



NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT

**SYNTHESIS OF LARGE-SCALE BIRD
CONSERVATION PLANS IN CANADA:
A RESOURCE FOR FOREST MANAGERS**

SPECIAL REPORT NO. 06-05

NOVEMBER 2006

by
**John M. Cooper and E. Todd Manning
Manning, Cooper and Associates Ltd.
Victoria, British Columbia**

Acknowledgments

The authors thank the National Council for Air and Stream Improvement for giving us the opportunity to conduct this work. The manuscript benefited greatly from earlier reviews by Darren Sleep of NCASI and several other industry reviewers.

For more information about this research, contact:

Darren J.H. Sleep, Ph.D.
Senior Forest Ecologist
NCASI Canada
P.O. Box 1490, Station B
Montreal, QC H3B 3L2 Canada
(514) 286-9690
dsleep@ncasi.org

Kirsten Vice
Vice President, Canadian Operations
NCASI Canada
P.O. Box 1490, Station B
Montreal, QC H3B 3L9 Canada
(514) 286-9111
kvice@ncasi.org

For information about NCASI publications, contact:

Publications Coordinator
NCASI
P.O. Box 13318
Research Triangle Park, NC 27709-3318
(919) 941-6400
publications@ncasi.org

National Council for Air and Stream Improvement, Inc. (NCASI). 2006. *Synthesis of large-scale bird conservation plans in Canada: A resource for forest managers*. Special Report No. 06-05. Research Triangle Park, N.C.: National Council for Air and Stream Improvement, Inc.

© 2006 by the National Council for Air and Stream Improvement, Inc.



servicing the environmental research needs of the forest products industry since 1943

PRESIDENT'S NOTE

Concerns about bird populations in North America have prompted development of several broad-scale conservation plans and agreements. These plans cover major species groups at national or multi-national scales and operate under the coordinating umbrella of the North American Bird Initiative. The plans are produced and monitored by committees of scientists and resource managers drawn from government agencies, research institutions, non-governmental organizations, and industry.

This Special Report presents an overview of the four most important bird conservation plans in Canada and assesses their relevance to the forestry sector. The plans considered are the North American Landbird Management Plan, the North American Waterfowl Management Plan, the Canadian Shorebird Conservation Plan, and Wings over Water. Additionally, this report provides a brief description of the Canadian Species at Risk Act and examines its relevance to the forestry sector with respect to bird species.

Information in this report will be useful in developing priorities for wildlife conservation in managed forests and in addressing requirements of forest certification programs. The report was prepared for NCASI by John Cooper and Todd Manning at Manning, Cooper and Associates Ltd. of Victoria, British Columbia. They suggest that bird conservation efforts in Canada's managed forests should be focused on 65 species, or about 10% of the more than 600 bird species that live in Canada. Of these priority species, 25 are covered by the Species at Risk Act (9 *Endangered*, 3 *Threatened*, 13 *Special Concern*). Most bird species in Canada (90%) either don't occur in managed forests or are not likely to have their populations reduced substantially by forestry practices.

A handwritten signature in black ink, appearing to read "Ron Yeske", is positioned above the printed name.

Ronald A. Yeske

November 2006

MOT DU PRÉSIDENT

Les préoccupations concernant les populations d'oiseaux en Amérique du Nord ont mené à la signature de plusieurs accords et à l'élaboration de plans de conservation à grande échelle. Ces plans, dont la mise en application est coordonnée par le *North American Bird Initiative*, visent les principaux groupes d'espèces à l'échelle d'un pays ou de plus d'un pays. Les plans sont élaborés et suivis de près par des comités de scientifiques et de gestionnaires de ressources provenant d'organismes gouvernementaux, d'établissements de recherche, d'organisations non gouvernementales et de l'industrie.

Le présent Rapport spécial donne un aperçu des quatre plus importants plans canadiens de conservation des oiseaux et évalue leur pertinence en foresterie. Ces plans sont les suivants : le plan nord-américain de gestion des oiseaux terrestres, le plan nord-américain de gestion de la sauvagine, le plan canadien de conservation des oiseaux de rivage et le plan de conservation du Canada pour les oiseaux aquatiques (appelé *Envolées d'oiseaux aquatiques*). De plus, ce rapport contient une brève description de la *Loi sur les espèces en péril* et examine l'applicabilité de cette loi en foresterie relativement aux oiseaux.

L'information contenue dans le présent rapport pourra servir à établir les priorités en matière de conservation de la faune dans les forêts aménagées et à répondre aux exigences des programmes de certification forestière. Dans ce rapport commandité par NCASI et rédigé par John Cooper et Todd Manning chez *Manning, Cooper and Associates Ltd.*, Victoria, Colombie-Britannique, les auteurs sont d'avis que les efforts de conservation des oiseaux dans les forêts aménagées du Canada devraient porter sur 65 espèces, ou environ 10% des oiseaux se trouvant au Canada (plus de 600 espèces). La *Loi sur les espèces en péril* en vise 25 parmi ces espèces prioritaires (9 espèces *en voie de disparition*, 3 espèces *menacées* et 13 espèces *préoccupantes*). La plupart des espèces d'oiseaux au Canada (90%) ne se trouvent pas dans les forêts aménagées ou ne sont pas susceptibles de voir leur population réduite considérablement par les pratiques forestières.



Ronald A. Yeske

Novembre 2006

SYNTHESIS OF LARGE-SCALE BIRD CONSERVATION PLANS IN CANADA: A RESOURCE FOR FOREST MANAGERS

SPECIAL REPORT NO. 06-05
NOVEMBER 2006

ABSTRACT

There are four major bird management plans in effect in Canada: the North American Landbird Management Plan, the North American Waterfowl Management Plan, the Canadian Shorebird Conservation Plan, and Wings Over Water (the Canadian waterbird conservation plan). These plans cover almost all native bird species that occur regularly in Canada. All of these plans operate under the North American Bird Conservation Initiative (NABCI).

The intent of this report is to increase awareness of the four major Federal bird plans among the forest industry, to provide forest managers a common reference point relative to the Federal government's perspective on managing various types of birds in Canada, and to synthesize information on birds that is most relevant to forest management planning.

About 634 species of birds occur in Canada. We reviewed all of those bird species and identified species which may be affected by forestry operations. Effects of forestry on birds may be positive, negative, or mixed depending on the species, specific management practices, spatial scale, and time scale.

We also reviewed the Bird Conservation Region (BCR) concept, a tool developed for the North American Bird Conservation Initiative. BCRs are ecologically defined units that share similar avifaunas and provide a consistent spatial framework for bird conservation across North American landscapes. The BCR concept is very relevant to the forest industry because most of the forest bird conservation planning processes currently underway in Canada are related to BCRs and the priority forest bird species within each.

