively impacting populations of other priority species.	7.1 Improve population/demographic monitoring.	Research is required to determine if anthropogenic factors are influencing Bald Eagle population and behaviour in the Georgia Depression, assess the degree of threat to other priority species, and identify potential mitigation strategies.	8.1 Research	Brant (Black), Brant (Western High Arctic), Double-crested Cormorant, Great Blue Heron (<i>fannini</i>)
Malicious shooting, illegal harvest for animal parts and	5.1 Hunting & collecting terrestrial animals	Prevent killing of protected priority species in accordance	2.8 Reduce mortality from legal or illegal hunting, and persecution.	Increase public awareness of the legal protection of priority species under the <i>Migratory Birds Convention Act</i> and British Columbia's <i>Wildlife Act</i> .	5.4 Compliance and enforcement	Bald Eagle, Peregrine Falcon (<i>anatum</i>), Peregrine Falcon (<i>pealei</i>), Trumpeter Swan

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected [†]
illegal falconry.		with the <i>Migratory Birds Convention Act</i> and British Columbia's <i>Wildlife Act</i> .		Continue to enforce existing legal protection of species.		
Mortality from hunting.	5.1 Hunting & collecting terrestrial animals	Manage hunting mortality to maintain game bird populations.	7.2 Improve harvest monitoring.	Continue to enforce legal bag and possession limits. Use adaptive management to ensure viable population levels. Promote increased hunter skill in waterfowl identification (avoid Cackling Goose or Dusky Canada Goose being mistaken for Pacific Canada Goose).	3.1 Species management 4.2 Training 5.4 Compliance and enforcement	Brant (Black), Brant (Western High Arctic), Cackling Goose, Canada Goose (Dusky)
Ingestion of plastics. Entanglement in plastics.	9.4 Garbage & solid waste	Reduce the amount of plastic available for ingestion. Reduce the number of entangled birds.	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants. 2.4 Reduce incidental mortality.	Determine the extent and impact of plastic ingestion on adult survival and reproductive success. Monitor levels of plastic pollution in the environment and determine sources. Encourage recycling programs, roadside and shoreline cleanups, and educate the public on the effects of plastic ingestion on birds to reduce the amount of plastic in the environment. Educate the public on safe disposal of items that commonly entangle birds. Encourage and support the adoption of "Zero Waste" strategies by municipal, provincial, and national governments.	2.3 Habitat and natural process restoration 4.3 Awareness and communications 8.1 Research 8.2 Monitoring	California Gull, Cassin's Auklet, Common Murre, Glaucous-winged Gull, Heermann's Gull, Horned Puffin, Leach's Storm-Petrel, Northern Fulmar, Pigeon Guillemot, Rhinoceros Auklet, Thayer's Gull, Thick-billed Murre, Tufted Puffin, Western Gull

Riparian

Riparian areas occur adjacent to standing or flowing water where the vegetation is influenced by the presence of water and is distinct from adjacent uplands (no map is available). Riparian areas may be treed, shrubby, or herbaceous, depending on site conditions. Riparian areas are geographically restricted and form only a small part of the overall landscape. In BCR 5, there is approximately 168,500 linear km of riparian habitat, covering 81,000 ha (or <0.1% of the BCR; Martell 2005). Despite their small representation, riparian areas are important in terms of biodiversity. Riparian areas are typically used as breeding, wintering, and stopover habitat by many species. They also serve as corridors connecting habitats and facilitating wildlife movement. Of the 12 priority species that are found in riparian habitats in BCR 5 (Table 23), there are 9 landbirds and 3 waterfowl.

Birds using riparian habitats are threatened by the loss of habitat and key habitat attributes to urban/industrial development and forestry (Fig. 25). In some areas, species are also threatened by habitat degradation due to overbrowsing by introduced/overabundant deer. Key actions to address these threats include the protection of riparian habitats, management of timber harvest to maintain important habitat attributes such as large, cavity-bearing trees, and control of introduced/overabundant deer populations (Table 24).

Table 23. Priority species that use riparian habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
Barrow's Goldeneye	forest	cavities	Maintain current				Y
Black-throated Gray Warbler	forest		Assess / Maintain			Y	
Bufflehead	forest	cavities	Maintain current				Y
Bullock's Oriole	forest	cottonwood riparian	Increase 100%		Y		
Common Goldeneye	forest	cavities	Assess / Maintain				Y
MacGillivray's Warbler	shrub	cottonwood riparian, recent burns	Increase 50%			Y	
Orange-crowned Warbler	shrub		Increase 100%			Y	
Pacific-slope Flycatcher	forest		Assess / Maintain			Y	
Rufous Hummingbird	shrub, forest	openings/clearings	Increase 100%		Y	Y	
Vaux's Swift	forest	cavities, snags, cottonwood riparian, chimneys	Assess / Maintain			Y	
Western Screech-Owl (<i>kennicottii</i>)	forest	cavities, openings/clearings	Assess / Maintain	Y			
Willow Flycatcher	shrub	openings/clearings	Increase 100%		Y	Y	

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

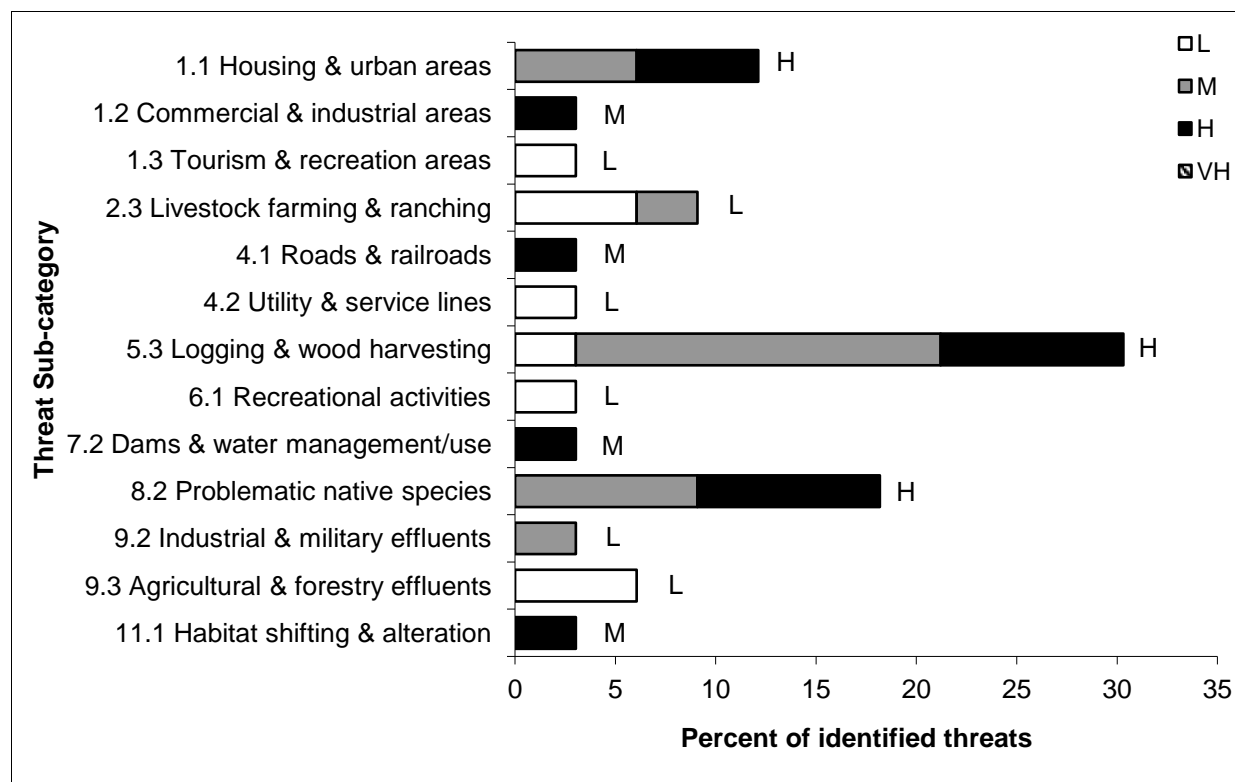


Figure 25. Percent of identified threats to priority species in riparian habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in riparian habitat (for example, if 100 threats were identified in total for all priority species in riparian habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in riparian habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions. *8.2 Problematic native species* refers to effects of locally overabundant deer and predation by Barred Owls. *9.2 Industrial and military effluents* includes PCB and mercury exposure, and *9.3 Agricultural and forestry effluents* refers to pesticides.

Table 24. Threats addressed, conservation objectives, recommended actions and priority species affected for riparian habitat in BCR 5 Pacific and Yukon Region.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of riparian habitat to residential and recreational developments, logging activity and hydroelectric development.	1.1 Housing & urban areas, 1.3 Tourism & recreation areas 5.3 Logging & wood harvesting 7.2 Dams & water management/use	Maintain and enhance the quality and diversity of riparian habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.2 Maintain the size, shape and configuration of habitat within the natural range of variation. 1.3 Ensure the continuation of natural processes that maintain bird habitat	Secure and manage riparian habitat for priority species through various methods, including land acquisition, conservation easements, stewardship agreements or establishment of formal parks, protected areas or management areas. Maintain, restore, and where possible, expand existing riparian buffers in agricultural and developed areas. At a minimum, maintain natural riparian vegetation in buffer strips (>30m wide) on either side of the watercourse, with riparian and upland vegetation >300m wide for at least 10% of stream length. Maintain a diversity of structural stages and important habitat components, such as large, mature trees, deciduous trees, and a well developed understory. Maintain natural hydrological cycles on managed streams and rivers to maintain riparian habitats.	1.1 Site/area protection 2.1 Site/area management 2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Black-throated Gray Warbler, Bullock's Oriole, MacGillivray's Warbler, Orange-crowned Warbler, Pacific-slope Flycatcher, Western Screech-Owl (<i>kennicottii</i>), Willow Flycatcher
Degradation of riparian habitats due to livestock activity.	2.3 Livestock farming & ranching	Maintain and enhance the quality and diversity of riparian habitats.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat.	Manage grazing to prevent degradation of riparian habitats. Where riparian areas have been degraded by livestock activity, restore and enhance habitat through fencing, livestock management, and planting native riparian vegetation.	5.3 Private sector standards and codes	MacGillivray's Warbler, Orange-crowned Warbler, Willow Flycatcher

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the [Widespread Issues](#) section, 3) identified threats in this habitat are of low magnitude.

Table 24 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Priority species affected [†]
Loss of cavity-bearing trees and snags to logging. Loss of large hollow trees and snags required for nesting and roosting by Vaux's Swift to logging.	5.3 Logging & wood harvesting	Maintain key habitat features in riparian habitats and ensure a supply of nesting sites for priority species.	1.4 Maintain important habitat features on the landscape.	Secure and manage riparian forest habitat to maintain key habitat features for priority species, particularly cavity-bearing trees and snags for cavity-nesting species and large hollow trees or snags as roost and nesting sites for Vaux's Swift.	1.1 Site/area protection 5.3 Private sector standards and codes	Barrow's Goldeneye, Bufflehead, Common Goldeneye, Vaux's Swift, Western Screech-Owl (<i>kennicottii</i>)
Degradation and loss of understory vegetation caused by introduced and/or overabundant deer.	8.1 Invasive non-native/alien species 8.2 Problematic native species	Ensure introduced and/or overabundant deer are not negatively impacting priority species.	3.6 Reduce overabundant species.	Remove, reduce or control the population of introduced deer on the Haida Gwaii archipelago to maintain natural undergrowth and ground vegetation. This could be achieved in part by eliminating or increasing bag limits. In other areas where overabundant native deer are negatively impacting understory vegetation (e.g., Gulf Islands), conduct site-specific deer population control to maintain densities <0.1 deer/ha. Monitor deer density and browse intensity to identify problem areas and to evaluate the effectiveness of population control measures.	2.2 Invasive/problematic species control 2.3 Habitat and natural process restoration 5.2 Policies and regulations 8.2 Monitoring	MacGillivray's Warbler, Orange-crowned Warbler, Pacific-slope Flycatcher, Rufous Hummingbird, Willow Flycatcher
Reduced survival of priority owl species due to Barred Owl competition and predation.	8.2 Problematic native species	Determine the impacts of Barred Owl on other owl populations as Barred Owls expand their range.	7.4 Improve understanding of causes of population declines.	Research is required to determine Barred Owl impacts on native owl populations (such as predation rates on priority species and the degree of competition for prey) and identify potential mitigation strategies.	8.1 Research	Western Screech-Owl (<i>kennicottii</i>)

Alpine

Alpine habitats occur at the highest elevations of the Coast Mountains in BCR 5 (Fig. 26). Areas classified as alpine begin at about 1,600 m elevation along the south coast of British Columbia and at somewhat lower elevations to the north. About 36% of BCR 5's terrestrial area is considered alpine (Martell 2005). Most vegetation within alpine areas consists of dwarf shrubs, grasses, forbs and lichens. Trees typically exist only as stunted forms at the lowest elevations of the alpine zone (BC Ministry of Forests 1998).

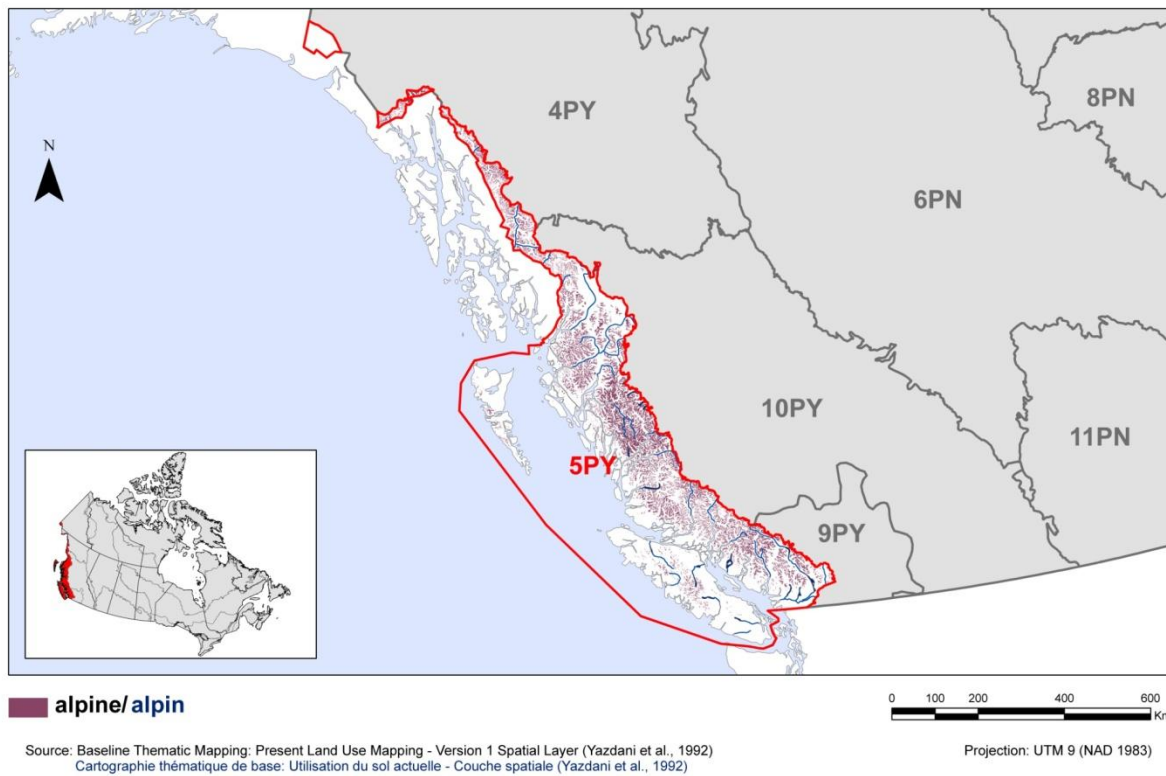


Figure 26. Map of alpine habitat in BCR 5 Pacific and Yukon Region: Northern Pacific Rainforest.