The plan most relevant to the forest industry is the Partners in Flight North American Landbird Conservation Plan (NALCP). It provides a continental synthesis of priorities and objectives to guide conservation actions for landbirds, many of which are forest-dwelling species. The primary objective of the NALCP is to maintain a representative diversity of avifauna in all ecoregions of Canada and the U.S.

Many of the 448 species covered by the NALCP breed in forested landscapes and may be directly or indirectly affected by forestry operations in positive and negative ways over various temporal and spatial scales, depending on the species and practice in question. We estimate that 48 of those species, which are all on *Watch* or *Stewardship Lists*, are of interest to the forest industry, as special management may be required to conserve populations. Other species that may be affected by forestry operations are thought to be secure under current conditions.

The North American Waterfowl Management Plan (NAWMP) is an international (Canada, U.S., Mexico) action plan to conserve migratory waterfowl (ducks, geese, and swans) throughout the continent. The NAWMP was initiated in 1986, updated in 1998, and is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, industry and many individuals. The primary objective of the NAWMP is to restore North American waterfowl populations to levels recorded during the 1970s, a period of relative abundance for waterfowl populations. Notably, there are several species that have already exceeded these objectives.

Of the 39 waterfowl species that occur in Canada and that are covered by the NAWMP, only 8 species are thought to be potentially affected by forestry operations; most of these species are cavity-nesting ducks.

The Canadian Shorebird Conservation Plan (CSCP) is a national plan designed to promote the conservation of shorebirds in Canada. The plan is intended to cooperate with other bird conservation initiatives including the U.S. Shorebird Conservation Plan, the Western Hemispheric Shorebird Reserve Network, the North American Waterfowl Management Plan, and Wings Over Water. The CSCP's stated vision is to ensure that healthy populations of shorebirds are distributed across their range and diversity of habitats in Canada and throughout their global range. Of the 47 shorebird species covered by the CSCP, we suggest only 4 species (listed as Not at Risk in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are potentially impacted by forestry operations: lesser yellowlegs, greater yellowlegs, solitary sandpiper, and American woodcock.

Wings Over Water (WOW), Canada's Waterbird Conservation Plan is the Canadian component of North American Waterbird Conservation Plan. The purpose of the plan is to sustain or restore, throughout the lands and waters of North America, Central America, and the Caribbean, the distribution, diversity, and abundance of populations and habitats of waterbirds. We suggest that only 5 of the 93 species covered by WOW are potentially impacted by forestry operations in Canada: Bonaparte's Gull, Green Heron, and Sandhill Crane ('Not at Risk'), and Great Blue Heron *fannini* subspecies ('Special Concern') and Marbled Murrelet ('Threatened').

We briefly reviewed linkages between Canada's Species At Risk Act and the 4 bird conservation plans, mainly as they may lead to future bird species conservation priorities at federal and provincial levels. Finally, we provide concluding remarks on the plans' similarities, differences, and relevance to the forest industry. The four bird conservation plans reviewed in this report have clear, but mainly indirect, relevance to forest management in Canada. The plans provide strategic-level guidance on goals and objectives for national and international conservation of birds, and on issues and threats for birds, but provide only high-level commentary on management actions or strategies. Specific management recommendations are lacking. The forest industry will need to rely on provincial and corporate guidelines, biodiversity management policy, effective operational-level actions, and formation of partnerships with other stakeholders to help attain the goals and objectives of the four federal bird conservation plans discussed herein.

KEYWORDS

Bird Conservation Regions, Canadian federal bird management plans, Canadian Species at Risk Act, North American Landbird Conservation Plan

RELATED NCASI PUBLICATIONS

Technical Bulletin No. 892 (December 2004). *Bird - forestry relationships in Canada: Literature review and synthesis of management recommendations.*

Technical Bulletin No. 822 (February 2001). *Accommodating birds in managed forests of North America: A review of bird-forestry relationships.*

**SYNTHÈSE DES PLANS NATIONAUX
DE CONSERVATION DES OISEAUX AU CANADA:
UNE RESSOURCE POUR LES GESTIONNAIRES DE LA FORÊT**

RAPPORT SPÉCIAL NO. 06-05
NOVEMBRE 2006

RÉSUMÉ

Il existe présentement quatre plans majeurs de gestion des oiseaux qui sont en vigueur au Canada: le plan nord-américain de gestion des oiseaux terrestres, le plan nord-américain de gestion de la sauvagine, le plan canadien de conservation des oiseaux de rivage et le plan de conservation du Canada pour les oiseaux aquatiques (appelé *Envolées d'oiseaux aquatiques*). Ces plans, dont la mise en application est coordonnée par le *North American Bird Initiative* (NABCI), visent presque tous les espèces indigènes d'oiseaux qui se trouvent régulièrement au Canada.

L'objectif du présent rapport est de sensibiliser davantage l'industrie forestière aux quatre principaux plans fédéraux de conservation des oiseaux, de fournir aux gestionnaires de la forêt un point de référence commun sur la perspective du gouvernement fédéral en matière de gestion des divers types d'oiseaux au Canada et de faire la synthèse des renseignements les plus pertinents sur les oiseaux dans la planification d'un aménagement forestier.

On compte environ 634 espèces d'oiseaux au Canada. Nous avons passé en revue toutes ces espèces et avons identifié celles affectées par les pratiques forestières. L'effet des coupes forestières sur les oiseaux peut être positif, négatif ou mixte selon l'espèce, les pratiques de gestion, l'échelle spatiale et l'échelle temporelle.

Nous avons également examiné le concept de région de conservation des oiseaux (RCO), un outil conçu par l'Initiative de conservation des oiseaux de l'Amérique du Nord. Les RCO sont des unités écologiques délimitées qui présentent une avifaune similaire et assurent un cadre de travail uniforme en matière de conservation des oiseaux en Amérique du Nord. Le concept des RCO convient particulièrement bien à l'industrie forestière car la plupart des processus actuels de planification de la conservation des oiseaux forestiers au Canada sont reliés aux RCO et aux espèces d'oiseaux prioritaires dans chaque RCO.

Le plan nord-américain de conservation des oiseaux terrestres (PNACOT) du programme Partenaires d'envol est celui qui est le plus pertinent pour l'industrie forestière. Il contient une synthèse des priorités et des objectifs applicables à l'échelle du continent qui orientent le type de mesures à mettre sur pied pour la conservation des oiseaux terrestres dont bon nombre sont des espèces qui dépendent de la forêt. Le principal objectif du PNACOT est de préserver une diversité représentative de l'avifaune dans toutes les écorégions du Canada et des États-Unis.

Bon nombre des 448 espèces couvertes par le PNACOT s'accouplent en forêt. Les opérations forestières peuvent donc avoir un impact direct ou indirect dont l'effet peut être positif ou négatif à des échelles spatiales et temporelles diverses selon l'espèce et la pratique forestière en question. Parmi ces 448 espèces, nous estimons que 48 d'entre elles, toutes sur des *listes de surveillance* ou *d'intendance*, sont d'intérêt pour l'industrie forestière car leur préservation passera possiblement par une gestion spéciale de leurs populations. Dans le cas des autres espèces, nous croyons qu'ils ne sont pas en péril dans les conditions actuelles.

Le plan nord-américain de gestion de la sauvagine (PNAGS) est un plan d'action international (Canada, États-Unis, Mexique) visant la conservation de la sauvagine migratrice (canards, oies et cygnes) sur tout le continent. Créé en 1986 et actualisé en 1998, le PNAGS est un partenariat entre le gouvernement fédéral, les provinces/États, les municipalités, les organisations non gouvernementales, l'industrie et de nombreux particuliers. Le principal objectif du PNAGS est de ramener le niveau des populations de la sauvagine de l'Amérique du Nord à celui des années 70, une période de relative abondance des populations de la sauvagine. Il faut noter que cet objectif a déjà été dépassé pour plusieurs espèces. Parmi les 39 espèces de sauvagine dans le PNAGS se trouvant au Canada, nous croyons que les opérations forestières ont un impact sur possiblement 8 espèces seulement, et la plupart de ces espèces sont des canards qui nichent dans des cavités.

Le plan canadien de conservation des oiseaux de rivage (PCCOR) est un plan national conçu pour favoriser la conservation des oiseaux de rivage au Canada et pour agir de concert avec d'autres initiatives de conservation des oiseaux, notamment le plan américain de conservation des oiseaux de rivage (*U.S. Shorebird Conservation Plan*), le réseau de réserves pour les oiseaux de rivage de l'hémisphère occidental, le plan nord-américain de gestion de la sauvagine et *Envolées d'oiseaux aquatiques*. La vision présentée dans le plan est de s'assurer que des populations d'oiseaux de rivage en santé soient réparties dans l'ensemble de leur aire de répartition ainsi que dans divers habitats au Canada et dans tout leur territoire. Parmi les 47 espèces d'oiseaux de rivage dans le PCCOR, nous sommes d'avis que les opérations forestières ont un impact sur possiblement 4 espèces seulement (inscrites comme espèces non en péril au Canada par le comité sur la situation des espèces en péril au Canada ou COSEPAC) : le Petit Chevalier, le Grand Chevalier, le Chevalier solitaire et la Bécasse d'Amérique.

Le plan canadien de conservation des oiseaux aquatiques, appelé *Envolées d'oiseaux aquatiques* (WOW en anglais), est la composante canadienne du plan nord-américain de conservation des oiseaux aquatiques. Ce dernier a pour but de maintenir ou de rétablir la répartition, la diversité et l'abondance des populations et des habitats d'oiseaux aquatiques sur l'ensemble des terres et des cours d'eau de l'Amérique du Nord, de l'Amérique Centrale et des Caraïbes. Nous sommes d'avis que les opérations forestières canadiennes ont un impact sur possiblement 5 des 93 espèces visées par WOW : la Mouette de Bonaparte, le Héron vert, la Grue du Canada (« espèce non en péril »), le Grand Héron de la sous-espèce *fannini* (« espèce préoccupante ») et le Guillemot marbré (« espèce menacée »).

Nous avons brièvement examiné les liens qui existent entre la *Loi sur les espèces en péril* du Canada et les 4 plans de conservation des oiseaux, principalement parce que ces liens serviront possiblement au gouvernement fédéral et aux provinces pour déterminer les priorités futures en matière de conservation des espèces d'oiseaux. Finalement, nous présentons quelques conclusions sur les similitudes entre les plans, leurs différences et leur pertinence pour l'industrie forestière. Les quatre plans de conservations s'appliquent nettement, mais indirectement, aux activités d'aménagement forestier au Canada. Ils présentent les orientations stratégiques sur les buts et les objectifs de conservation des oiseaux sur le plan national et international, décrivent les enjeux sur les oiseaux et les menaces auxquelles sont confrontés ces derniers, mais ne fournissent que des commentaires très généraux sur les actions ou stratégies de gestion. Il n'y a aucune recommandation spécifique en matière de gestion. L'industrie forestière devra se fier sur les orientations provinciales, les directives d'entreprise, les politiques de gestion sur la biodiversité, les pratiques d'exploitation éprouvées et la création de partenariats avec d'autres personnes intéressées afin d'atteindre les buts et objectifs des quatre plans fédéraux de conservation des oiseaux décrits dans le présent rapport.

MOTS CLÉS

Loi sur les espèces en péril, plans canadiens de gestion des oiseaux, plan nord-américain de conservation des oiseaux terrestres, régions de conservation des oiseaux

AUTRES PUBLICATIONS DE NCASI DANS CE DOMAINE

Bulletin technique n° 892 (décembre 2004). *Bird - forestry relationships in Canada: Literature review and synthesis of management recommendations.*

Bulletin technique n° 822 (février 2001). *Accommodating birds in managed forests of North America: A review of bird-forestry relationships.*

CONTENTS

1.0	INTRODUCTION AND OBJECTIVES	1
2.0	METHODS	2
2.1.	Rationale for Inclusion or Omission of Bird Species from This Report.....	2
2.2.	Overview of Current Information Available on the Management of Forest Birds	3
2.3.	Bird Conservation Regions (BCRs).....	4
3.0	REVIEW OF FOUR MAJOR CANADIAN BIRD MANAGEMENT PLANS	6
3.1	North American Landbird Conservation Plan	6
3.2.	North American Waterfowl Management Plan.....	15
3.3.	Canadian Shorebird Conservation Plan	20
3.4.	Wings Over Water	22
3.5.	Summary of the Relevance of the Four Major Canadian Bird Management Plans to Forest Management.....	26
4.0	SPECIES AT RISK ACT	26
5.0	CONCLUSIONS	29
	REFERENCES.....	31
	APPENDICES	
A	Scientific Names of Birds Mentioned in This Report.....	A1

FIGURES

Figure 2.1	Map of North American Bird Conservation Regions in Canada	5
Figure 3.1	Avifaunal Biomes in North America	7

TABLES

Table 2.1	Bird Conservation Regions in Canada	6
Table 3.1	Birds Positively Affected by Forestry Operations and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan	11
Table 3.2	Birds Negatively Affected by Forestry Operations and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan	12
Table 3.3	Birds That May Be Affected Positively or Negatively by Forestry Operations and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan	14
Table 3.4	Fine-Scale Bird Conservation Plans Relevant to the Forest Industry in Canada	15
Table 3.5	Joint Ventures in Canada under the North American Waterfowl Management Plan with Relevance to Potential Collaboration with the Forest Industry	17
Table 3.6	Birds Affected by Forestry Practices That Are Covered by the North American Waterfowl Management Plan	19
Table 3.7	Birds Affected by Forestry Practices That Are Covered by the Canadian Shorebird Conservation Plan	21
Table 3.8	Birds affected by forestry practices that are covered by the Wings Over Water, Canada's Waterbird Conservation	25
Table 3.9	Summary of Bird Species and Their Respective Management Plans	26
Table 4.1	Species At Risk Act Bird Species Relevant to Forest Management	28
Table 4.2	Species At Risk Act Bird Species Not Relevant to Forest Management	29