Alpine areas provide both breeding and migration habitat to a number of bird species, though only one priority species—the White-tailed Ptarmigan (*saxitallis*)—was identified in alpine habitat in BCR 5 (Table 25). Two threats were identified for ptarmigan: loss of habitat to development (e.g., ski hills), and loss/alteration of habitat due to climate change (Fig. 27). Loss of habitat to development was ranked Low, and as this threat affects only one priority species, conservation objectives and recommended actions were not developed for this threat. Effects of climate change (including effects on alpine habitats) and related conservation objectives are presented in the [Widespread Issues](#) section

Table 25. Priority species that use alpine habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status			
				At Risk	CC	S	NAWMP
White-tailed Ptarmigan (<i>saxatilis</i>)	tundra, subalpine meadow, rock/ice	snow fields	Assess / Maintain	Y			

Note: Reasons for inclusion in the priority species list are as follows:

At Risk: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is on the Red or Blue lists in BC; CC: the species meets conservation concern criteria for its bird group; S: the species meets stewardship criteria for its bird group; NAWMP: the species has NAWMP priority of Moderate-High, High or Highest in the BCR.

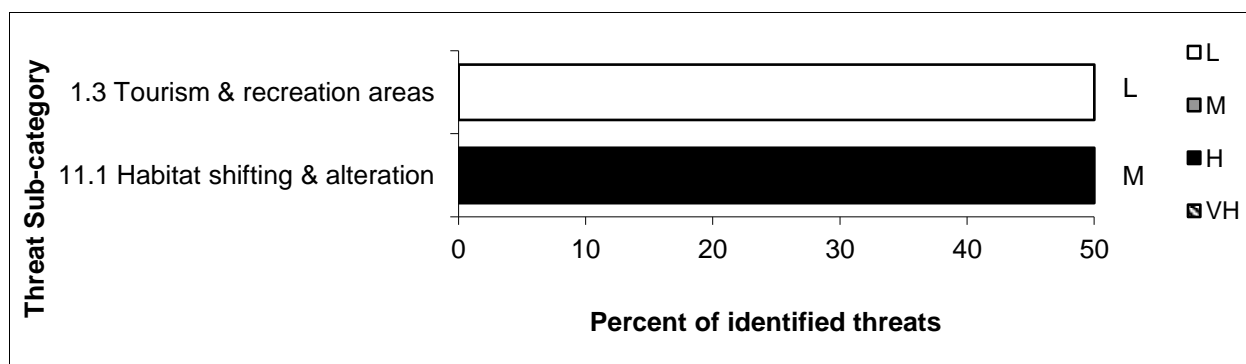


Figure 27. Percent of identified threats to priority species in alpine habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in alpine habitat (for example, if 100 threats were identified in total for all priority species in alpine habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in alpine habitat is shown at the end of each bar (also presented in Table 4. Relative magnitude of identified threats to priority species within BCR 5 Pacific and Yukon by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions.

Section 3: Additional Issues

Widespread Issues

Some well known conservation issues may not be identified in the literature as significant threats to populations of an individual priority species and therefore may not be captured in the threat assessment. However, these issues, while they may or may not be limiting factors for any individual species or population, contribute to avian mortality or decreases in reproductive success across many species and thus warrant conservation attention. Usually these issues transcend habitat types and are considered “widespread”. Examples of these issues include:

- Collisions with man-made structures (buildings, cars, utility/telecommunications towers and lines, etc.)
- Predation by domestic cats
- Pollution/pesticides/oil spills
- Climate change

Because the widespread issues do not fit into the standard presentation format used in the BCR strategies, they are presented separately here. The mortality estimates included here are largely based on draft reports that were available within Environment Canada when this strategy was produced; the numbers may change as the final scientific papers are peer-reviewed and published. Human-related avian mortality across all sectors was standardized and compared in Calvert *et al.* 2013.

Collisions

Buildings

Collisions with glass windows or reflective panels on buildings, is believed to be a significant source of bird mortality in Canada. Estimates of mortality from collisions with houses in Canada (including birds using feeders) range from approximately 15.8–30.5 million birds per year (Machtans et al. 2013). Mortality from collisions with buildings of fewer than 12 storeys is estimated at approximately 0.3–11.4 million birds/year, and for all cities in Canada with tall buildings in an urban core the estimate is 13,000–256,000 birds/year (Machtans et al. 2013). The total estimate of mortality from collisions with buildings in Canada is therefore between 16.1–42.2 million birds/year (Table 26; Machtans et al. 2013).

Data from Canada and the northeastern United States reveal that 163 species of birds of 32 families are known to have been killed by buildings. Some families and species of birds are disproportionately affected by collisions with buildings. *Parulidae* (warblers), *Fringillidae* (sparrows and allies), and *Regulidae* (kinglets) account for 70% of all bird deaths; the species most frequently killed are White-throated Sparrows (13.5% of all reported deaths), Golden-crowned Kinglets (10.2%), Dark-eyed Juncos (6.1%), Ovenbirds (5.3%) and Ruby-crowned Kinglets (5.3%). The population-level effects of bird mortality from building strikes are unknown. See Table 26 for conservation objectives and actions.

Wind Turbines

The 2,955 wind turbines in Canada in 2011 have drawn considerable attention for their potential to cause mortality to birds and other species (notably bats). Two sources of mortality are typically associated with wind turbines: collisions with the turbines themselves, and the destruction of nests by turbine construction activities during the breeding season. On average, 5.9 birds are killed per turbine per year. Scaling up to a national level, an estimated 16,700 birds (range 13,300 – 21,600) die from collisions with wind turbines each year (Table 26; Zimmerling et al. 2013).

Some species are particularly vulnerable to collisions with wind turbines, for example, raptors flying along a land/water interface. For smaller, more common passerine species (warblers, thrushes, kinglets, etc.), the relatively small number of birds affected does not appear to pose a population level threat. However, the anticipated proliferation of wind turbines means we should continue to ensure that turbines are sited to avoid important bird habitats and migration corridors. In BCR 5, there is great potential for future wind development in coastal and offshore habitats. While no offshore wind developments have yet been built, developments have been proposed and it is likely that at least some of these will proceed in the future. Seabirds tend to have long lifespans with low annual productivity, and these life-history traits increase the likelihood that increases in adult mortality will result in population-level impacts (Drewitt and Langston 2006). However, species susceptibility to collisions is highly variable, depending on, among other factors, flight altitude, maneuverability, and avoidance behaviours (Garthe and Hüppop 2004; Desholm and Kahlert 2005).

In addition to collision mortality, wind turbines construction and installation can result in the loss of habitat for birds. At the 43 terrestrial wind farms in Canada for which data are available, on average, total habitat loss per turbine is approximately 1.23 ha on average. Based on this average, the predicted total habitat loss for wind farms nationwide is 3,635 ha. Using published estimates of nest densities, the total number of affected nests, not accounting for construction that might occur outside the breeding season, is approximately 5,700 (Zimmerling et al. 2013). For sensitive species, effective loss of habitat to wind turbines can far exceed the actual installation footprint of the turbine, and for offshore wind development, loss of habitat due to avoidance of wind farms could have as much or larger impact on birds than collision mortality. Avoidance behaviours have been observed in Europe, where several species of waterbirds have been observed to avoid offshore wind farms and the surrounding area. In contrast, other species (e.g., gulls, terns) were apparently attracted to the wind farm. In addition, offshore wind developments have been shown to present potential migration barriers, with migrating birds preferring to fly around wind farms rather than between individual turbines. If not carefully designed and located, large complexes of offshore wind farms could present significant barriers (Drewitt and Langston 2006). See Table 26 for conservation objectives and actions.

Communication Towers

There are currently almost 8,000 communication towers in Canada >60m high (Longcore et al. 2012), each of which can pose a hazard to birds during migration. Birds are attracted to the lights of communication towers and are killed when they collide with the structures and guy wires. Mortality increases exponentially with tower height, in part because the use of guy wires also increases with tower height. Poor weather also plays a significant role in increasing migrant fatality; foggy and cloudy conditions increase the lit area around towers and block celestial clues used by migrating birds. The result is that birds circle to exhaustion in the halo of artificial light, or collide with each other, the tower, or its guy wires (American Bird Conservancy 2012).

Avian mortality at towers is unequally distributed among species and regions, but estimates suggest that over 220,000 birds are killed in Canada each year (Table 26; Longcore et al. 2012). However, BCR 5 is estimated to contribute relatively little to the total avian collision mortality in Canada (Longcore et al. 2010).

Neotropical migrants in the families *Parulidae* (wood-warblers) and *Vireonidae* (vireos) are the species most commonly killed by communication towers. These families include threatened species and many that are of conservation concern in Canada and/or the United States. When considered in concert with mortality at towers in the United States (which is 20 times higher due to the larger number and greater height of towers in the United States), and the mortality from other stationary structures, mortality from collisions with communications towers may negatively affect the population trends of some birds. See Table 26 for conservation objectives and actions.

Power Lines

Birds may be killed by colliding with power lines, or they may be electrocuted. Species with high wing-loading and thus low maneuverability, such as waterfowl, appear particularly at risk for collisions (Bevanger 1998). Electrocutions are most likely for large birds such as raptors and herons, whose bodies are large enough to span the distances between wires and create a short circuit. Raptors' habit of using power poles as perches further increases their risk. However, estimates of total mortality due to collisions and electrocutions can vary widely (Manville 2005) and population-level impacts are difficult to determine. Canadian estimates are that 161,000 – 802,000 birds are killed annually by electrocution and another 5.3 – 20.6 million birds are killed each year by colliding with electrical transmission lines (Calvert et al. 2013). See Table 26 for conservation objectives and actions.

Vehicles

There are over 1.4 million km of roads and hundreds of airports in Canada (World Bank Indicators 2012) that are often bordered by fences and vegetation that provide convenient places for birds to perch, forage, and nest. The paved surfaces can attract birds through the heat they emit, the puddles that form beside roads, and the salt and grit used for de-icing. Current estimates for one- and two-lane paved roads outside of major urban centres in Canada are that between 4.65 and 13.8 million birds are killed annually (Bishop and Brogan 2013).

Bird collisions with cars are influenced by the location of the road, proximity of vegetation, and vehicle speed. Raptors and owls that hunt and forage near roads are particularly vulnerable, but many species forage for grit and road salt or are otherwise attracted to roads have a high likelihood of being hit by vehicles. The population level effects of this source of mortality are not known. See Table 26 for conservation objectives and actions.

Predation by Domestic Cats

Based on the number of pet cats in Canada and published kill rates by cats elsewhere, roughly 204 million birds (range 105–348 million) are killed by domestic and feral cats in Canada each year (Blancher 2013). The broad range on this estimate reflects imprecise information on the average number of bird kills per cat, especially for rural and feral cats, and a lack of information on the number of feral cats (versus owned or pet cats) in Canada.

The birds most susceptible to cat predation are those that nest or forage on or near the ground or spend substantial time in human-dominated landscapes (both rural and urban) where cats are abundant. The proportion of Canada's birds killed by cats would be higher if additional cat predation when migrating through, or wintering in, the U.S. is factored in.

Without detailed study of the individual species affected, it is difficult to assess whether mortality caused by cat predation impacts population trends of birds in Canada. Nevertheless, it is likely that many species of birds are potentially vulnerable to population effects at the local scale in southern Canada. See Table 26 for conservation objectives and actions.

Pollution

Pollution caused by industrial chemicals, pesticides and heavy metals can have both direct and indirect effects on survival and reproduction in birds. Sometimes the effects of exposure to pollutants are unexpected and do not result in immediate, measurable impacts on bird populations (Eeva and Lehtikoinen 2000, Franceschini et al. 2008, North American Bird Conservation Initiative, U.S. Committee 2009, Mineau 2010). However, persistent exposure can result in sharp declines in bird populations as happened with Peregrine Falcons in eastern Canada prior to the ban of DDT.

Pesticides

The most recent estimate suggests that 0.96-4.4 million birds are killed by pesticides annually in Canada (Mineau 2010). Provinces such as Saskatchewan, which have a large agricultural land base, account for the majority of the estimated kill, and pesticides are thought to be an important contributor to the decline in grassland bird species in Canada (Mineau 2010). Pesticides can kill birds rapidly following contact or may have sub-lethal impacts such as suppressed immune function and reduced stress response. There may also be indirect effects of pesticides such as reduction in prey and changes in vegetation that reduce habitat quality. While the use of the many toxic pesticides has been eliminated in Canada, migratory birds are

still exposed while on wintering grounds in countries where their use is still permitted (Mineau 2010). See Table 26 for conservation objectives and actions.

Toxic Chemicals and Heavy Metals

Toxic organic chemicals and heavy metals released into the environment can also negatively impact bird populations. While some industrial chemicals such as PCBs are regulated, there is concern about new chemicals such as flame retardants (PBDE) that are used in computers, car parts and upholstery and whose effects on wildlife are largely unknown (Great Lakes Fact Sheet 2003). Scavengers experience toxic effects when they ingest lead shotgun pellets or bullet fragments embedded in carcasses of game animals, and loons and other waterbirds are exposed to lead from shotgun pellets, sinkers and jigs that they ingest either while collecting grit for their gizzards or by eating bait fish with line and sinker still attached (Scheuhammer and Norris 1996, Scheuhammer et al. 2003). In some areas lead poisoning from sinkers and jigs can account for approximately half of the mortality of adult Common Loons on their breeding grounds (Scheuhammer and Norris 1996). Birds are also susceptible to bioaccumulation of other toxic metals such as methylmercury, selenium, and others when they consume prey that has been exposed to these substances. See Table 26 for conservation objectives and actions.

Oil Pollution

Oil may enter the environment either accidentally, through deliberate dumping, or in contained tailings ponds. It may be a single large event, as occurred in the Gulf of Mexico in 2010, or numerous smaller events. Annual estimates are that between 217,800 and 458,600 birds are killed by ship-source oil spills annually (Calvert et al. 2013). Typically, diving birds are most at risk of oiling; however any birds that come into contact with oil are vulnerable. Oil can impact birds through direct effects such as hypothermia (resulting from lost water-proofing of feathers following oil contamination), toxicity (from ingesting oil as they preen or by inhaling volatile organic compounds), and indirect effects, such as reduced prey availability and decreased quality of habitat. While techniques exist to clean and rehabilitate oiled birds, many birds die before, during and after rescue attempts (Brown and Lock 2003). See Table 26 for summary and objectives and actions.

Table 26. Conservation objectives and actions associated with bird mortality from collisions, cats and contaminants.