SYNTHESIS OF LARGE-SCALE BIRD CONSERVATION PLANS IN CANADA: A RESOURCE FOR FOREST MANAGERS

1.0 INTRODUCTION AND OBJECTIVES

The forested landscape of Canada is home to a wealth of avian biodiversity. The boreal forest of Canada alone is one of the largest forested ecosystems on Earth. Stretching from the Yukon to Newfoundland and Nova Scotia, it is thought to contain 5 billion landbirds and be the home of 14 million breeding waterfowl and millions of breeding shorebirds (Natural Resources Canada; http://www.nrcan.gc.ca/cfs-scf/national/what-quoi/sof/sof05/special03_e.html). Many millions more birds are found in Pacific Coast rainforests, the varied forests of interior British Columbia and the Rocky Mountains, the transitional forests of the Prairies, the hardwood forests of southern Ontario and Quebec, and the Acadian forests of the Maritimes.

Most of the landbirds, waterfowl, and shorebirds that breed in Canada's forests are migratory, wintering further south in the USA, Mexico or beyond. Some seabirds also come ashore to breed in the forest, then spend the remainder of the year at sea. Some species such as grouse, jays, woodpeckers, and chickadees are resident year round in our forests.

Canada's forested landscape is an area of immense wilderness in places, but is also an area of significant forest management in all provinces and territories. Some studies suggest that many forest-dependent bird species are experiencing widespread population declines (e.g., Blancher 2003). Human activity in forests, including forest harvesting, may be a factor contributing to declines for some species, and is cause for concern among forest managers and conservationists. However, with each passing year the forest industry becomes more involved with managing bird populations. According to the Forest Products Association of Canada, approximately 80% of Canadian forest industry operations are actively involved in bird research, inventory, and monitoring (FPAC 2006).

Increasingly, forest management in forested ecosystems is shifting toward planning and practices which emulate natural disturbance patterns (i.e., from wildfire and insects). However, success of the natural disturbance paradigm for harvesting will come from recognizing that not all ecological aspects of natural disturbances can be emulated through harvesting. For example, harvesting to emulate the action of wildfire suggests larger cutblocks, but it also means retention of trees, both within a cutblock and as whole stands, where the interval between harvests is extended or stands are removed from harvesting for a rotation (NRCAN 2005). This shift has translated into a wide range of forest research, habitat modelling, species inventory, and adaptive management trials across Canada. In many cases, these have involved forest and wetland bird species as indicator groups for evaluating the effects of management practices on bird populations (i.e., relative abundance) and their habitats. Thus, there is a definite need for a comprehensive and practical bird management planning resource for use by forest managers in Canada.

There are four major bird management plans in effect in Canada: North American Landbird Management Plan, North American Waterfowl Management Plan, Canadian Shorebird Conservation Plan, and Wings Over Water (the Canadian waterbird conservation plan). These plans cover almost all native bird species that occur regularly in Canada. All of these plans operate under the North American Bird Conservation Initiative (NABCI 2000). NABCI is an agreement among organizations and agencies in Canada, Mexico, and the U.S. to increase the effectiveness of existing and new bird conservation initiatives, by building on existing structures and fostering greater cooperation among stakeholders. NABCI's goal is to improve conservation of all North American birds and their habitats through coordinated action at the continental level. This multi-species, multi-national initiative plans

to restore, manage and maintain healthy bird populations and their habitats through regionally based, biologically driven, landscape-oriented partnerships across the continent.

The North American Landbird Conservation Plan (NALCP) covers *landbirds*, or species that are closely tied to terrestrial habitats. *Landbirds* include songbirds, grouse, hawks, owls, nighthawks, doves, pigeons, hummingbirds, and woodpeckers. Compared to the other three plans, the NALCP covers many more species and those with the most relevance to forestry operations. The North American Waterfowl Management Plan covers ducks, geese, and swans. This group of birds contains several species that may be affected by forestry operations. The Canadian Shorebird Conservation Plan covers sandpipers, plovers, stilts, avocets, and oystercatchers. This group has very few species that may be affected by forestry operations. Wings Over Water covers a wide variety of waterbird species other than ducks, geese, and swans. This group includes loons, grebes, shearwaters, petrels, cormorants, pelicans, auks, herons, bitterns, cranes, rails, terns, and gulls. Although there are many species covered by this plan, few species are potentially affected by forestry operations.

Within and associated with each of the four major plans are numerous bird management plans, joint ventures, and initiatives that operate at provincial, regional, or local levels. In addition, The Migratory Bird Convention Act, an international treaty, provides overarching protection for all migratory birds in North America. In Canada, the federal Species At Risk Act provides special protection and management for those species deemed to be at risk.

A single document is needed to increase awareness of the four major Federal bird plans among forest industry managers, to provide a common reference point relative to the Federal government's perspective on managing various types of birds in Canada, and to synthesize the most relevant information on birds needed for forest management planning. The following report is such a synthesis and will hopefully promote increased effectiveness in managing bird habitat in forested landscapes across Canada.

The main objectives of this report are to

1. provide in one resource document, all information contained in the four major federal bird management plans that is relevant to identifying conservation priorities and managing bird habitat in Canadian forests; and
2. review each plan to identify those bird species which may be affected by forestry operations, and provide a summary of this information. Species are organized according to broad geographic/physiographic regions and ecological boundaries (i.e., Bird Conservation Regions).

2.0 METHODS

2.1 Rationale for Inclusion or Omission of Bird Species from This Report

About 634 species of birds occur in Canada (Thayer Birding Software 2005; based on the names and taxonomic order used in the American Ornithologists' Union 7th edition Checklist, 44th supplement). From this list we omitted any species that do not occur regularly in Canada. For the remainder we reviewed species accounts in *The Birds of North America* (A. Poole and F. Gill, eds.) series for information on effects of forestry operations on habitat and populations. *The Birds of North America* provides the most comprehensive review available of the scientific literature on all 743 North American bird species. All of the accounts can be accessed online at <http://bna.birds.cornell.edu/BNA/>.

Birds may be affected positively, negatively, or both negatively and positively by forestry practices depending on the species, specific management practices, spatial scale, and time scale. We included in this report species that are potentially affected by forestry. Many species that breed only in Arctic tundra (e.g., many shorebirds), grasslands, or wetlands (e.g., many waterfowl), and migrate and/or winter in coastal marine environments (e.g., shorebirds and seabirds) do not use areas that produce merchantable timber, and are therefore unaffected by forestry. We omitted from the analysis all species that do not use forests for any life stage, or species that we judged are otherwise unaffected by forestry practices. For this we also reviewed all the North American ornithological journals, the Canadian forestry-related journals, and *Conservation Biology* and *Journal of Wildlife Management* for papers on effects of forestry on birds.

2.2 Overview of Current Information Available on the Management of Forest Birds

Managed forests throughout Canada support a rich diversity of bird populations. Forest management practices are one of the primary agents of change in forest composition and structure along with succession, disease, insects, wind, ice, and fire. Forestry operations can influence bird populations and diversity through the alteration of habitat structure and availability.

A previous NCASI report, *Accommodating Birds in Managed Forests of North America: A Review of Bird Forestry Relationships*, reviewed 116 research papers dating from 1960 to 1998, that addressed effects of forestry practices on bird populations (NCASI 2001). This review included studies on more common birds and excluded studies on rare and threatened species such as Northern Goshawk, Marbled Murrelet, and Spotted Owl. Coniferous, hardwood, and mixed forests were all well represented in research. Clearcut harvesting was by far the most frequently studied silvicultural treatment, and landscape-level studies were few, but occurred much more frequently in more recent years. When all forestry practices were considered together, more studies reported decreases in bird abundance and species diversity than increases, no change, or mixed results (increases/decreases versus summer/winter populations). All studies on the effects of snag removal reported decreases in bird abundance.

The NCASI review found that most studies of nesting success in relation to forestry reported a decline in success, although some reported increased success. Overall community response was negligible for even-aged management, more species increased than decreased for uneven-aged management, and many more species decreased than increased for intermediate cutting prescriptions (specifically snag removal). Short-term effects were found more commonly than no effect, with population decreases reported more often than increases. Long-term effects were mostly negligible, and when effects were identified, they were more beneficial than deleterious (NCASI 2001).

A more recent review focused on bird-forestry relationships and management in Canada (NCASI 2004). Not surprisingly, this review concluded that forest management influences birds in many ways. The authors noted general patterns of effects.

“At the stand level, the short-term effects on pre-harvest bird communities increase with the amount of harvest, so that, in general, selection harvesting has least impact and clearcutting has most”. However, “retention of residual structure may play an important role in ameliorating post-harvest effects on some species; the removal of overstory vegetation provides important habitat for bird species associated with early successional habitats; and many effects are likely analogous to those which occur following natural disturbances” (NCASI 2004).

The broad stand-level conclusion drawn from these findings is that “*short-term effects on pre-harvest communities are in general proportional to the extent of harvest operations*” (NCASI 2004). Longer-term effects are related mainly to stocking history, successional events, and rotation interval before the next harvest.

“At the landscape level, the paradigm of emulating natural disturbances, to the extent possible, offers some reassurance that effects on birds caused by forest management will be similar to those which occur naturally, although there are many differences between a naturally disturbed forest area and one which has been subjected to harvesting” (NCASI 2004).

The broad conclusion is that harvesting regimes that emulate ecological processes of natural disturbance to the best extent possible, will provide suitable habitat for the most number of bird species. A smaller number of species require habitat features that are best provided solely by natural disturbances (Simon, Schwab, and Otto 2002) or in unharvested landscapes, and many of these species are of high priority under the Canadian bird management plans.

The variety of responses of bird communities and species to forestry operations points to the difficult problem of managing for all species of birds equally. The evidence is clear that certain species and species groups are more sensitive to forestry management than others. Species associated with mature forest, large tracts of forest, or mixed forests will likely decline as more mature forest is harvested, rotations are shortened and mixed wood forests are converted to other forest types/structures or land uses. On the other hand, species that prefer open areas, more open forest, and earlier seral stages will expand ranges and abundances.

The obvious conclusion is that bird species that need older forests, a natural range of forest habitats, and larger tracts of forest are the species that will need the most careful management. Over the last decade, a tremendous amount of industrial and regulatory change has been implemented in the forestry sector (e.g., riparian management areas, habitat modeling, habitat connectivity, protection for sensitive breeding areas, various types of selection harvesting, stand-level habitat enhancement) that benefits the conservation of birds. In addition, there are many examples of species-specific forest management initiatives for some of the species most adversely affected by harvesting practices of the past.

2.3 Bird Conservation Regions (BCRs)

Bird Conservation Regions (BCRs) are a tool developed for the North American Bird Conservation Initiative (NABCI 2000; Figure 2.1). BCRs are ecologically defined units that share similar avifaunas and provide a consistent spatial framework for bird conservation across North American landscapes (Bird Studies Canada 2006). The BCR concept is very relevant to the forest industry because most of the bird conservation planning processes currently underway in Canada are related to BCRs and the priority bird species within each BCR. There are 12 BCRs in Canada (Table 2.1). For this report, BCR 3 has been excluded as it occurs in non-forested areas of northern Canada. To read detailed descriptions of Canadian BCRs consult the Bird Studies Canada website at <http://www.bsc-eoc.org/international/bcrcanada.html>.

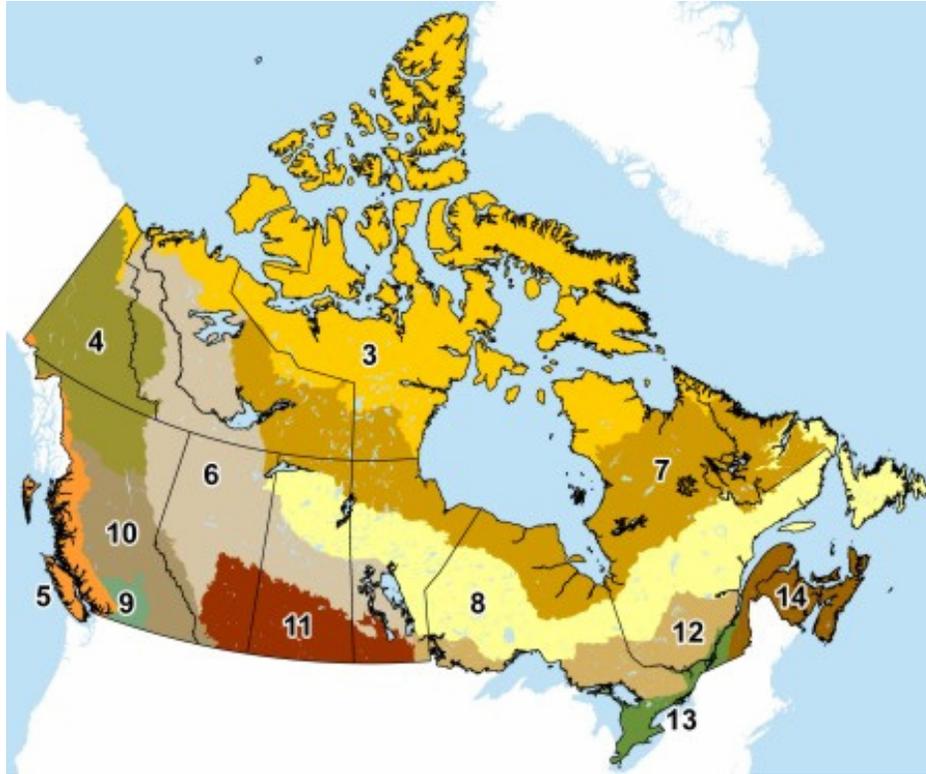


Figure 2.1 Map of North American Bird Conservation Regions in Canada (Environment Canada)