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
Collision mortality						
Collisions with buildings cause bird mortality.	1.1 Housing and urban areas 1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with windows/buildings	2.7 Reduce incidental mortality from collisions	Follow beneficial management practices for bird-friendly buildings including using bird-friendly glass, reducing reflection from windows, providing visual markers to enable birds to perceive windows, and reducing light pollution.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with wind turbines cause bird mortality.	3.3 Renewable energy	Reduce incidental mortality from collisions with wind turbines	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing bird mortality when designing and locating wind turbines. Ensure that offshore wind energy developments will not present significant migration barriers. Locate offshore wind energy developments away from seabird breeding colonies and important waterbird foraging areas. Utilize techniques such as radar monitoring to determine pre-construction flight paths and assess the degree to which wind farms present migration barriers, and infrared camera systems to quantify strike rates.	2.1 Site/area management 5.3 Private sector standards and codes 1.2 Resource and habitat protection 8.2 Monitoring	All species
Collisions with communications towers cause bird mortality, particularly during migration.	1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with man-made structures	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing mortality to birds when constructing new communications towers. Switch off solid lights on existing	2.1 Site/area management 5.3 Private sector standards and codes	All species

Table 26 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
				<p>towers and ensure that remaining lights have a synchronized, complete dark phase.</p> <p>Take steps to ensure that new towers avoid guy wires and minimize height, and avoid topographic locations where migrating birds are likely to be found in abundance.</p> <p>Retrofit existing towers to adhere to as many guidelines as possible.</p>		
Collisions with power lines and accidental electrocution cause bird mortality.	4.2 Utility and service lines	Reduce mortality from collisions with utility lines / transmission towers	2.7 Reduce incidental mortality from collisions.	<p>In high-risk areas, retrofit power lines so that the risk of electrocution of raptors is minimized. In new developments, locate transmission lines underground.</p> <p>Use markers or paint to increase visibility of power lines in high-strike areas. Avoid siting lines over or near wetlands.</p>	2.1 Site/area management	Waterfowl, herons, raptors
Collisions with vehicles cause bird mortality.	4.1 Roads and railroads	Reduce mortality from collisions with vehicles	2.7 Reduce incidental mortality from collisions.	<p>Erect road signs or speed bumps to lower vehicle speeds where bird activity is frequent.</p> <p>Remove plants that attract birds from roadsides and medians. Landscape along roads using taller trees and bushes to cause birds to fly higher.</p> <p>Encourage the use of salt management plans to avoid unnecessary use of particulate salt (a bird attractant) on roads.</p> <p>Avoid locating roads in valuable bird habitat.</p>	<p>2.1 Site/area management</p> <p>1.1 Site/area protection</p>	Bald Eagle, Barn Owl, Barn Swallow, Common Nighthawk, Cooper's Hawk, Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>), Northern Saw-whet Owl (<i>brooksi</i>), Pine Siskin, Red Crossbill, Red-breasted Sapsucker, Rough-legged Hawk, Short-eared Owl, Snowy Owl, Western Screech-owl (<i>kennicotti</i>)

Table 26 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
Population effects of collisions are unknown.	12.1 Information lacking	Improve understanding of population effects of mortality from collisions	7.4 Improve understanding of causes of population declines.	Assess the biological importance of bird kills from all sources of collisions.	8.1 Research	All species
Predation by domestic cats						
Predation by domestic and feral cats.	8.1 Invasive non-native/ alien species	Reduce mortality from domestic and feral cats	2.4 Reduce incidental mortality.	Implement a “ <u>Cats Indoors!</u> ” Campaign following the guidelines of the American Bird Conservancy. Work to reduce feral cat overpopulation through cat control regulations.	5.3 Private sector standards and codes 5.2 Policies and regulations	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
Population effects of cat predation are unknown.	12.1 Information lacking	Improve understanding of population effects of cat predation	7.4 Improve understanding of causes of population declines.	Evaluate which species are most vulnerable to cat predation. Investigate the population-level effects of cat predation through better monitoring of kill rates and the number of feral cats. Continue to monitor bird populations so changes in numbers and distributions can be identified and management of cats can be altered to reflect these changes. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.	8.1 Research 8.2 Monitoring	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
Environmental Contaminants						
Mortality, sub-lethal effects, reductions in prey populations and habitat alteration	9.3 Agricultural & forestry effluents	Substantially reduce the use of herbicides, insecticides and rodenticides in Canada. Where	2.1 Reduce mortality and/or sub-lethal effects from pesticide	Substantially reduce the use of pesticides/rodenticides/herbicides in Canada. Where elimination is not possible, they should be used as part of an integrated pest management	5.2 Policies and regulations 5.3 Private sector standards and codes	Direct or indirect poisoning by pesticides: American Wigeon, Bald Eagle, Band-tailed Pigeon, Barn Owl, Black-crowned Night Heron,

Table 26 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
caused by exposure to/use of pesticides.		elimination is not possible, they should be used as part of an integrated pest management system.	use. 5.1 Maintain natural food webs and prey sources.	system. Improve regulation of pesticides/rodenticides/herbicides in Canada to reduce bird mortality.		Canada Goose (Pacific), Common Tern, Cooper's Hawk, Double-crested Cormorant, Green Heron, Heermann's Gull, Laysan Albatross, Leach's Storm-Petrel, Lewis's Woodpecker, MacGillivray's Warbler, Northern Harrier, Pelagic Cormorant, Peregrine Falcon (<i>anatum</i>), Peregrine Falcon (<i>pealei</i>), Pine Siskin, Rough-legged Hawk Reductions in prey due to pesticide use: Barn Swallow, Black Tern, Common Nighthawk, Northern Harrier, Vaux's Swift, Violet-green Swallow
Mortality from ingestion of lead shot or tackle.	5.1 Hunting & collecting terrestrial animals 5.4 Fishing & harvesting aquatic resources	Reduce mortality and sub-lethal effects of lead shot and fishing tackle on birds	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Work with hunters, anglers and industry to eliminate the exposure of birds to shot, sinkers and jigs made of lead. Continue to enforce the use of non-toxic shot in waterfowl hunting, and encourage adoption of non-toxic alternatives in target shooting, upland game bird hunting, and fishing.	4.3 Awareness and communications 5.4 Compliance and enforcement	American Wigeon, Bald Eagle, Black Scoter, Blue-winged Teal, Cackling Goose, Canada Goose (Dusky), Canada Goose (Pacific), Canvasback, Common Loon, Greater Scaup, Greater White-fronted Goose, Green-winged Teal, Lesser Scaup, Lewis's Woodpecker, Lesser Snow Goose, Mallard, Northern Pintail, Northern Shoveler, Trumpeter Swan, Tundra Swan
Mortality from heavy metals and other contaminants.	9.2 Industrial & military effluents	Reduce mortality from heavy metals and other contaminants	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Work with industry and policy makers to reduce the quantity of heavy metals and other contaminants released into the environment.	5.3 Private sector standards and codes 5.2 Policies and regulations	Heavy metals: Band-tailed Pigeon, Barrow's Goldeneye, Common Goldeneye, Common Loon, Northern Harrier, Surf Scoter PCBs: Band-tailed Pigeon, Barrow's Goldeneye, Common Goldeneye,

Table 26 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
						<p>Caspian Tern, Common Tern, Double-crested Cormorant, Glaucous-winged Gull, Greater Scaup, Heerman's Gull, Laysan Albatross, Leach's Storm-Petrel, Pelagic Cormorant</p> <p>Other contaminants:</p> <p>Ancient Murrelet, Black-footed Albatross, Cassin's Auklet, Common Murre, Horned Grebe, Marbled Murrelet, Peregrine Falcon (<i>anatum</i>), Peregrine Falcon (<i>pealei</i>), Pigeon Guillemot, Pink-footed Shearwater, Short-tailed Albatross, Tufted Puffin, Western Grebe, Xantus's Murrelet</p>
Mortality of waterbirds from oil pollution.	9. Pollution	Reduce mortality from oil pollution	<p>2.3 Reduce mortality and/or sublethal effects of oil pollution.</p> <p>5.1 Maintain natural food webs and prey sources.</p>	<p>Improve monitoring and enforcement capacity to reduce chronic oil pollution from illegal dumping of bilge waste and cleaning of oil tanks.</p> <p>Improve education/outreach to make sure that the oil industry and its regulators are aware of the potential impacts on birds and take measures to prevent exposure of birds to oil.</p>	<p>5.4 Compliance and enforcement</p> <p>4.3 Awareness and communications</p>	<p>Lethal and sublethal effect of oil exposure:</p> <p>American Golden-Plover, Ancient Murrelet, Bald Eagle, Barrow's Goldeneye, Black Oystercatcher, Black Scoter, Black Turnstone, Brandt's Cormorant, Brant (Black), Brant (Western High Arctic), Bufflehead, Buller's Shearwater, Cackling Goose, California Gull, Canada Goose (Dusky), Cassin's Auklet, Common Goldeneye, Common Loon, Common Murre, Double-crested Cormorant, Flesh-footed Shearwater, Glaucous-winged Gull, Great Blue Heron (<i>fannini</i>), Greater Scaup, Harlequin Duck, Heerman's Gull, Horned Grebe, Horned Puffin, Laysan Albatross, Leach's Storm-Petrel, Lesser</p>

Table 26 continued

Threats addressed	Threat category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
						<p>Scaup, Manx Shearwater, Marbled Murrelet, Northern Fulmar, Pelagic Cormorant, Pigeon Guillemot, Pink-footed Shearwater, Red Knot, Red-necked Phalarope, Rhinoceros Auklet, Rock Sandpiper, Ruddy Turnstone, Sanderling, Short-billed Dowitcher, Short-tailed Albatross, Surf Scoter, Surfbird, Thayer's Gull, Thick-billed Murre, Tufted Puffin, Wandering Tattler, Western Grebe, Whimbrel, White-winged Scoter, Xantus's Murrelet, Yellow-billed Loon</p> <p>Declines in prey due to oil spills: Peregrine Falcon (<i>pealei</i>)</p>
Population effects of pollution are unknown.	12.1 information lacking	Improve understanding of population effects of pollution	7.4 Improve understanding of causes of population declines.	<p>Evaluate the affects of PBDEs and other chemicals on vital rates in birds.</p> <p>Evaluate the extent to which pesticides are reducing prey availability for aerial insectivores.</p> <p>Improve the ability to monitor and understand the effects of contaminant concentrations in birds.</p> <p>Continue to acquire information on oiling of waterbirds through programs like Birds Oiled at Sea.</p>	<p>8.1 Research</p> <p>8.2 Monitoring</p>	All species

Climate Change

The effects of climate change are already measureable in many bird habitats and have resulted in range shifts and changes in the timing of migration and breeding in some species (National Audubon Society 2009, North American Bird Conservation Initiative, U.S. Committee 2009). Birds in all habitats will be affected by climate change. The most vulnerable are predicted to be those that are dependent on oceanic ecosystems and those found in coastal, island, grassland, arctic and alpine habitats (North American Bird Conservation Initiative, U.S. Committee 2010). Changing climate may also facilitate the spread of disease, the introduction of new predators and the invasion of non-native species which alter habitat structure and community composition (North American Bird Conservation Initiative, U.S. Committee 2009, Faaborg et al. 2010). See Tables 27 and 28 for a summary of impacts of climate change and conservation objectives.

A recent exercise used bioclimatic modeling to predict changes in bird species ranges based on anticipated climate change for different time periods and under different emissions scenarios (Lawler et al. 2010). Bioclimatic models use statistical associations between the current range of a species and a suite of climate variables to predict future ranges under new climate conditions. The study focused on bird species currently found within Bird Conservation Regions in Canada. The results suggest that bird species turnover in Canada will be highest in northern Bird Conservation Regions as species ranges continue to shift northward in the coming decades. In BCR 5 Pacific and Yukon, the model predicts a gain of 16 species, a loss of 11 species for a total turnover (species gains + species losses) of 13% by the period of 2071-2100.

In BCR 5, the effects of changing climate are apparent. Over the last 50 years, temperatures have increased, and more precipitation is falling as rain rather than as snow. These changes have resulted in shorter winters and a longer growing season. Sea surface temperatures have increased all along the coast, and relative sea level has also risen in many areas, increasing vulnerability of low-lying areas to flooding under extreme weather conditions.

As these trends continue, British Columbia can expect warmer temperatures year-round, along with wetter winters and drier summers. Extreme weather events are expected to become more common, and increased windthrow disturbance is expected to occur in coastal forests. Geographical shifts in vegetation are expected for many species as climatic envelopes shift markedly upslope and northward, and will result in the redistribution of ecosystems on the landscape. Rates of individual species movement will vary widely, however. Many species (e.g., trees) are likely to take decades or centuries to shift accordingly, while some birds within British Columbia have already shifted northwards and/or show increased density in the northern portions of their ranges. There is potential for expansion northwards and upslope for dry forest types such as Douglas-fir and Garry Oak parklands, and upslope movement of moist conifer at the expense of subalpine forest types is expected. There is also great potential for the loss of alpine habitats to upslope forest encroachment (BC Ministry of Environment 2006, Pojar 2010).

Sea-level rise is also expected to have significant impacts in the coming years. Projections indicate that relative sea level will probably rise on the order of 0.2 to 0.5 m by 2100, and possibly as much as 1.2 m in some locations (Bornhold 2008). While most of British Columbia's coastline is steep and rocky, increases in sea level will have strong negative impacts on mudflats, sandflats, beaches, salt marshes and estuaries. The Fraser River delta and the east coast of Graham Island (Haida Gwaii) have been identified as particularly at risk (Bornhold 2008; Thomson et al. 2008). In some areas, low-lying coastal habitats may be able to migrate inland to some degree as sea level rises; however extremely valuable tidal habitat in developed areas (such as Robert's Bank and Boundary Bay in the Fraser River delta) will be squeezed between the rising waters and coastal dykes and significant amounts of habitat will inevitably be lost. Continued increases in sea surface temperatures are also expected to impact marine ecosystems, altering the timing and availability of prey for breeding seabirds and affecting their reproductive success (Gjerdrum et al. 2003).

If we are to maintain healthy bird populations in the face of a changing climate, conservation must be carefully planned and must be implemented so as to buffer birds from the negative impacts of climate change wherever possible (Faaborg et al. 2010).

Table 27. Priority species in BCR 5 for which climate change has been identified as a threat.

Climate change risk	Threat category	Example priority species affected
Direct bird mortality due to temperature extremes and severe weather.	11.3 Temperature extremes 11.4 Storms & flooding	Barn Swallow, Belted Kingfisher, Common Nighthawk, Olive-sided Flycatcher, Purple Martin, Violet-green Swallow
Reductions in food availability (e.g., nectar, invertebrates) and/or mismatches in the timing of breeding and peak food abundance due to phenological shifts, droughts, or temperature extremes.	11.1 Habitat shifting & alteration 11.2 Droughts 11.3 Temperature extremes	Barn Swallow, Common Nighthawk, Olive-sided Flycatcher, Purple Martin, Rufous Hummingbird, Violet-green Swallow
Changes in marine productivity, food webs, and foraging conditions.	11.1 Habitat shifting & alteration 11.4 Storms & flooding	Ancient Murrelet, Black-footed Albatross, Buller's Shearwater, Cassin's Auklet, Common Murre, Flesh-footed Shearwater, Horned Puffin, Laysan Albatross, Leach's Storm Petrel, Manx Shearwater, Northern Fulmar, Pigeon Guillemot, Pink-footed Shearwater, Short-tailed Albatross, Thick-billed Murre, Tufted Puffin, Western Grebe
Loss or degradation of habitat due to climate change (e.g., loss of mudflats, sandflats, beaches, and tidal marshes with increased storm severity, sea level rise and coastal flooding; loss of alpine and subalpine).	11.1 Habitat shifting & alteration 11.2 Droughts 11.4 Storms & flooding	<p>Coastal: American Golden-Plover, American Wigeon, Belted Kingfisher, Black-bellied Plover, Brant (Black), Brant (Western High Arctic), Dunlin, Great Blue Heron (<i>fannini</i>), Green-winged Teal, Lesser Snow Goose, Long-billed Curlew, Marbled Godwit, Northern Pintail, Purple Martin, Red Knot, Sanderling, Short-billed Dowitcher, Trumpeter Swan, Western Sandpiper, Whimbrel, Wilson's Phalarope</p> <p>Alpine and subalpine: Sooty Grouse, White-tailed Ptarmigan (<i>saxitallis</i>)</p>

Table 28. Proposed conservation objectives and actions to address climate change.

Threats addressed	Threat category	Objective	Objective category	Recommended Actions	Action category	Priority species affected
Climate change impacts habitat and negatively affects survival and productivity of birds	11.1 Habitat shifting and alteration	<p>Reduce greenhouse gas emissions</p> <p>Mitigate the effects of climate change on bird habitat</p>	<p>6.1 Support efforts to reduce greenhouse gas emissions</p> <p>6.2 Manage for habitat resilience as climate changes</p>	<p>Support efforts to reduce greenhouse gas emissions.</p> <p>Manage for habitat resilience to allow ecosystems to adapt despite disturbances and changing conditions. Minimize anthropogenic stressors (such as development or pollution) to help maintain resilience.</p> <p>Manage buffer areas and the matrix between protected areas to enhance movement of species across the landscape.</p> <p>Manage ecosystems to maximize carbon storage and sequestration while simultaneously enhancing bird habitat.</p> <p>Incorporate predicted shifts in habitat into landscape level plans (e.g., when establishing protected areas ensure the maintenance of north-south corridors to facilitate northward range shifts of bird species).</p>	<p>5.2 Policies and regulations</p> <p>1.1 Site/area protection</p> <p>2.1 Site/area management</p> <p>5.2 Policies and regulations</p>	All
Population-level effects of climate change are unknown	12.1 Information lacking	Improve understanding of climate change on birds and their habitats	7.5 Improve understanding of potential effects of climate change	<p>Evaluate which species are most vulnerable to climate change.</p> <p>Investigate the cumulative effects of climate change.</p>	8.1 Research	All

Threats addressed	Threat category	Objective	Objective category	Recommended Actions	Action category	Priority species affected
				<p>Investigate behavioural responses to climate change (such as range shifts, changes in demographic rates, and changes in timing of breeding and migration) through long-term studies.</p> <p>Continue to monitor bird populations so changes in numbers and distributions can be identified.</p> <p>Undertake monitoring to evaluate the effectiveness of mitigation activities.</p>	8.2 Monitoring	

Research and Population Monitoring Needs

Population Monitoring

An estimate of population trend for each species is necessary for the development of elements 1 and 3 (Species Assessment and Population Objectives). However, there are many species for which we are currently unable to estimate a population trend (PT) score. These species were typically assigned a population objective of “assess/maintain.” The inability to estimate a PT score may be the result of a lack of monitoring data for the BCR as a whole or may be because certain species are not well captured by common monitoring techniques (such as the Breeding Bird Survey [BBS]). To be able to effectively evaluate species believed to be of conservation concern, and to track those not yet of concern for future changes in status, we require more comprehensive monitoring that enables us to generate population trends for all species of birds in Canada. However, it is important to note that for some species, population trends are better understood at scales larger or smaller than the BCR unit, and lack of BCR-scale population trend data should not preclude acting to conserve these species.

For example, the PIF species assessment database (Rocky Mountain Bird Observatory 2005) and local re-analysis of BBS data yields a PT of 3 for many priority waterfowl (25 of 26 species) in BCR 5. However, many of these species primarily winter in BCR 5, and are subject to widespread and intense monitoring on their breeding grounds. Population trends for waterfowl are typically well-understood at the flyway scale. It is for this reason we set population objectives for waterfowl from the Pacific Coast Joint Venture’s Strategic Plan and Biological Foundation (Martell 2005), rather than directly from local PT scores.

Similarly, the Partners in Flight (PIF) species assessment database and local re-analysis of Breeding Bird Survey (BBS) data yielded PT scores of 3 for all priority shorebirds (18 species) and most waterbirds (37 of 38 waterbird species). Both shorebirds and waterbirds are poorly sampled by the BBS. However, for many of these species (13 of 18 shorebirds, and 24 of 38 waterbirds), population trends are better understood at a national scale (see Table 1 for PT scores from national assessments in *Wings Over Water: Canada’s Waterbird Conservation Plan* (Milko et al. 2003) and the *Canadian Shorebird Conservation Plan* (Donaldson et al. 2000)). In addition, many colonial waterbirds (e.g., Ancient Murrelet, Cassin’s Auklet, Double-crested Cormorant, Horned Puffin) are best monitored via colony counts, though this information does not always scale up to the entire BCR.

BBS data yields much better information for landbirds, though population trends remain uncertain at the BCR scale for some landbird species. Our inability to more accurately assess population trends for these species is due, at least in part, to the rugged, remote, and inaccessible nature of much of BCR 5, which means that many areas have poor or non-existent coverage by volunteer-based survey efforts like the BBS. In addition, coastal and pelagic habitats present their own unique monitoring challenges. However, volunteer-based surveys such as the BBS, Christmas Bird Count, British Columbia Breeding Bird Atlas and the British Columbia Coastal Waterbirds Survey provide much of the population trend data that exists, and

maintaining these programs is critical. Supporting the expansion of these programs into under-sampled habitats and remote areas—possibly by use of paid observers—will also improve their utility in the future.

Key areas and habitats lacking monitoring effort in BCR 5 include the central and north coasts of British Columbia, particularly outside estuaries. Data on the abundance and distribution of pelagic seabirds is sparse and both opportunistic and planned surveys should continue. Remote forests and high-elevation habitats are also deserving of attention. Specific recommendations for some groups of priority species with unknown or uncertain population trends are presented in Table 29.

A recent Environment Canada review (Avian Monitoring Review Steering Committee 2012) of avian monitoring programs in Canada made the following recommendations for each of the four main species groups:

Landbirds

- develop options for on-the-ground monitoring across boreal Canada;
- evaluate the ability of migration monitoring and checklist surveys to contribute to Environment Canada’s monitoring needs; and
- evaluate the feasibility and cost-effectiveness of improving demographic monitoring to help understand causes of population change.

Shorebirds

- complete a first round of Arctic PRISM breeding shorebird surveys to obtain reliable population estimates and baseline distribution information across the Arctic;
- develop more reliable sampling methods for counting shorebirds in migration to address concerns about bias; and
- increase Latin American involvement in monitoring shorebirds on the wintering grounds, including Red Knot.

Waterbirds

- evaluate alternative strategies for filling gaps in coverage for both colonial waterbirds and marsh birds;
- consider both costs and potential reduction in risks; and
- carry out any necessary pilot work to evaluate options.

Waterfowl

- develop strategies to reduce expenditures on the prairie and eastern waterfowl breeding surveys, while retaining acceptable precision in population estimates;
- review the information needs and expenditures for arctic goose and duck banding programs;
- reduce the number of Greater Snow Goose survey components;
- redesign the Trumpeter Swan surveys; and
- realign resources for eider and scoter monitoring to a more efficient suite of surveys.

Table 29. Categories of poorly monitored species, possible monitoring approaches, and example priority species in BCR 5.

Category	Example priority species	Possible monitoring approaches
Aerial insectivores	Black Swift, Common Nighthawk, Purple Martin, Vaux's Swift, Violet-green Swallow	<p>Conduct regular colony counts where applicable (e.g., Purple Martin, Violet-green Swallow; Vaux's Swift roost sites). Initial surveys may be required to locate breeding areas, colonies, and/or communal roosts.</p> <p>Implement or expand focused crepuscular surveys for Common Nighthawk. These surveys could be modeled after the United States Nightjar Survey Network (ccb-wm.org/nightjars.htm).</p>
Diurnal raptors	Bald Eagle, Gyrfalcon, Northern Goshawk (<i>laingi</i>), Northern Harrier, Peregrine Falcon (<i>anatum</i>), Peregrine Falcon (<i>pealei</i>), Rough-legged Hawk, Short-eared Owl	<p>Support and expand Christmas Bird Counts to capture wintering raptors such as Bald Eagle, Gyrfalcon, Northern Harrier, Rough-legged Hawk, and Short-eared Owl. Support increased observer training in raptor identification.</p> <p>Sparsely distributed raptors that are not well represented by regular survey efforts such as the Breeding Bird Survey require targeted, species-specific inventory efforts, particularly on the coast and Haida Gwaii (e.g., Peregrine Falcon [<i>anatum</i>], Peregrine Falcon [<i>pealei</i>], Northern Goshawk [<i>laingi</i>]).</p>
Nocturnal raptors	Barn Owl, Northern Saw-whet Owl (<i>acadicus</i>), Northern Pygmy-Owl, Northern Saw-whet Owl (<i>brooksi</i>), Spotted Owl, Western Screech-Owl (<i>kennicottii</i>)	<p>Support and expand Nocturnal Owl Surveys.</p> <p>Species-specific surveys may be required for species that are not well sampled by typical survey methods (e.g., Northern Pygmy-Owl), rare species (e.g., Spotted Owl) and endemic subspecies (e.g., Northern Saw-whet Owl [<i>brooksi</i>]).</p>
Hummingbirds	Rufous Hummingbird	Coordinate with the Western Hummingbird Partnership and the Hummingbird Monitoring Network to design and implement an effective hummingbird monitoring program that will build upon existing programs.
Colonial waterbirds	Ancient Murrelet, Cassin's Auklet, Common Murre, Brandt's Cormorant, Horned Puffin, Leach's Storm-Petrel, Pelagic Cormorant, Pigeon Guillemot, Rhinoceros Auklet, Thick-billed Murre, Tufted Puffin	Support and expand continued annual surveys of principal colonies across the BCR.
Pelagic waterbirds	Black-footed Albatross, Buller's Shearwater, Flesh-footed Shearwater, Laysan Albatross, Northern Fulmar, Manx Shearwater, Pink-footed Shearwater, Short-tailed Albatross, Xantus's Murrelet	Support and expand both opportunistic and planned pelagic surveys of seabird distribution and abundance.

Table 29 continued

Category	Example priority species	Possible monitoring approaches
Coastal species	Barrow's Goldeneye, Black Oystercatcher, Black Scoter, Black Turnstone, Brandt's Cormorant, Bufflehead, Caspian Tern, Common Loon, Harlequin Duck, Heermann's Gull, Horned Grebe, Pelagic Cormorant, Rock Sandpiper, Ruddy Turnstone, Sanderling, Surf Scoter, Surfbird, Western Grebe, White-winged Scoter, Yellow-billed Loon	Support initiatives such as the B.C. Coastal Waterbirds Survey. Increase coverage on western Vancouver Island and expand surveys into the central and north coasts of B.C. and Haida Gwaii.
Estuary-associated species	Barrow's Goldeneye, Black Scoter, Blue-winged Teal, Brant (Black), Brant (Western High Arctic), Bufflehead, Cackling Goose, Canada Goose (Dusky), Canvasback, Common Goldeneye, Great Blue Heron (<i>fannini</i>), Greater Scaup, Lesser Scaup, Trumpeter Swan, Tundra Swan	Support and expand regular estuary surveys throughout the coast. Conduct surveys in winter as well to capture wintering species.
Wetland-associated species	American Bittern, Black-crowned Night-Heron, Blue-winged Teal, Cinnamon Teal, Great Blue Heron (<i>fannini</i>), Greater White-fronted Goose, Green Heron, Lesser Scaup, Northern Pintail, Northern Shoveler, Rusty Blackbird	Implement, support and expand Marsh Monitoring Programs similar to those in the Great Lakes Basin. Conduct surveys in winter as well to capture wintering species.
Easily mis-identified species	Cackling Goose, Canada Goose (Dusky), Short-billed Dowitcher	Implement increased observer training to increase accurate identification of easily confused species where they co-occur (e.g., identification of Cackling Goose vs. Dusky Canada Goose vs. Pacific Canada Goose; Short-billed Dowitcher vs. Long-billed Dowitcher).
Migrating/wintering shorebirds	Black-bellied Plover, Dunlin, Short-billed Dowitcher, Western Sandpiper	Continue seasonal migration and wintering counts of shorebirds at key stopover and wintering sites (e.g., Tofino Mudflats, the Fraser River delta, Sydney Spit). Support and expand Arctic PRISM surveys to determine population trends for arctic-breeding shorebirds.
Species inhabiting poorly-sampled habitat	Belted Kingfisher, Common Loon, Harlequin Duck, Rusty Blackbird, White-tailed Ptarmigan (<i>saxatilis</i>)	Increase Breeding Bird Survey coverage of remote or poorly-sampled habitats, such as alpine and subalpine areas (White-tailed Ptarmigan), forested wetlands (Rusty Blackbird) and aquatic habitats such as lakes and rivers (Belted Kingfisher, Common Loon, Harlequin Duck). Modified or separate methodology may be required in some habitats.
Other species captured by Breeding Bird Survey, but currently lacking enough data for trend analysis in the BCR.	Black-throated Gray Warbler, Chestnut-backed Chickadee, Hairy Woodpecker, Pacific Wren, Pacific-slope Flycatcher, Pine Grosbeak (<i>carlottae</i>), Spotted Towhee, Steller's Jay, Townsend's Warbler, Varied Thrush	Increase Breeding Bird Survey coverage in all habitats (both density of routes and geographic coverage) to increase data and improve trend information on undersampled species.

Research

The focus of this section is to outline the main areas where a lack of information hindered our ability to understand conservation needs and make conservation recommendations. Research objectives presented here are bigger picture questions, and not necessarily a schedule of studies, that are needed to determine the needs of individual species (Table 30). Undertaking research will allow us to improve future iterations of BCR strategies and to focus future implementation, and will also enable the development of new tools for conservation.

Table 30. General research objectives in BCR 5 Pacific and Yukon.

Objective	Example priority species affected
<p>For all priority bird species exhibiting declines in BCR 5, or those that are known to be declining nationally or continentally:</p> <p>Determine the primary drivers of population decline (e.g., productivity, juvenile survival, adult breeding season survival, overwinter survival) to identify when and where species are being limited.</p> <p>Assess threats identified for these species (both within and outside Canada for migratory species) to determine the degree to which they are driving population trends.</p>	<p>Species exhibiting declining trends in BCR 5: Band-tailed Pigeon, Barn Swallow, Black Tern, Black Swift, Bullock's Oriole, Cassin's Auklet, Cassin's Vireo, Common Murre, Cooper's Hawk, Golden-crowned Kinglet, MacGillivray's Warbler, Olive-sided Flycatcher, Orange-crowned Warbler, Pine Siskin, Purple Finch, Red Crossbill, Red-breasted Sapsucker, Rock Sandpiper, Rufous Hummingbird, Sooty Grouse, Western Bluebird, Western Meadowlark, Western Wood-Pewee, Willow Flycatcher</p> <p>Additional species exhibiting declines nationally or continentally: American Bittern, American Golden-plover, Ancient Murrelet, Black Scoter, Black-bellied Plover, Black-footed Albatross, Brandt's Cormorant, Common Tern, Dunlin, Green Heron, Horned Grebe, Laysan Albatross, Leach's Storm-Petrel, Lesser Scaup, Long-billed Curlew, Manx Shearwater, Marbled Godwit, Marbled Murrelet, Northern Pintail, Pelagic Cormorant, Pigeon Guillemot, Pink-footed Shearwater, Red Knot, Red-necked Phalarope, Ruddy Turnstone, Sanderling, Short-billed Dowitcher, Short-tailed Albatross, Surf Scoter, Surfbird, Tufted Puffin, White-winged Scoter, Whimbrel, Wilson's Phalarope, Xantus's Murrelet</p>
<p>Map land cover changes that have occurred across the BCR between the baseline time periods established in BCR plans and the current day in order to correlate habitat loss with species declines and assess the main types of habitat transitions that have occurred (e.g., wetland to urban development, old growth to managed forest, tidal flats and flood plains to agriculture, etc.).</p>	<p>All species for which habitat-related declines have occurred or are suspected.</p>

Table 30 continued

Objective	Example priority species affected
Combine up-to-date land cover information, additional data on bird densities, and detailed bird-habitat relationships for all priority species to allow for the calculation of quantitative habitat targets and to directly link conservation and population objectives.	All priority species.
Identify priority areas for implementation of recommendations in BCR plans.	All priority species.
Determine specific population connectivity and migration routes between breeding and wintering areas, using techniques such as genetic analysis, stable isotopes and geolocators.	All non-resident species.
Where they do not already exist, conduct research to develop sector-specific beneficial management practices documents, with an emphasis on bird and biodiversity conservation. Monitor adherence to these BMPs and assess their effectiveness at preserving and/or increasing priority bird populations.	All priority species.
Determine the population-level significance of bird mortality from collisions with anthropogenic structures of all types and predation by domestic cats. Identify particularly vulnerable species.	All priority species.
Continue to engage in and support climate change research with respect to: <ul style="list-style-type: none"> -links between climate, forage species (e.g., fish, plankton), and priority seabirds; and model potential responses to changes in climatic conditions. -alteration and loss of coastal habitat with predicted sea-level rise, particularly estuaries, saltmarsh, beach/dunes and mud/sand flats; and effects on priority species. -alteration and loss of terrestrial habitats, particularly shifting forest types and loss of alpine habitats. -range expansion or contraction of priority bird species. -identification of vulnerable species. 	All priority species.
Conduct research to determine the effects of disturbances such as boat traffic on birds at sea and assess the resiliency of birds to disturbance, both during and outside the breeding season. Increase survey efforts to accurately map the seasonal distribution and abundance of seaducks, coastal seabirds and pelagic seabirds to identify potential areas of high conflict.	All seabirds and seaducks.
Monitor compliance and assess the effectiveness of current bycatch mitigation measures in commercial longline fisheries. Monitor bycatch in commercial net fisheries, and develop, implement, and assess effectiveness of bycatch mitigation measures for gillnet fisheries. Identify particularly vulnerable species to gillnet and longline bycatch.	All seabirds and seaducks.