Table 2.1 Bird Conservation Regions (BCR) in Canada

No.	BCR Name	Description
3	Arctic Plains and Mountains	Northern Yukon, Northwest Territories, Quebec and Labrador, most of Nunavut
4	Northwestern Interior Forest	Yukon, western edge of the Northwest Territories, and northwest British Columbia
5	Northern Pacific Rainforest	Vancouver Island and west coast of British Columbia
6	Boreal Taiga Plains	Western Northwest Territories, northeast British Columbia, northern and central Alberta, and central Saskatchewan
7	Taiga Shield and Hudson Plains	Eastern Northwest Territories, southern Nunavut, northern Manitoba and Ontario, north-central Quebec and Labrador
8	Boreal Softwood Shield	Northern Saskatchewan, Manitoba, Ontario, Quebec, eastern Labrador and all of Newfoundland
9	Great Basin	South-central British Columbia
10	Northern Rockies	Central and southeast British Columbia, southwest edge of Alberta
11	Prairie Potholes	Southern Prairies over southeast Alberta, southern Saskatchewan and Manitoba
12	Boreal Hardwood Transition	Southern Ontario and Quebec down to the St Lawrence seaway
13	Lower Great Lakes / St. Lawrence Plain	South of the St Lawrence seaway in Ontario and Quebec up to around Quebec City
14	Atlantic Northern Forest	South of the St Lawrence seaway from Quebec City northeast to include New Brunswick, PEI, and Nova Scotia

3.0 REVIEW OF FOUR MAJOR CANADIAN BIRD MANAGEMENT PLANS

The North American Landbird Management Plan, North American Waterfowl Management Plan, Canadian Shorebird Conservation Plan, and Wings Over Water all contain goals and objectives for the conservation of bird populations and habitat. The plans focus largely on population estimates (global and regional), population trends, and threats. The plans provide a generalized synthesis of conservation issues for birds covered by the respective plans, many of which overlap. However, none of the plans contain specific recommendations for enhancing bird habitat and populations.

The following sections contain brief overviews of each bird conservation plan, lists of bird species that are relevant to forestry operations, and discussions of how forestry operations may affect those species.

3.1 North American Landbird Conservation Plan

3.1.1 *Relevance to the Forest Industry*

The Partners in Flight North American Landbird Conservation Plan (NALCP) provides a continental synthesis of priorities and objectives to guide landbird conservation actions (Rich et al. 2004). Partners in Flight (PIF), an alliance of organizations in Canada and the U.S., was formed in 1990 with the commitment to conserve resident, short-distance, and Neotropical migrant landbird species. PIF's mandate is to help recover species at risk, but also to "*keep common birds common*". The NALCP is divided into two main sections with four appendices and eight tables. The first section, *The Continental Plan*, outlines the vision and its implementation, and provides a continental perspective on North American landbird conservation, representing geographic, species, and habitat priorities. The section *Continental Landbird Objectives* outlines specific objectives for different categories of birds. The NALCP identifies deficiencies in information and research for use in making informed management decisions. The final part of the first section, *Taking Action*, provides specific steps for collaboration, education, and research.

The second section of the plan focuses on species of concern as well as conservation priorities within each of the seven major avifaunal biomes. Priority species, primary habitats, conservation issues, and recommended actions are identified for each (Figure 3.1). The plan also provides estimates of population sizes of all the landbird species of continental importance because "population estimates serve as the critical foundation for setting measurable population objectives at the continental scale". Population objectives were based on methods developed by Rosenberg and Blancher (2005), but the accuracy of these estimates is highly questionable (Vickery and Shriver 2005).

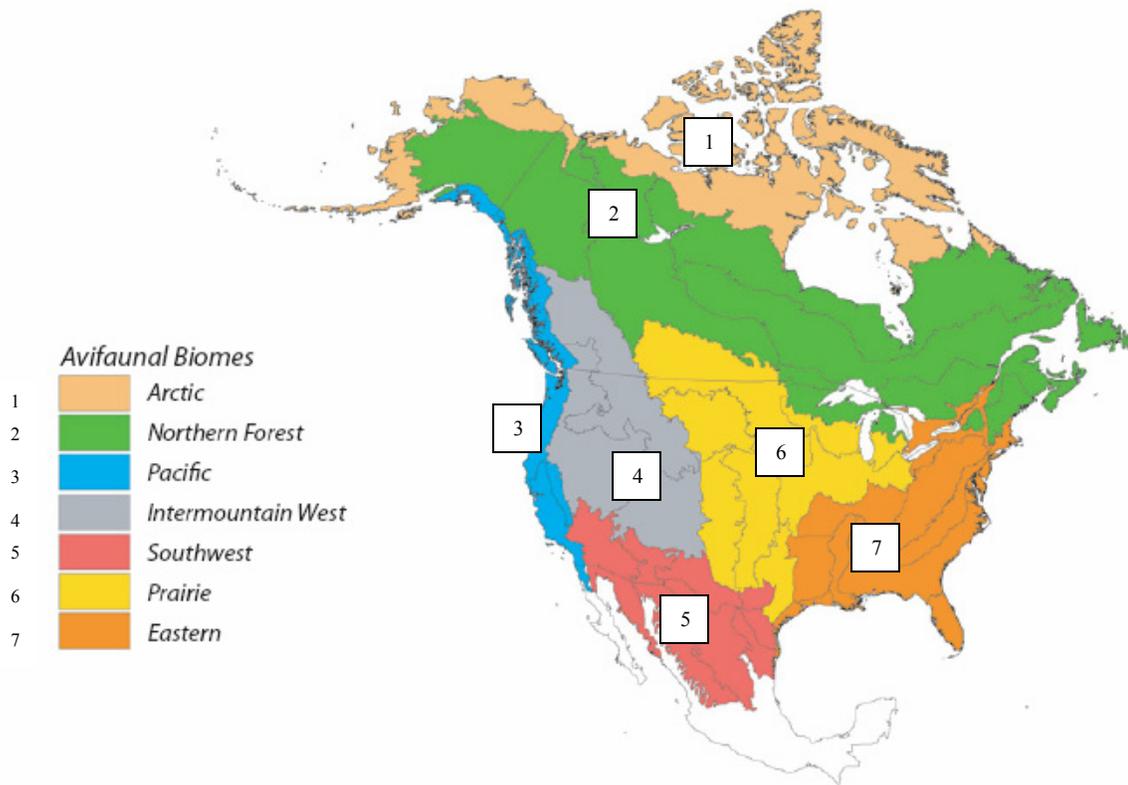


Figure 3.1 Avifaunal Biomes in North America (Rich et al. 2004)

The primary objective of the NALCP is to maintain a representative diversity of avifauna in all ecoregions of Canada and the U.S. Three major goals of the NALCP are to:

1. “Ensure an active scientifically based conservation design process that identifies and develops solutions to threats and risks to landbird populations;
2. Create a coordinated network of conservation partners implementing the objectives of landbird conservation plans at multiple scales; and
3. Secure sufficient commitment and resources to support vigorous implementation of landbird conservation objectives”.