Table 30 continued

Objective	Example priority species affected
Assess and quantify direct and indirect impacts of commercial fisheries on priority seabirds (e.g., commercial harvest of forage fish, fishery-induced changes in marine food webs).	All seabirds.
Assess the potential effects of coastal and offshore wind developments on birds, including both direct (collision mortality) and indirect (habitat loss due to avoidance of turbine installations) effects. Identify particularly vulnerable species.	All birds found in coastal and offshore areas, including migrating individuals/flocks.
Investigate the potential effects of finfish aquaculture on priority bird species. Quantify and assess the population-level significance of direct mortality (e.g., shooting, net entanglement) and habitat loss/degradation (e.g., installation footprint, algal blooms due to nutrient input, etc.).	All waterbirds and seaducks that use nearshore habitats.
Engage in interdisciplinary research to identify additive and interactive effects of multiple invasive species on ecosystem structure and function, in both terrestrial (e.g., introduced Sitka black-tailed deer, rabbits, raccoons, cats and rats; European Starling, House Sparrow, Scotch broom, etc.), freshwater (e.g., purple loosestrife, yellow flag iris, etc.) and marine habitats (e.g., <i>Spartina spp.</i> , green crab, etc.). Identify impacts to priority bird species.	All priority species.

Threats Outside Canada

Many bird species found in Canada spend a large portion of their lifecycle outside of the country (Fig. 28). These species face threats while they are outside Canada; in fact, threats to some migratory species may be most severe outside of the breeding season (Calvert et al. 2009). Of the 139 priority species in BCR 5, 113 (81%) are migratory and spend part of their annual cycle—up to half the year or more—outside Canada.

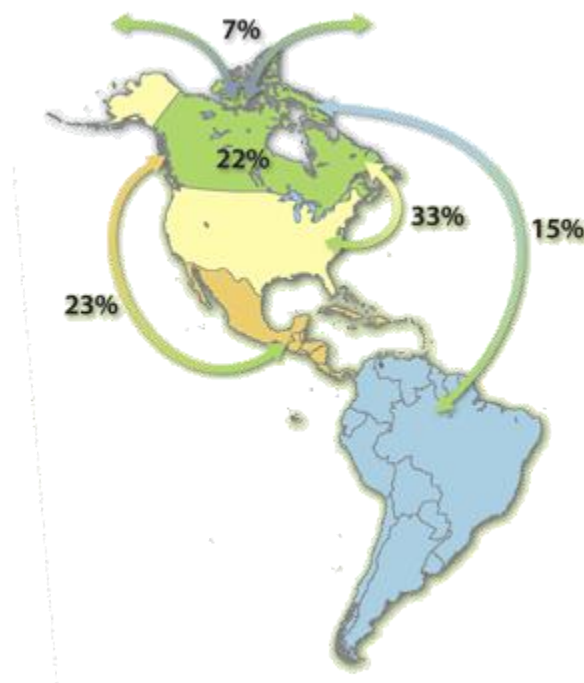


Figure 28. Percent of Canadian breeding birds that migrate to regions outside of Canada for part of their life cycle (North American Bird Conservation Initiative Canada 2012).

Birds are some of the most mobile species on the planet, and some species are true global wanderers. Priority birds from BCR 5 range widely throughout North, Central and South America. Some species merely withdraw from the northernmost parts of their range during winter, such as the Band-tailed Pigeon, which winters from Washington state to California. Many of our waterfowl migrate somewhat further, wintering in the southern parts of the United States and through Mexico. Neotropical migrant songbirds from BCR 5 are particularly reliant on central and western Mexico, with many species, including the Black-throated Gray Warbler, Bullock's Oriole, MacGillivray's Warbler, Pacific-Slope Flycatcher, and Townsend's Warbler wintering in those areas. Other species, such as the Barn Swallow, Common Nighthawk, and Purple Martin migrate further south, wintering throughout South America. In addition, BCR 5's seabirds venture widely in the Pacific Ocean. Some, such as Tufted Puffin and Horned Puffin breed in BCR 5, but wander throughout the North Pacific in the non-breeding season. Others, such as the Laysan Albatross, Short-tailed Albatross, Flesh-footed Shearwater, and Pink-footed Shearwater breed as far away as Japan, Australia, New Zealand, Hawaii, and Chile, and are only seasonal visitors to Canadian waters.

Outside Canada, key migration, wintering and breeding habitats can be lost or degraded through development, agriculture, forestry, resource extraction or other human activities. Some species have relatively small and concentrated wintering ranges, where any habitat degradation or loss could have major impacts on the species population. Others, such as Dunlin and Western Sandpiper, are particularly vulnerable as large proportions of the species' population concentrate at just a handful of key migratory stopover sites; degradation or loss of these sites could have devastating impacts. In addition, birds may be incidentally killed as fisheries bycatch or by colliding with man-made structures; lit communications towers and tall buildings can pose a major hazard to night-migrating birds. Birds can be exposed to toxic pollutants, including chemicals which may be banned or tightly regulated in Canada and the United States but are more freely available elsewhere. While the United States and Mexico have passed laws similar to Canada's Migratory Birds Convention Act, 1994, which provide legal protection to many birds, other countries have not and migratory birds can be threatened by unsustainable or illegal hunting and persecution.

Similar to our assessment of threats facing priority species within Canada, we conducted a literature review to identify threats facing priority species while they are outside Canada (Fig. 29). A lack of data was a pervasive issue for this exercise. For many species, little is known about threats they face during migration or while on their wintering grounds. Indeed, for some species, their wintering ranges and habitat use are only poorly known, if at all. There is also little information linking specific wintering areas to particular breeding populations, making it difficult to connect declines in breeding populations to potential problems on the wintering grounds. In addition, what data exist on wintering migrant species are heavily biased towards work done in the United States and little research is available from Mexico, Central and South America. While many of the threats identified in the United States likely affect species throughout their range, unique issues outside of the United States may have been missed. An absence of threats in a region may reflect that the necessary research has not yet been conducted (or may not be published in English). Because information on bird distributions during the non-breeding season is limited, we were unable to assess the scope and severity of threats to priority species while they are outside of Canada.

Despite the paucity of data regarding migration and wintering migrant birds, actions must be taken to support our migratory species. We need to support conservation initiatives outside of Canada if we are to reach our goals and ensure the future of our migratory birds.

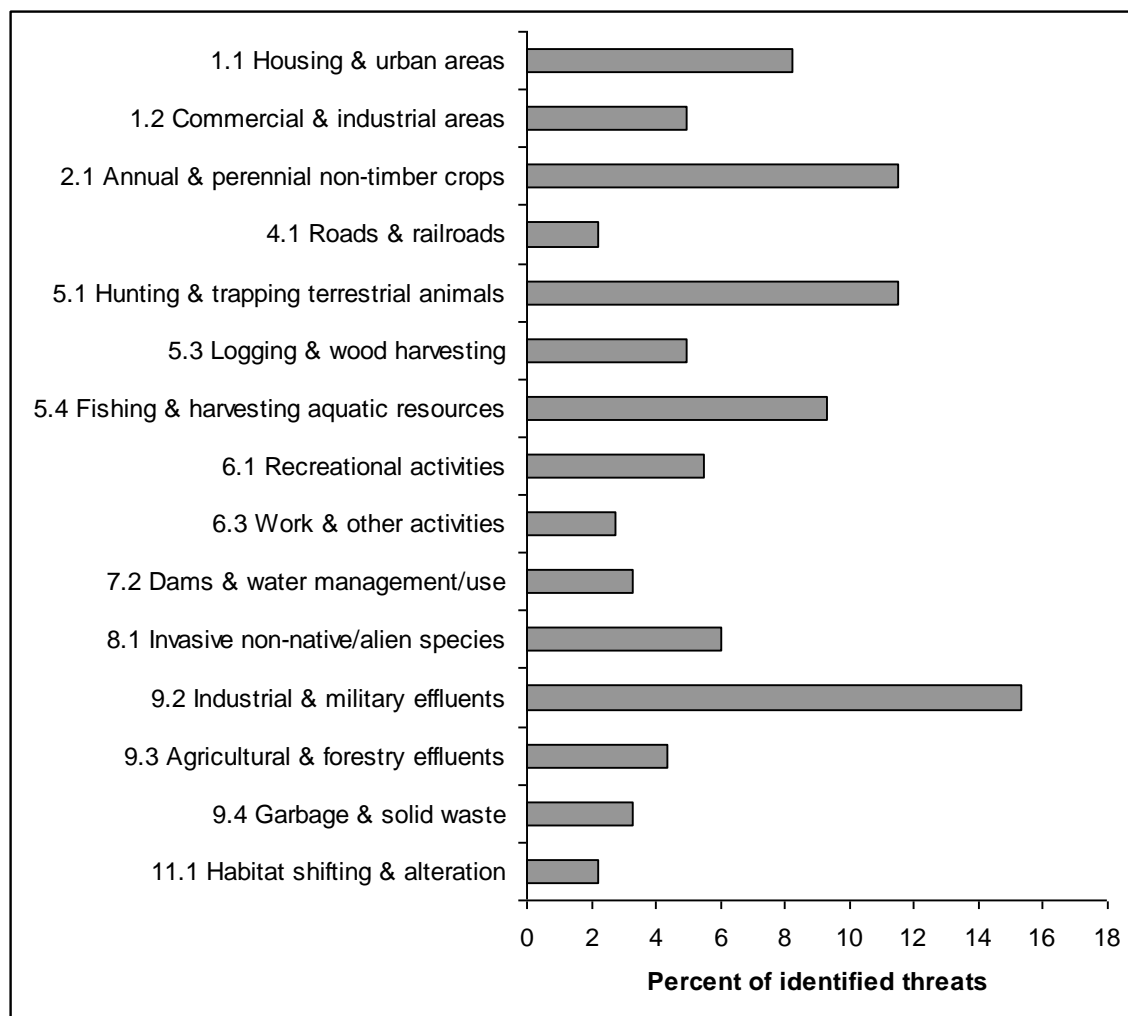


Figure 29. Percent of identified threats to priority species (by threat sub-category) in BCR 5 Pacific and Yukon when they are outside Canada.

Note: Magnitudes could not be assigned for threats outside Canada due to lack of information on scope and severity. Categories representing $\leq 1\%$ of all identified threats are omitted for clarity. *5.1 Hunting and trapping terrestrial animals* refers primarily to hunting (legal and illegal) and lead poisoning from consumption of spent shot, but also includes accidental mortality of non-target species in pest bird control programs. *5.4 Fishing and harvesting aquatic resources* refers primarily to bycatch of birds in fisheries. *8.1 Invasive non-native/alien species* includes habitat degradation from invasive plants and introduced herbivores, as well as direct predation by introduced predators (primarily on seabird colonies). *9.2 Industrial and military effluents* refers primarily to oil spills, but also includes exposure to heavy metals and other industrial contaminants. *9.3 Agricultural and forestry effluents* refers to pesticides. Finally, *9.4 Garbage and solid waste* refers to ingestion of plastic debris.

Next Steps

The primary aims of BCR strategies are to present Environment Canada's priorities with respect to migratory bird conservation, and to provide a comprehensive overview of the conservation needs of bird populations to practitioners who may then undertake activities that promote bird conservation in Canada and internationally. Users from all levels of government, Aboriginal communities, the private sector, academia, NGOs and citizens will benefit from the information. BCR strategies can be used in many different ways depending on the needs of the user, who may focus on one or more of the elements of the strategy to guide their conservation projects.

BCR strategies will be updated periodically. Errors, omissions, and additional sources of information may be provided to [Environment Canada](#) at any time for inclusion in subsequent versions.

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Appendix 1

List of All Bird Species in BCR 5 Pacific and Yukon: Northern Pacific Rainforest

Table A1. Complete list of species in BCR 5 Pacific and Yukon, when they are in the BCR (breeding, migrant, winter) and their priority status.

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Empidonax alnorum</i>	Alder Flycatcher	Moucherolle des aulnes	Landbird	Y				
<i>Corvus brachyrhynchos</i>	American Crow	Corneille d'Amérique	Landbird	Y		Y		
<i>Cinclus mexicanus</i>	American Dipper	Cincle d'Amérique	Landbird	Y		Y		
<i>Carduelis tristis</i>	American Goldfinch	Chardonneret jaune	Landbird	Y		Y		
<i>Falco sparverius</i>	American Kestrel	Crécerelle d'Amérique	Landbird	Y		Y		
<i>Anthus rubescens</i>	American Pipit	Pipit d'Amérique	Landbird	Y		Y		
<i>Setophaga ruticilla</i>	American Redstart	Paruline flamboyante	Landbird	Y				
<i>Turdus migratorius</i>	American Robin	Merle d'Amérique	Landbird	Y		Y		
<i>Picoides dorsalis</i>	American Three-toed Woodpecker	Pic à dos rayé	Landbird	Y		Y		
<i>Spizella arborea</i>	American Tree Sparrow	Bruant hudsonien	Landbird	Y		Y		
<i>Calypte anna</i>	Anna's Hummingbird	Colibri d'Anna	Landbird	Y		Y		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Pygargue à tête blanche	Landbird	Y		Y		Y
<i>Columba fasciata</i>	Band-tailed Pigeon	Pigeon à queue barrée	Landbird	Y		Y		Y
<i>Riparia riparia</i>	Bank Swallow	Hirondelle de rivage	Landbird	Y				
<i>Tyto alba</i>	Barn Owl	Effraie des clochers	Landbird	Y		Y		Y
<i>Hirundo rustica</i>	Barn Swallow	Hirondelle rustique	Landbird	Y				Y
<i>Strix varia</i>	Barred Owl	Chouette rayée	Landbird	Y		Y		
<i>Megaceryle alcyon</i>	Belted Kingfisher	Martin-pêcheur d'Amérique	Landbird	Y		Y		Y
<i>Thryomanes bewickii</i>	Bewick's Wren	Troglodyte de Bewick	Landbird	Y		Y		
<i>Cypseloides niger</i>	Black Swift	Martinet sombre	Landbird	Y				Y
<i>Poecile atricapillus</i>	Black-capped Chickadee	Mésange à tête noire	Landbird	Y		Y		
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak	Cardinal à tête noire	Landbird	Y				

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Dendroica nigrescens</i>	Black-throated Gray Warbler	Paruline grise	Landbird	Y				Y
<i>Bombycilla garrulus</i>	Bohemian Waxwing	Jaseur boréal	Landbird	Y		Y		
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	Quiscale de Brewer	Landbird	Y		Y		
<i>Certhia americana</i>	Brown Creeper	Grimpereau brun	Landbird	Y		Y		
<i>Molothrus ater</i>	Brown-headed Cowbird	Vacher à tête brune	Landbird	Y		Y		
<i>Icterus bullockii</i>	Bullock's Oriole	Oriole de Bullock	Landbird	Y				Y
<i>Psaltiriparus minimus</i>	Bushtit	Mésange buissonnière	Landbird	Y		Y		
<i>Vireo cassinii</i>	Cassin's Vireo	Viréo de Cassin	Landbird	Y				Y
<i>Bombycilla cedrorum</i>	Cedar Waxwing	Jaseur d'Amérique	Landbird	Y		Y		
<i>Poecile rufescens</i>	Chestnut-backed Chickadee	Mésange à dos marron	Landbird	Y		Y		Y
<i>Spizella passerina</i>	Chipping Sparrow	Bruant familial	Landbird	Y				
<i>Nucifraga columbiana</i>	Clark's Nutcracker	Cassenoix d'Amérique	Landbird	Y		Y		
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	Hirondelle à front blanc	Landbird	Y				
<i>Chordeiles minor</i>	Common Nighthawk	Engoulevent d'Amérique	Landbird	Y				Y
<i>Corvus corax</i>	Common Raven	Grand Corbeau	Landbird	Y		Y		
<i>Carduelis flammea</i>	Common Redpoll	Sizerin flammé	Landbird			Y		
<i>Geothlypis trichas</i>	Common Yellowthroat	Paruline masquée	Landbird	Y				
<i>Accipiter cooperii</i>	Cooper's Hawk	Épervier de Cooper	Landbird	Y		Y		Y
<i>Junco hyemalis</i>	Dark-eyed Junco	Junco ardoisé	Landbird	Y		Y		
<i>Picoides pubescens</i>	Downy Woodpecker	Pic mineur	Landbird	Y		Y		
<i>Tyrannus tyrannus</i>	Eastern Kingbird	Tyran tritri	Landbird	Y				
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Gros-bec errant	Landbird	Y		Y		
<i>Passerella iliaca</i>	Fox Sparrow	Bruant fauve	Landbird	Y		Y		
<i>Aquila chrysaetos</i>	Golden Eagle	Aigle royal	Landbird	Y		Y		
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Roitelet à couronne dorée	Landbird	Y		Y		Y
<i>Zonotrichia atricapilla</i>	Golden-crowned Sparrow	Bruant à couronne dorée	Landbird	Y		Y		
<i>Dumetella carolinensis</i>	Gray Catbird	Moqueur chat	Landbird	Y				
<i>Perisoreus canadensis</i>	Gray Jay	Mésangeai du Canada	Landbird	Y		Y		
<i>Leucosticte tephrocotis</i>	Gray-crowned Rosy-Finch	Roselin à tête grise	Landbird	Y		Y		

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Strix nebulosa</i>	Great Gray Owl	Chouette lapone	Landbird	Y		Y		
<i>Bubo virginianus</i>	Great Horned Owl	Grand-duc d'Amérique	Landbird	Y		Y		
<i>Falco rusticolus</i>	Gyr Falcon	Faucon gerfaut	Landbird			Y		Y
<i>Picoides villosus</i>	Hairy Woodpecker	Pic chevelu	Landbird	Y		Y		Y
<i>Empidonax hammondi</i>	Hammond's Flycatcher	Moucherolle de Hammond	Landbird	Y				
<i>Catharus guttatus</i>	Hermit Thrush	Grive solitaire	Landbird	Y		Y		
<i>Eremophila alpestris strigata</i>	Horned Lark (<i>strigata</i>)	Alouette hausse-col (<i>strigata</i>)	Landbird	Y [□]		Y		Y
<i>Carpodacus mexicanus</i>	House Finch	Roselin familier	Landbird	Y		Y		
<i>Troglodytes aedon</i>	House Wren	Troglodyte familier	Landbird	Y				
<i>Vireo huttoni</i>	Hutton's Vireo	Viréo de Hutton	Landbird	Y		Y		Y
<i>Calcarius lapponicus</i>	Lapland Longspur	Bruant lapon	Landbird			Y		
<i>Passerina amoena</i>	Lazuli Bunting	Passerin azuré	Landbird	Y				
<i>Empidonax minimus</i>	Least Flycatcher	Moucherolle tchébec	Landbird	Y				
<i>Melanerpes lewis</i>	Lewis's Woodpecker	Pic de Lewis	Landbird	Y*				Y
<i>Melospiza lincolni</i>	Lincoln's Sparrow	Bruant de Lincoln	Landbird	Y		Y		
<i>Asio otus</i>	Long-eared Owl	Hibou moyen-duc	Landbird	Y		Y		
<i>Oporornis tolmiei</i>	MacGillivray's Warbler	Paruline des buissons	Landbird	Y				Y
<i>Cistothorus palustris</i>	Marsh Wren	Troglodyte des marais	Landbird	Y		Y		
<i>Falco columbarius</i>	Merlin	Faucon émerillon	Landbird	Y		Y		
<i>Sialia currucoides</i>	Mountain Bluebird	Merlebleu azuré	Landbird	Y		Y		
<i>Poecile gambeli</i>	Mountain Chickadee	Mésange de Gambel	Landbird	Y		Y		
<i>Zenaida macroura</i>	Mourning Dove	Tourterelle triste	Landbird	Y		Y		
<i>Oreothlypis ruficapilla</i>	Nashville Warbler	Paruline à joues grises	Landbird	Y				
<i>Colaptes auratus</i>	Northern Flicker	Pic flamboyant	Landbird	Y		Y		
<i>Accipiter gentilis laingi</i>	Northern Goshawk (<i>laingi</i>)	Autour des palombes (<i>laingi</i>)	Landbird	Y		Y		Y
<i>Circus cyaneus</i>	Northern Harrier	Busard Saint-Martin	Landbird	Y		Y		Y

* No longer breeds in the BCR, but continues to occur as occasional non-breeding individuals or small wintering populations. Interim population objective set as “increase”, with the future goal of re-establishing breeding populations

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Surnia ulula</i>	Northern Hawk Owl	Chouette épervière	Landbird			Y		
<i>Glaucidium gnoma</i>	Northern Pygmy-Owl	Chevêchette naine	Landbird	Y		Y		Y
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	Hirondelle à ailes hérissées	Landbird	Y				
<i>Aegolius acadicus acadicus</i>	Northern Saw-whet Owl (<i>acadicus</i>)	Petite Nyctale (<i>acadicus</i>)	Landbird	Y		Y		Y
<i>Aegolius acadicus brooksi</i>	Northern Saw-whet Owl (<i>brooksi</i>)	Petite Nyctale (<i>brooksi</i>)	Landbird	Y		Y		Y
<i>Lanius excubitor</i>	Northern Shrike	Pie-grièche grise	Landbird	Y		Y		
<i>Parkesia noveboracensis</i>	Northern Waterthrush	Paruline des ruisseaux	Landbird	Y				
<i>Corvus caurinus</i>	Northwestern Crow	Corneille d'Alaska	Landbird	Y		Y		Y
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Moucherolle à côtés olive	Landbird	Y				Y
<i>Oreothlypis celata</i>	Orange-crowned Warbler	Paruline verdâtre	Landbird	Y		Y		Y
<i>Pandion haliaetus</i>	Osprey	Balbusard pêcheur	Landbird	Y				
<i>Troglodytes pacifica</i>	Pacific Wren	Troglodyte mignon	Landbird	Y		Y		Y
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	Moucherolle côtier	Landbird	Y				Y
<i>Falco peregrinus anatum</i>	Peregrine Falcon (<i>anatum</i>)	Faucon pèlerin (<i>anatum</i>)	Landbird	Y		Y		Y
<i>Falco peregrinus pealei</i>	Peregrine Falcon (<i>pealei</i>)	Faucon pèlerin (<i>pealei</i>)	Landbird	Y		Y		Y
<i>Dryocopus pileatus</i>	Pileated Woodpecker	Grand Pic	Landbird	Y		Y		
<i>Pinicola enucleator carlottae</i>	Pine Grosbeak (<i>carlottae</i>)	Durbec des sapins (<i>carlottae</i>)	Landbird	Y		Y		Y
<i>Carduelis pinus</i>	Pine Siskin	Tarin des pins	Landbird	Y		Y		Y
<i>Carpodacus purpureus</i>	Purple Finch	Roselin pourpré	Landbird	Y		Y		Y
<i>Progne subis</i>	Purple Martin	Hirondelle noire	Landbird	Y				Y
<i>Loxia curvirostra</i>	Red Crossbill	Bec-croisé des sapins	Landbird	Y		Y		Y
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Sittelle à poitrine rousse	Landbird	Y		Y		
<i>Sphyrapicus ruber</i>	Red-breasted Sapsucker	Pic à poitrine rouge	Landbird	Y		Y		Y
<i>Vireo olivaceus</i>	Red-eyed Vireo	Viréo aux yeux rouges	Landbird	Y				
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Buse à queue rousse	Landbird	Y		Y		
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	Carouge à épauettes	Landbird	Y		Y		
<i>Buteo lagopus</i>	Rough-legged Hawk	Buse pattue	Landbird			Y		Y

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Regulus calendula</i>	Ruby-crowned Kinglet	Roitelet à couronne rubis	Landbird	Y		Y		
<i>Bonasa umbellus</i>	Ruffed Grouse	Gélinotte huppée	Landbird	Y		Y		
<i>Selasphorus rufus</i>	Rufous Hummingbird	Colibri roux	Landbird	Y				Y
<i>Euphagus carolinus</i>	Rusty Blackbird	Quiscale rouilleux	Landbird	Y		Y		Y
<i>Passerculus sandwichensis</i>	Savannah Sparrow	Bruant des prés	Landbird	Y		Y		
<i>Sayornis saya</i>	Say's Phoebe	Moucherolle à ventre roux	Landbird	Y				
<i>Accipiter striatus</i>	Sharp-shinned Hawk	Épervier brun	Landbird	Y		Y		
<i>Asio flammeus</i>	Short-eared Owl	Hibou des marais	Landbird	Y		Y		Y
<i>Alauda arvensis</i>	Sky Lark	Alouette des champs	Landbird	Y		Y		
<i>Plectrophenax nivalis</i>	Snow Bunting	Bruant des neiges	Landbird			Y		
<i>Bubo scandiacus</i>	Snowy Owl	Harfang des neiges	Landbird			Y		Y
<i>Melospiza melodia</i>	Song Sparrow	Bruant chanteur	Landbird	Y		Y		
<i>Dendragapus fuliginosus</i>	Sooty Grouse	Tétras fuligineux	Landbird	Y		Y		Y
<i>Strix occidentalis</i>	Spotted Owl	Chouette tachetée	Landbird	Y		Y		Y
<i>Pipilo maculatus</i>	Spotted Towhee	Tohi tacheté	Landbird	Y		Y		Y
<i>Cyanocitta stelleri</i>	Steller's Jay	Geai de Steller	Landbird	Y		Y		Y
<i>Catharus ustulatus</i>	Swainson's Thrush	Grive à dos olive	Landbird	Y				
<i>Melospiza georgiana</i>	Swamp Sparrow	Bruant des marais	Landbird			Y		
<i>Myadestes townsendi</i>	Townsend's Solitaire	Solitaire de Townsend	Landbird	Y		Y		
<i>Dendroica townsendi</i>	Townsend's Warbler	Paruline de Townsend	Landbird	Y		Y		Y
<i>Tachycineta bicolor</i>	Tree Swallow	Hirondelle bicolore	Landbird	Y				
<i>Cathartes aura</i>	Turkey Vulture	Urubu à tête rouge	Landbird	Y		Y		
<i>Ixoreus naevius</i>	Varied Thrush	Grive à collier	Landbird	Y		Y		Y
<i>Chaetura vauxi</i>	Vaux's Swift	Martinet de Vaux	Landbird	Y				Y
<i>Catharus fuscescens</i>	Veery	Grive fauve	Landbird	Y				
<i>Pooecetes gramineus affinis</i>	Vesper Sparrow (<i>affinis</i>)	Bruant vespéral (<i>affinis</i>)	Landbird	Y				Y
<i>Tachycineta thalassina</i>	Violet-green Swallow	Hirondelle à face blanche	Landbird	Y				Y
<i>Vireo gilvus</i>	Warbling Vireo	Viréo mélodieux	Landbird	Y				
<i>Sialia mexicana</i>	Western Bluebird	Merlebleu de l'Ouest	Landbird	Y*		Y		Y

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Sturnella neglecta</i>	Western Meadowlark	Sturnelle de l'Ouest	Landbird	Y*		Y		Y
<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl (<i>kennicottii</i>)	Petit-duc des montagnes (<i>kennicottii</i>)	Landbird	Y		Y		Y
<i>Piranga ludoviciana</i>	Western Tanager	Tangara à tête rouge	Landbird	Y				
<i>Contopus sordidulus</i>	Western Wood-Pewee	Pioui de l'Ouest	Landbird	Y				Y
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	Bruant à couronne blanche	Landbird	Y		Y		
<i>Lagopus leucurus saxatilis</i>	White-tailed Ptarmigan (<i>saxatilis</i>)	Lagopède à queue blanche (<i>saxatilis</i>)	Landbird	Y		Y		Y
<i>Zonotrichia albicollis</i>	White-throated Sparrow	Bruant à gorge blanche	Landbird			Y		
<i>Loxia leucoptera</i>	White-winged Crossbill	Bec-croisé bifascié	Landbird	Y		Y		
<i>Empidonax traillii</i>	Willow Flycatcher	Moucherolle des saules	Landbird	Y				Y
<i>Wilsonia pusilla</i>	Wilson's Warbler	Paruline à calotte noire	Landbird	Y				
<i>Dendroica petechia</i>	Yellow Warbler	Paruline jaune	Landbird	Y				
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird	Carouge à tête jaune	Landbird	Y				
<i>Dendroica coronata</i>	Yellow-rumped Warbler	Paruline à croupion jaune	Landbird	Y		Y		
<i>Pluvialis dominica</i>	American Golden-Plover	Pluvier bronzé	Shorebird		Y			Y
<i>Calidris bairdii</i>	Baird's Sandpiper	Bécasseau de Baird	Shorebird		Y			
<i>Haematopus bachmani</i>	Black Oystercatcher	Huîtrier de Bachman	Shorebird	Y		Y		Y
<i>Arenaria melanocephala</i>	Black Turnstone	Tournepierre noir	Shorebird			Y		Y
<i>Pluvialis squatarola</i>	Black-bellied Plover	Pluvier argenté	Shorebird		Y	Y		Y
<i>Himantopus mexicanus</i>	Black-necked Stilt	Échasse d'Amérique	Shorebird		Y			
<i>Calidris alpina</i>	Dunlin	Bécasseau variable	Shorebird		Y	Y		Y
<i>Tringa melanoleuca</i>	Greater Yellowlegs	Grand Chevalier	Shorebird	Y		Y		
<i>Charadrius vociferus</i>	Killdeer	Pluvier kildir	Shorebird	Y		Y		
<i>Calidris minutilla</i>	Least Sandpiper	Bécasseau minuscule	Shorebird	Y	Y			
<i>Tringa flavipes</i>	Lesser Yellowlegs	Petit Chevalier	Shorebird	Y		Y		
<i>Numenius americanus</i>	Long-billed Curlew	Courlis à long bec	Shorebird		Y	Y		Y
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher	Bécassin à long bec	Shorebird		Y	Y		
<i>Limosa fedoa</i>	Marbled Godwit	Barge marbrée	Shorebird			Y		Y
<i>Pluvialis fulva</i>	Pacific Golden-Plover	Pluvier fauve	Shorebird		Y			