Goal 2 is most relevant to the forest industry. Under Goal 2, the NALCP notes the need to “put measurable actions and results on the ground, based on best current information and adaptive management practices”. Working with PIF to achieve this goal could help members of the forest industry meet their requirements for forest certification.

Many of the 448 species covered by the NALCP breed in forested landscapes and can be directly or indirectly affected by forestry operations in positive and negative ways over various temporal and spatial scales, depending on the species and practice in question. The NALCP does not refer to any specific effects but simply predicts that forestry and forest management will have major, continent-wide effects on birds. Some examples of possible effects of forestry on birds taken from the general scientific literature are outlined below.

The effects of harvesting could be positive over the short- and medium-term for birds that prefer open and early seral stages (Imbeau, Drapeau, and Mönkkönen 2003), or forest edges (e.g., Blue Grouse—Schroeder 1984; Red-Tailed Hawk—Preston and Beane 1993; Eastern Towhee—Greenlaw 1996; White-Throated Sparrow—Boulet, Darveau, and Boulanger 2003; Chestnut-Sided Warbler—Richardson and Brauning 1995; Mourning Warbler—Pitocchelli 1993, Machtans and Latour 2003). The effects could be negative at various temporal and spatial scales for birds that prefer larger amounts of mature forest (e.g., Northern Goshawk—McClaren and Pendergast 2003; Spotted Owl—Courtenay et al. 2004) or more mature trees for cone crops (e.g., White-Winged Crossbill—Benkman 1992). The effects could be temporarily negative after harvesting but then positive after successional regrowth (e.g., Philadelphia Vireo—Moskoff and Robinson 1996; Canada Warbler—Conway 1999). The effects could be dependent on scale, such as Cassin's Finch, which is positive for selection and small clearcut harvesting but negative for large clearcuts (Hahn 1996).

In addition, some bird species may be affected by forestry operations that are not related to harvest. Thinning and pruning can create stand characteristics more suitable for some species that use forests with structural attributes (extensive vertical diversity, canopy gaps, larger trees) more similar to mature stands (e.g., Northern Goshawk—Manning, Cooper and Associates 2005; Cerulean Warbler—Hamel 2000). Vegetation control (e.g., herbicides, mechanical cutting) can temporarily reduce habitat suitability for species that prefer early seral stages, deciduous growth, and edges (e.g., Willow Flycatcher and Mourning Warbler—Pitocchelli 1993). Burning can enhance habitat suitability for species that are adapted to fire-dependent forests or prefer open forests with snags (e.g., Lewis's Woodpecker—Cooper and Gillies 2000), Olive-Sided Flycatcher—Altman and Sallabanks 2000), and Kirtland's Warbler—Mayfield 1992).

Some forestry operations may negatively affect species not directly associated with forests (e.g., wetland species). For example, draining or altering wetlands for plantations or road building, or burning that impacts woody vegetation around wetlands can impact species that breed along wetland edges or in wetlands. For example, evidence reported in the literature makes weak links between forestry operations and negative impacts for species such as Nelson's Sharp-Tailed Sparrow (Greenlaw and Rising 1994) and Palm Warbler (Wilson 1996).

Of the 448 landbird species covered by the NALCP, 100 are designated as *Watch List Species*, i.e., species that have multiple reasons for conservation concern across their entire range. An additional 92 species are designated as *Stewardship Species*, i.e., species that are characteristic of a single avifaunal biome (Figure 3.1) and that merit special conservation measures within their core ranges. The remainder of the species (256) covered by the plan are relatively secure and do not need special management actions, and are therefore not included for detailed discussion in this report.

The NALCP designates three levels of management actions required to conserve the 192 species on the *Watch* and *Stewardship Lists*. Twenty-eight bird species on the *Watch List* are designated as *Immediate Action*, and require immediate and intensive management to reverse serious declines or conserve small and fragile populations. Only four of these species (Spotted Owl, Golden-Winged Warbler, Kirtland's Warbler, and Bicknell's Thrush) are relevant to the forest industry in Canada. The Spotted Owl is a high profile bird species with a very limited range in Canada (southwestern mainland British Columbia) that is associated with old-growth coniferous forests (Blackburn et al. 1997). Both Kirtland's Warbler, a jackpine specialist (James 1999), and Golden-Winged Warbler, a deciduous forest bird (Confer 1992), have very limited ranges in Canada. Both also use early seral stages of their respective forest types, so potentially may benefit from forestry operations. Bicknell's Thrush breeds in dense subalpine Acadian forests and may be affected by forestry operations that create more open forest conditions (Rimmer et al. 2001). All four of these species should have a high priority for forest companies operating within their respective ranges. The remaining 24 species either do not occur in Canada or do not occur in forested landscapes.

Forty-four *Watch List* and 14 *Stewardship List* species are designated as *Management* species, requiring on-the-ground actions to conserve vulnerable populations or species in long-term decline. Long-term planning and responsibility is thought to be needed for 28 *Watch List* and 78 *Stewardship List* species (Rich et al. 2004).

Some provinces have their own landbird conservation plans or conservation initiatives which include landbirds. These plans operate independently, but within the overall mandate of the NALCP. For British Columbia and Yukon, see CWS (2003a); for Nunavut and Northwest Territories see (<http://www.pnr-rpn.ec.gc.ca/nature/migratorybirds/lb/dc32s00.en.html>). In Ontario, biological plans for the conservation of landbirds will be written by Bird Studies Canada under the supervision of and with principal funding from the Ontario Region Canadian Wildlife Service and the Ontario Ministry of Natural Resources (Ontario Partners In Flight <http://www.bsc-eoc.org/PIF/PIFOntario.html>). Similar plans, based on BCRs will likely be prepared across Canada. In addition, management of boreal birds is a focus of Environment Canada's *Western Boreal Conservation Initiative* (<http://www.pnr-rpn.ec.gc.ca/boreal>).