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Calidris melanotos</i>	Pectoral Sandpiper	Bécasseau à poitrine cendrée	Shorebird		Y			
<i>Calidris canutus</i>	Red Knot	Bécasseau maubèche	Shorebird		Y			Y
<i>Phalaropus fulicarius</i>	Red Phalarope	Phalarope à bec large	Shorebird			Y		
<i>Phalaropus lobatus</i>	Red-necked Phalarope	Phalarope à bec étroit	Shorebird			Y		Y
<i>Calidris ptilocnemis</i>	Rock Sandpiper	Bécasseau des Aléoutiennes	Shorebird			Y		Y
<i>Arenaria interpres</i>	Ruddy Turnstone	Tourneepierre à collier	Shorebird			Y		Y
<i>Calidris alba</i>	Sanderling	Bécasseau sanderling	Shorebird			Y		Y
<i>Charadrius semipalmatus</i>	Semipalmated Plover	Pluvier semipalmé	Shorebird	Y				
<i>Calidris pusilla</i>	Semipalmated Sandpiper	Bécasseau semipalmé	Shorebird		Y			
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Bécasseau à queue pointue	Shorebird		Y			
<i>Limnodromus griseus</i>	Short-billed Dowitcher	Bécassin roux	Shorebird	Y	Y			Y
<i>Tringa solitaria</i>	Solitary Sandpiper	Chevalier solitaire	Shorebird	Y				
<i>Actitis macularius</i>	Spotted Sandpiper	Chevalier grivelé	Shorebird	Y		Y		
<i>Calidris himantopus</i>	Stilt Sandpiper	Bécasseau à échasses	Shorebird		Y			
<i>Aphriza virgata</i>	Surfbird	Bécasseau du ressac	Shorebird			Y		Y
<i>Heteroscelus incanus</i>	Wandering Tattler	Chevalier errant	Shorebird	Y	Y	Y		Y
<i>Calidris mauri</i>	Western Sandpiper	Bécasseau d'Alaska	Shorebird		Y	Y		Y
<i>Numenius phaeopus</i>	Whimbrel	Courlis corlieu	Shorebird		Y	Y		Y
<i>Tringa semipalmata</i>	Willet	Chevalier semipalmé	Shorebird		Y			
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Phalarope de Wilson	Shorebird	Y	Y			Y
<i>Gallinago delicata</i>	Wilson's Snipe	Bécassine de Wilson	Shorebird	Y		Y		
<i>Botaurus lentiginosus</i>	American Bittern	Butor d'Amérique	Waterbird	Y		Y		Y
<i>Fulica americana</i>	American Coot	Foulque d'Amérique	Waterbird	Y		Y		
<i>Synthliboramphus antiquus</i>	Ancient Murrelet	Guillemot à cou blanc	Waterbird	Y		Y		Y
<i>Sterna paradisaea</i>	Arctic Tern	Sterne arctique	Waterbird	Y	Y			
<i>Chlidonias niger</i>	Black Tern	Guifette noire	Waterbird	Y				Y
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Bihoreau gris	Waterbird	Y		Y		Y
<i>Phoebastria nigripes</i>	Black-footed Albatross	Albatros à pieds noirs	Waterbird			Y	Y	Y
<i>Rissa tridactyla</i>	Black-legged Kittiwake	Mouette tridactyle	Waterbird	Y		Y	Y	

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Puffinus opisthomelas</i>	Black-vented Shearwater	Puffin cul-noir	Waterbird				Y	
<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull	Mouette de Bonaparte	Waterbird	Y		Y		
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	Cormoran de Brandt	Waterbird	Y		Y		Y
<i>Pelecanus occidentalis</i>	Brown Pelican	Pélican brun	Waterbird				Y	
<i>Puffinus bulleri</i>	Buller's Shearwater	Puffin de Buller	Waterbird				Y	Y
<i>Larus californicus</i>	California Gull	Goéland de Californie	Waterbird	Y		Y		Y
<i>Hydroprogne caspia</i>	Caspian Tern	Sterne caspienne	Waterbird	Y				Y
<i>Ptychoramphus aleuticus</i>	Cassin's Auklet	Starique de Cassin	Waterbird	Y		Y		Y
<i>Bubulcus ibis</i>	Cattle Egret	Héron garde-boeufs	Waterbird			Y		
<i>Gavia immer</i>	Common Loon	Plongeon huard	Waterbird	Y		Y		Y
<i>Uria aalge</i>	Common Murre	Guillemot marmette	Waterbird	Y		Y		Y
<i>Sterna hirundo</i>	Common Tern	Sterne pierregarin	Waterbird		Y			Y
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Cormoran à aigrettes	Waterbird	Y		Y		Y
<i>Podiceps nigricollis</i>	Eared Grebe	Grèbe à cou noir	Waterbird			Y		
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	Puffin à pieds pâles	Waterbird				Y	Y
<i>Oceanodroma furcata</i>	Fork-tailed Storm-Petrel	Océanite à queue fourchue	Waterbird	Y		Y		
<i>Larus hyperboreus</i>	Glaucous Gull	Goéland bourgmestre	Waterbird			Y		
<i>Larus glaucescens</i>	Glaucous-winged Gull	Goéland à ailes grises	Waterbird	Y		Y		Y
<i>Ardea herodias fannini</i>	Great Blue Heron (<i>fannini</i>)	Grand Héron (<i>fannini</i>)	Waterbird	Y		Y		Y
<i>Butorides virescens</i>	Green Heron	Héron vert	Waterbird	Y		Y		Y
<i>Larus heermanni</i>	Heermann's Gull	Goéland de Heermann	Waterbird				Y	Y
<i>Larus argentatus</i>	Herring Gull	Goéland argenté	Waterbird	Y		Y		
<i>Podiceps auritus</i>	Horned Grebe	Grèbe esclavon	Waterbird			Y		Y
<i>Fratercula corniculata</i>	Horned Puffin	Macareux cornu	Waterbird	Y		Y		Y
<i>Phoebastria immutabilis</i>	Laysan Albatross	Albatros de Laysan	Waterbird				Y	Y
<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	Océanite cul-blanc	Waterbird	Y		Y		Y
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger	Labbe à longue queue	Waterbird		Y			
<i>Puffinus puffinus</i>	Manx Shearwater	Puffin des Anglais	Waterbird				Y	Y
<i>Brachyramphus</i>	Marbled Murrelet	Guillemot marbré	Waterbird	Y		Y		Y

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>marmoratus</i>								
<i>Larus canus</i>	Mew Gull	Goéland cendré	Waterbird	Y		Y		
<i>Pterodroma inexpectata</i>	Mottled Petrel	Pétrel maculé	Waterbird				Y	
<i>Pterodroma ultima</i>	Murphy's Petrel	Pétrel de Murphy	Waterbird				Y	
<i>Fulmarus glacialis</i>	Northern Fulmar	Fulmar boréal	Waterbird	Y		Y		Y
<i>Gavia pacifica</i>	Pacific Loon	Plongeon du Pacifique	Waterbird	Y		Y		
<i>Aethia psittacula</i>	Parakeet Auklet	Starique perroquet	Waterbird			Y		
<i>Stercorarius parasiticus</i>	Parasitic Jaeger	Labbe parasite	Waterbird		Y			
<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	Cormoran pélagique	Waterbird	Y		Y		Y
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Grèbe à bec bigarré	Waterbird	Y		Y		
<i>Cephus columba</i>	Pigeon Guillemot	Guillemot colombin	Waterbird	Y		Y		Y
<i>Puffinus creatopus</i>	Pink-footed Shearwater	Puffin à pieds roses	Waterbird				Y	Y
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	Labbe pomarin	Waterbird		Y			
<i>Podiceps grisegena</i>	Red-necked Grebe	Grèbe jougris	Waterbird	Y		Y		
<i>Gavia stellata</i>	Red-throated Loon	Plongeon catmarin	Waterbird	Y		Y		
<i>Cerorhinca monocerata</i>	Rhinoceros Auklet	Macareux rhinocéros	Waterbird	Y		Y		Y
<i>Larus delawarensis</i>	Ring-billed Gull	Goéland à bec cerclé	Waterbird			Y		
<i>Xema sabini</i>	Sabine's Gull	Mouette de Sabine	Waterbird		Y			
<i>Grus canadensis</i>	Sandhill Crane	Grue du Canada	Waterbird	Y		Y		
<i>Phoebastria albatrus</i>	Short-tailed Albatross	Albatros à queue courte	Waterbird				Y	Y
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	Puffin à bec grêle	Waterbird				Y	
<i>Puffinus griseus</i>	Sooty Shearwater	Puffin fuligineux	Waterbird				Y	
<i>Porzana carolina</i>	Sora	Marouette de Caroline	Waterbird	Y				
<i>Stercorarius macormicki</i>	South Polar Skua	Labbe de McCormick	Waterbird				Y	
<i>Larus thayeri</i>	Thayer's Gull	Goéland de Thayer	Waterbird			Y		Y
<i>Uria lomvia</i>	Thick-billed Murre	Guillemot de Brünnich	Waterbird	Y		Y		Y
<i>Fratercula cirrhata</i>	Tufted Puffin	Macareux huppé	Waterbird	Y		Y		Y
<i>Rallus limicola</i>	Virginia Rail	Râle de Virginie	Waterbird	Y		Y		
<i>Aechmophorus occidentalis</i>	Western Grebe	Grèbe élégant	Waterbird			Y		Y

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Larus occidentalis</i>	Western Gull	Goéland d'Audubon	Waterbird	Y		Y		Y
<i>Synthliboramphus hypoleucus</i>	Xantus's Murrelet	Guillemot de Xantus	Waterbird				Y	Y
<i>Gavia adamsii</i>	Yellow-billed Loon	Plongeon à bec blanc	Waterbird			Y		Y
<i>Anas rubripes</i>	American Black Duck	Canard noir	Waterfowl	Y		Y		
<i>Anas americana</i>	American Wigeon	Canard d'Amérique	Waterfowl	Y		Y		Y
<i>Bucephala islandica</i>	Barrow's Goldeneye	Garrot d'Islande	Waterfowl	Y		Y		Y
<i>Melanitta americana</i>	Black Scoter	Macreuse noire	Waterfowl			Y		Y
<i>Anas discors</i>	Blue-winged Teal	Sarcelle à ailes bleues	Waterfowl	Y				Y
<i>Branta bernicla nigricans</i>	Brant (Black)	Bernache cravant noire	Waterfowl		Y	Y		Y
<i>Branta bernicla spp.</i>	Brant (Western High Arctic)	Bernache cravant de l'ouest de l'Extrême-Arctique	Waterfowl		Y	Y		Y
<i>Bucephala albeola</i>	Bufflehead	Petit Garrot	Waterfowl	Y		Y		Y
<i>Branta hutchinsii</i>	Cackling Goose	Bernache de Hutchins	Waterfowl			Y		Y
<i>Branta canadensis occidentalis</i>	Canada Goose (Dusky)	Bernache du Canada (forme sombre)	Waterfowl	Y		Y		Y
<i>Branta canadensis</i>	Canada Goose (Pacific)	Bernache du Canada (Pacifique)	Waterfowl			Y		Y
<i>Aythya valisineria</i>	Canvasback	Fuligule à dos blanc	Waterfowl			Y		Y
<i>Anas cyanoptera</i>	Cinnamon Teal	Sarcelle cannelle	Waterfowl	Y				Y
<i>Bucephala clangula</i>	Common Goldeneye	Garrot à oeil d'or	Waterfowl	Y		Y		Y
<i>Mergus merganser</i>	Common Merganser	Grand Harle	Waterfowl	Y		Y		
<i>Chen canagica</i>	Emperor Goose	Oie empereur	Waterfowl		Y			
<i>Anas penelope</i>	Eurasian Wigeon	Canard siffleur	Waterfowl			Y		
<i>Anas strepera</i>	Gadwall	Canard chipeau	Waterfowl	Y		Y		
<i>Aythya marila</i>	Greater Scaup	Fuligule milouinan	Waterfowl			Y		Y
<i>Anser albifrons</i>	Greater White-fronted Goose	Oie rieuse	Waterfowl			Y		Y
<i>Anas crecca</i>	Green-winged Teal	Sarcelle d'hiver	Waterfowl	Y		Y		Y
<i>Histrionicus histrionicus</i>	Harlequin Duck	Arlequin plongeur	Waterfowl	Y		Y		Y
<i>Lophodytes cucullatus</i>	Hooded Merganser	Harle couronné	Waterfowl	Y		Y		

Table A1 continued

Scientific Name	English Name	French Name	Pillar Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Somateria spectabilis</i>	King Eider	Eider à tête grise	Waterfowl			Y		
<i>Aythya affinis</i>	Lesser Scaup	Petit Fuligule	Waterfowl	Y		Y		Y
<i>Chen caerulescens caerulescens</i>	Lesser Snow Goose	Petite Oie des neiges	Waterfowl			Y		Y
<i>Clangula hyemalis</i>	Long-tailed Duck	Harelde kakawi	Waterfowl	Y		Y		
<i>Anas platyrhynchos</i>	Mallard	Canard colvert	Waterfowl	Y		Y		Y
<i>Cygnus olor</i>	Mute Swan	Cygne tuberculé	Waterfowl	Y		Y		
<i>Anas acuta</i>	Northern Pintail	Canard pilet	Waterfowl	Y		Y		Y
<i>Anas clypeata</i>	Northern Shoveler	Canard souchet	Waterfowl	Y		Y		Y
<i>Mergus serrator</i>	Red-breasted Merganser	Harle huppé	Waterfowl	Y		Y		
<i>Aythya americana</i>	Redhead	Fuligule à tête rouge	Waterfowl			Y		
<i>Aythya collaris</i>	Ring-necked Duck	Fuligule à collier	Waterfowl	Y		Y		
<i>Chen rossii</i>	Ross's Goose	Oie de Ross	Waterfowl			Y		
<i>Oxyura jamaicensis</i>	Ruddy Duck	Érismature rousse	Waterfowl	Y		Y		
<i>Melanitta perspicillata</i>	Surf Scoter	Macreuse à front blanc	Waterfowl			Y		Y
<i>Cygnus buccinator</i>	Trumpeter Swan	Cygne trompette	Waterfowl	Y		Y		Y
<i>Aythya fuligula</i>	Tufted Duck	Fuligule morillon	Waterfowl			Y		
<i>Cygnus columbianus</i>	Tundra Swan	Cygne siffleur	Waterfowl			Y		Y
<i>Melanitta fusca</i>	White-winged Scoter	Macreuse brune	Waterfowl			Y		Y
<i>Aix sponsa</i>	Wood Duck	Canard branchu	Waterfowl	Y		Y		

Appendix 2

General Methodology for Compiling the Six Standard Elements

Each strategy includes six required elements to conform to the national standard. An extensive manual (Kennedy et al. 2012) provides methods and other guidance for completing each element. The six elements provide an objective means of moving towards multi-species conservation efforts that are targeted to species and issues of highest priority. The six elements are:

- 1) identifying priority species – to focus conservation attention on species of conservation concern and those most representative of the region
- 2) attributing priority species to habitat classes – a tool for identifying habitats of conservation interest and a means of organizing and presenting information
- 3) setting population objectives for priority species – an assessment of current population status compared to the desired status, and a means of measuring conservation success
- 4) assessing and ranking threats – identifies the relative importance of issues affecting populations of priority species within the planning area as well as outside Canada (i.e., throughout their life-cycle)
- 5) setting conservation objectives – outlines the overall conservation goals in response to identified threats and information needs; also a means of measuring accomplishments
- 6) proposing recommended actions – strategies to begin on-the-ground conservation to help achieve conservation objectives.

The first four elements apply to individual priority species, and together comprise an assessment of the status of priority species and the threats they face. The last two elements integrate information across species to create a vision for conservation implementation both within Canada and in countries that host priority species during migration and the non-breeding season.

Element 1: Species Assessment to Identify Priority Species

The Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each subregion. The priority species approach allows management attention and limited resources to focus on those species with particular conservation importance, ecological significance and/or management need. The species assessment processes used are derived from standard assessment protocols developed by the four major bird conservation initiatives.¹

The species assessment process applies quantitative rule sets to biological data for factors such as:

- population size,
- breeding and non-breeding distribution,

¹ Partners in Flight (landbirds), Wings Over Water (waterbirds), Canadian Shorebird Conservation Plan (shorebirds), North American Waterfowl Management Plan (waterfowl).

- population trend,
- breeding and non-breeding threats, and
- regional density and abundance

The assessment is applied to individual bird species and ranks each species in terms of its biological vulnerability and population status. The assessments can be used to assign sub-regional (i.e., provincial section of a BCR), regional (BCR) and continental conservation priorities among birds.

In BCR 5, a species was considered as “regularly occurring” within the BCR and assessed for priority status if there are 10 or more records in the past 10 years, occurring every year or almost every year. Records were obtained from *The Birds of British Columbia* (Campbell et al. 1990, 1997, 2001), preliminary data from the [British Columbia Atlas of Breeding Birds](#), [eBird Canada](#), [NatureServe](#), the Pacific Coast Joint Venture’s *Strategic Plan and Biological Foundation* (Martell 2005), the *Atlas of Pelagic Seabirds* (Kenyon et al. 2009), Bird Studies Canada’s British Columbia Coastal Waterbird Survey dataset (1999-2007) and expert opinion. Federally or provincially listed species were also considered, even if there were fewer than 10 records.

Priority species were initially identified based on the following two criteria: (a) whether they were listed by the pillar plans for the species group (landbirds, waterbirds, shorebirds, and waterfowl) or (b) whether they were designated “At Risk” by provincial or federal processes. Landbirds, waterbirds and shorebirds were also added to the list as species of regional concern or stewardship based on the criteria outlined below. The resulting initial list of priority species was then screened by local experts, and additional species of conservation concern were added to the list.

Partners in Flight criteria for landbirds

Landbird species identified as being of Continental Concern or Stewardship in BCR 5 by the PIF species assessment database (Rocky Mountain Bird Observatory 2005) were added to the priority list in the Canadian portion of BCR 5.

The process for identifying Regional Concern and Regional Stewardship landbird species in the Canadian portion of BCR 5 included a reassessment of the BCR 5 Threats to Breeding (TB), Threats to Non-breeding (TN), and Population Trend (PT) scores appearing in the 2005 PIF species assessment database to reflect data specific to the planning area. TB and TN scores were reassessed by local experts, and PT scores were reassessed based on 1968-2007 Breeding Bird Survey trend data for the Canadian portion of BCR 5 and the PT scores criteria described in *The Partners in Flight Handbook on Species Assessment* (Panjabi et al. 2005). Where a change in score was made, the highest of the BCR-wide and sub-BCR scores was retained. New Regional Combined Scores for the breeding (RCS-b) and non-breeding (RCS-n) seasons were calculated using Breeding Distribution (BD), Non-Breeding Distribution (ND), Population Size (PS), Breeding Relative Density (RD-b) and global PT scores from the PIF species assessment database, Non-breeding Relative Density (RD-n) scores provided by Peter Blancher (CWS-National), and TB, TN, and regional PT scores from the regional reassessment (see formulas below).

Birds that occur in the Canadian portion of BCR 5 only during the breeding season:

$$RCS-b = BD_{global} + PS_{global} + PT_{BCR\ 5} + TB_{BCR\ 5} + RD-b_{BCR\ 5}$$

Birds that occur in the Canadian portion of BCR 5 only during the non-breeding season:

$$RCS-n = ND_{global} + PS_{global} + PT_{global} + TN_{BCR\ 5} + RD-n_{BCR\ 5}$$

Birds that occur in the Canadian portion of BCR 5 during both the breeding and non-breeding seasons (residents):

$$RCS-n = ND_{global} + PS_{global} + PT_{BCR\ 5} + TN_{BCR\ 5} + RD-b_{BCR\ 5}$$

The criteria used by Panjabi et al. (2005) for identifying Regional Concern and Regional Stewardship species were then applied to prioritize species in the Canadian portion of BCR 5 (see below).

Regional Concern: Species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High Regional Threats (> 3) or Moderate Regional Threat (3) combined with significant population decline (PT > 3)
- Occurs regularly in significant numbers in the BCR, i.e., RD > 1

Regional Stewardship: Species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High importance of the BCR to the species; % of Western Hemisphere Breeding Population in BCR 5 ≥ 25 OR (RD=5 and % of Western Hemisphere Breeding Population in BCR 5 ≥ 5). **Note:** The % of Western Hemisphere Breeding Population was used here as opposed to the % of Global Breeding Population because Global Population data were not available for most non-landbirds.
- Future conditions are not enhanced by human activities, i.e., Threat Score > 1

Waterfowl

For waterfowl, the prioritization by the 2004 Strategic Guidance to the North American Waterfowl Management Plan: Strengthening the Biological Foundation (North American Waterfowl Management Plan, Plan Committee 2004) was used as a criterion for identifying waterfowl priority species in the Canadian portion of BCR 5. Species that scored Moderate High, High or Highest for either Breeding or Non-breeding Need in WCR 5 in the NAWMP prioritization were selected as priority species.

Waterbirds and Shorebirds

Unlike waterfowl, the pillar plans for waterbirds and shorebirds reflect a national scope and do not list priority species by region and unlike landbirds, no standardized methods exist to adjust species lists to reflect species of regional concern or stewardship. We have therefore developed a technique to allow for the assessment of waterbirds and shorebirds at a regional scale. These methods are loosely based on those developed by Schonewille et al. (2007) but were somewhat modified to reflect the data available in our region.

For Waterbirds:

PT, PS, TB, TN, BD and ND scores are taken directly from Wings Over Water Canada's Waterbird Conservation Plan (Milko et al. 2003; WOW). Species in categories 1 (highly imperiled) and 2 (high concern) in WOW are automatically added to the priority species list. To regionalize we used the percent of the species range that occurs within the BCR. The percent range scores were calculated using range data from [NatureServe](#) and included the portions of the range where each species is listed as Extant and/or Possibly Present. The categories of data used from NatureServe include:

- Native (year-round)
- Native (breeding season only)
- Native (non-breeding season only)
- Native (as a passage migrant or wanderer)

The highest of the 4 scores were used to assign the species to one of 5 categories that reflected the percent of the species' range in the BCR.

- 1—<1%
- 2—1-9%
- 3—10-24%
- 4—25-49%
- 5—≥50%

The regional combined score (RCS_BCR) is:

$$\text{RCS_BCR} = \text{PT} + \text{PS} + \text{TB} + \text{TN} + \text{BD} + \text{ND} + \% \text{ Range in BCR}$$

If $\text{RCS_BCR} \geq 18$ then the species is added to the priority species list. Species that have a $\text{RCS_BCR} \geq 18$ are considered to be regional stewardship species.

For Shorebirds:

Species in categories 4 (species of high concern) and 5 (highly imperiled) in the Canadian Shorebird Conservation Plan (Donaldson et al. 2000) were automatically added to the priority species list. As above, to regionalize we used the percent of the species' range that occurs within the BCR. If the percent of the species' range in the BCR falls into categories 4 or 5

(above) then the overall score given to the species in the Canadian Shorebird Conservation Plan was increased by one.

If the new score is ≥ 4 then the species is added to the priority species list. Species that have $\geq 25\%$ of their range in the BCR are considered to be regional stewardship species.

Species at Risk

Among the species occurring in the Canadian portion of BCR 5, those that were Red- or Blue-listed in British Columbia or had a COSEWIC status of Endangered, Threatened or Special Concern were identified as priority species.

Screening by Experts

The list resulting from the assessment described above was screened by experts. The Band-tailed Pigeon, Black-bellied Plover, Common Loon, Dunlin, and Western Sandpiper were added on the basis of expert opinion.

Element 2: Habitats Important to Priority Species

Identifying the broad habitat requirements for each priority species in the breeding and non-breeding season allows species with shared habitat-based conservation issues or actions to be grouped. If many priority species associated with the same habitat class face similar conservation issues, then conservation action in that habitat class may support populations of several priority species. In BCR 5, a maximum of two broad-scale habitat associations were identified for each priority species. Habitat associations do not indicate relative use, suitability ratings or rankings, nor selection or avoidance; this could be a useful exercise to undertake in the future.

In order to link with other national and international land classification schemes and to capture the range of habitat types across Canada, habitat classes for all priority species are based, at the coarsest level, on the hierarchical approach of the international Land Cover Classification System (LCCS) developed by the United Nations Food and Agriculture Organization (FAO 2000). Some modifications were made to the LCCS scheme to reflect habitat types that are important to birds that are not included in the classification (e.g., marine habitats). Species often are assigned to more than one of these coarse habitat classes. To retain the link to regional spatial data (e.g., provincial forest inventories, etc.), or to group species into regionally relevant habitat classes, individual BCR strategies may identify finer scale habitat classes. Finer-scale habitat attributes and the surrounding landscape context were also captured when possible to better guide the development of specific conservation objectives and actions.

Element 3: Population Objectives for Priority Species

A central component of effective conservation planning is setting clear objectives that can be measured and evaluated. Bird Conservation Strategies set objectives based upon the conservation philosophies of national and continental bird initiatives, including the North

American Bird Conservation Initiative (NABCI), that support conserving the distribution, diversity and abundance of birds throughout their historical ranges. The baselines for population objectives used in this planning exercise (those existing during the late 1960s, 1970s, and 1990s for eastern waterfowl) reflect population levels prior to widespread declines. Most of the four bird conservation initiatives under the umbrella of NABCI have adopted the same baselines at the continental and national scale (waterfowl, shorebirds and landbirds; national and continental waterbird plans have not yet set population objectives). Some regions in the current planning effort have adjusted baselines to reflect the start of systematic monitoring. The ultimate measure of conservation success will be the extent to which population objectives have been reached. Progress towards population objectives will be regularly assessed as part of an adaptive management approach.

Population objectives for all bird groups are based on a quantitative or qualitative assessment of species' population trends. If the population trend for a species is unknown, the objective is usually "assess and maintain," and a monitoring objective is set. Harvested waterfowl and stewardship species that are already at desired population levels are given an objective of "maintain." For any species listed under the Species at Risk Act (SARA) or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. If recovery documents are not available, objectives are set using the same approach as for other species within that bird group. Once recovery objectives are available, they will replace interim objectives.

For BCR 5, population objectives for waterfowl were taken from the Pacific Coast Joint Venture's Strategic Plan and Biological Foundation (Martell 2005). Population objectives for landbirds, waterbirds and shorebirds were assigned based on the species' population trend (PT) score. For each priority species, the PT score for the entire BCR was provided by Partners in Flight, and the PT score for the Canadian portion of the BCR was calculated from BBS data following PIF protocols (Panjabi et al. 2005). Conservatively, the higher of the two PT scores was used to assign a population objective. Priority species exhibiting declines (PT = 4) were set an objective of "increase population by 50%," while strongly declining species (PT = 5) had an objective identified as "increase population by 100%." For species with PT = 3 (uncertain or unknown trend), objectives were set as "maintain and assess." Finally, species with stable or increasing populations (PT = 1 or 2) had an objective set to "maintain current." Priority species which no longer breed in the BCR but continue to occur as occasional non-breeding individuals or small wintering populations had interim objectives set as "increase", with the goal of eventually re-establishing breeding populations. Population objectives were not set for priority species which only occur in the BCR on migration and do not breed or winter in the region.

Element 4: Threat Assessment for Priority Species

Bird population trends are driven by factors that affect reproduction and/or survival during any point in the annual cycle. Threats that can reduce survival include, for example, reduced food availability at migratory stopovers or exposure to toxic compounds. Examples of threats that

can reduce reproductive success may include high levels of nest predation or reduced quality or quantity of breeding habitat.

The threats assessment exercise included three main steps:

1. Conducting a literature review to itemize past, current and future threats for each priority species and classifying the threats following a using a standardized classification scheme (Salafsky et al. 2008).
2. Ranking the magnitude of threats for priority species following a standardized protocol (Kennedy et al. 2012).
3. Preparing a set of threat profiles for the BCR subregion, for broad habitat categories.

Each threat was categorized following the IUCN-CMP threat classification scheme (Salafsky et al. 2008) with the addition of categories to capture species for which we lack information. Only threats stemming from human activity were included in the threats assessment because they can be mitigated; natural processes that prevent populations from expanding beyond a given level were considered and noted, but no actions beyond research and/or monitoring were developed. Threats were ranked by assessing the scope (the proportion of the species' range within the subregion that is affected by the threat) and severity (the relative impact that the threat poses to the viability of the species' populations) of the threat. The scores for scope and severity were combined to determine an overall magnitude low, medium, high or very high. These magnitudes were then rolled up by threat categories and sub-categories across habitat types (see Kennedy et al. 2012 for details on this process). The threats roll up allows for comparison of the relative magnitude of the threats among threat categories and habitat types. The scoring and ranking of threats not only helps to determine which threats contribute most to population declines in individual species, but also allows us to focus attention on the threats with the greatest effects on suites of species or in broad habitat classes.

Element 5: Conservation Objectives

Overall, conservation objectives represent the desired conditions, within the subregion that will collectively contribute to achieving population objectives. Objectives may also outline the research or monitoring needed to improve the understanding of species declines and how to best take action.

Currently, most conservation objectives are measurable using qualitative categories (e.g., decrease, maintain, increase) that will allow an evaluation of implementation progress but they are not linked quantitatively to population objectives. Implementation that incorporates an active adaptive management process is an underlying principle of this conservation effort and will allow for future evaluation of whether or not reaching conservation objectives contributed to achieving population objectives.

Whenever possible, conservation objectives benefit multiple species, and/or respond to more than one threat. However, where necessary, they focus on the specific requirements of a single species.

Conservation objectives generally fall into one of two broad categories:

- habitat objectives within the BCR subregion (the quantity, quality and configuration of priority habitats),
- non-habitat objectives within the BCR subregion (minimizing mortality by reducing predation, conducting education and outreach to reduce human disturbance, etc.)

Ideally, habitat objectives would reflect the type, amount and location of habitat necessary to support population levels of priority species outlined in the population objectives. Currently, there is a lack of data and tools at the BCR scale to develop these specific quantitative objectives. Threats-based objectives present the direction of change required to move toward the population objectives using the best available information and our knowledge of ecosystem management strategies within broad habitat types.

Element 6: Recommended Actions

Recommended conservation actions are the strategies required to achieve conservation objectives. Recommended actions are usually made at the strategic level rather than being highly detailed and prescriptive. Actions were classified following the IUCN-CMP classification of conservation actions (Salafsky et al. 2008) with the addition of categories to address research and monitoring needs. When possible, more detailed recommendations can be included, for example if beneficial management practices, ecosystem plans or multiple recovery documents are available for a subregion. However, actions should be detailed enough to provide initial guidance for implementation.

The objectives for research, monitoring and widespread issues may not have actions associated with them. These issues are often so multi-faceted that actions are best designed in consultation with partners and subject-matter experts. Implementation teams will be better positioned to address these complex issues, drawing input from various stakeholders.

Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but because these strategies are directed at multiple species, actions are usually more general than those developed for individual species. For more detailed recommendations for species at risk, readers should consult recovery documents.

www.ec.gc.ca

Additional information can be obtained at:

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