3.1.2 *Bird Species Affected by Forestry practices*

The NALCP covers 448 landbird species. Of those 448 species, 192 are on the *Watch and Stewardship Lists* and targeted for special management under the NALCP. The remaining species are thought to be secure under current management regimes. For purposes of this report, we focus analysis on 70 of the 192 listed species that we judged are affected by forestry operations (see Tables 3.1 through 3.3); the remaining species were judged as not affected by forestry (i.e., shorebirds, grassland birds, etc.). Potential impacts of forestry operations may occur during the breeding season for all species, and in non-breeding seasons for some resident species.

We have identified 22 *Watch and Stewardship Lists* species that respond positively, on balance, to forestry operations in the short- to medium-term (Table 3.1). Most of these species respond to clearcut or selection harvesting, thinning and pruning, and to the provision of earlier seral stages by increasing abundances and distribution. Although we did not focus on species not on the *Watch or Stewardship Lists*, it is important to note that some of our most common bird species benefit greatly from forestry operations (e.g., Red-Tailed Hawk—Preston and Beane 1993; Common Nighthawk—Poulin et al. 1996; American Robin—Sallabanks and James 1999; and Dark-Eyed Junco—Nolan et al. 2002).

We have identified 37 *Watch and Stewardship Lists* species that respond negatively, on balance, by forestry operations over the short to medium term (Table 3.2). Most of these species have one or more of the following characteristics: prefer mature and old-growth forests over younger seral stages {e.g., Yellow-bellied Flycatcher (Gross and Lowther 2001), Bicknell's Thrush (Rimmer et al. 2001), Cape May Warbler (Balz and Latta 1998), White-winged Crossbill (Benkman 1992)}; are area sensitive in that they need relatively large tracts of suitable habitat {e.g., Spotted Owl (Courtney et al. 2004)}; need forest structural attributes that are often rare or absent in harvested areas unless specifically provided for by reserves or other management actions {e.g., Williamson's Sapsucker prefers older western larch trees with heartrot (Cooper 1995)}; or are sensitive to shortened rotations (e.g., numerous woodpeckers, chickadees and warblers). All of these species can be managed over larger spatial areas by providing sufficient reserves of suitable forest or by speeding up attainment of older forest structural features in some stands through specific silvicultural actions.

We have also identified 11 *Watch and Stewardship Lists* species that may be both positively and negatively affected, on balance, by specific forestry operations over the short- and medium-term (Table 3.3). These species may be sensitive to certain types of harvest or silviculture but benefit from other types of harvest or silviculture. For example, Yellow-Bellied Sapsuckers are sensitive to harvest of trembling aspen stands but benefit when coniferous or dense hardwood stands are opened up by

selection harvest (Walters, Miller, and Lowther 2002). The Sharp-Tailed Grouse uses recent clearcut harvested areas, but tree planting speeds up succession in open areas limiting the utility such areas (Connelly, Gratson, and Reese 1998). Alder and Willow Flycatchers benefit from early seral stages as they nest in young deciduous stages but herbicide treatment of early seral deciduous diminishes nesting habitat quality (Lowther 1999; Sedgwick 2000). Yellow-Throated and Philadelphia Vireos are sensitive to large clearcut harvesting but may benefit from selection harvest, small clearcuts, and burning (Rodewald and James 1996). The Hooded Warbler is excluded from clearcut harvested areas but prefers open mature forest and may occur in higher numbers in selection harvested stands (Evans-Ogden and Stutchberry 1994).

Table 3.1 Birds Positively Affected by Forestry Operations over the Short- to Medium-Term and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan

Common Name	NALCP Priority ¹	BCR ²	Primary Habitat ³	Habitat ⁴	Nest ⁵	Comment
Blue Grouse	Management	4, 5, 6, 7, 8, 12, 14	Coniferous forest	y	g	Avoids dense forest
Band-tailed Pigeon	Management	5	Mixed forest	b	g	Prefers early seral and edges
Calliope Hummingbird	Longterm Planning	9, 10	Shrublands	b	t	Prefers edges, early seral, and shrubs
Rufous Hummingbird	Management	5, 9, 10	Open forest, shrublands	b	t	Prefers early seral, and shrubs
Olive-sided Flycatcher	Management	4, 5, 6, 7, 8, 9, 10, 12, 14	Coniferous forest	b	t	Selection of small clearcuts beneficial
Dusky Flycatcher	Longterm Planning	9, 10	Riparian	b	t	Clearcut harvest, fragmentation beneficial
Northern Shrike	Longterm Planning	4, 6, 7, 8, 12, 14	Shrublands	b	t	Prefers early seral
Carolina Wren	Longterm Planning	13	Deciduous forest	y	s, c	Fragmentation beneficial
Mountain Bluebird	Longterm Planning	9, 10	Shrublands, burns	b	c	Clearcut harvest with snag retention beneficial
Bohemian Waxwing	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	b w	t	Prefers edges and open forest
Blue-winged Warbler	Management	13	shrub/successional	b	g	Prefers early-mid successional; clearcuts beneficial
Golden-winged Warbler	Immediate Action	12, 13	shrub/successional	b	g	Edge and early seral specialist
Nashville Warbler	Longterm Planning	6, 7, 8, 12, 14	Mixed forest	b	g	Prefers second-growth and cutover areas
Chestnut-sided Warbler	Management	6, 8, 12, 14	shrub/successional	b	s	Highest densities in early seral
Kirtland's Warbler	Immediate Action	13	Coniferous forest	b	g	Clearing/planting can mimic fire-created habitat
Prairie Warbler	Management	13	shrub/successional	b	t	Clearing of forest very beneficial
Mourning Warbler	Longterm Planning	6, 7, 8, 12, 14	shrub/successional	b	g	Prefers early seral
Eastern Towhee	Management	13	shrub/successional	y	g	Prefers mid-seral and edges; harvesting and thinning beneficial
Fox Sparrow	Longterm Planning	5	Shrubland	b	g, s, t	Prefers early seral
Lincoln's Sparrow	Longterm Planning	4, 6, 7, 8, 12, 14	Wetland	b	g	Uses clearcuts with shrubby wet areas
White-throated Sparrow	Longterm Planning	4, 6, 7, 8, 12, 13, 14	Mixed forest	b	g	Prefers edges, early seral, forest openings
Indigo Bunting	Longterm Planning	13	shrub/successional	b	s	Prefers shrubby edges

¹ see Rich et al. (2004) for definitions ² Bird Conservation Regions (BCR), see Figure 3.1 ³ Primary habitat used by the species as described by Rich et al. (2004) ⁴ Seasonal habitat concerned. B=breeding, w=winter, y=year round ⁵ g=ground nester, s=shrub nester, t=tree nester, c=cavity-nester

Table 3.2 Birds Negatively Affected by Forestry Operations, on Balance, over the Short- to Medium-Term and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan (Some positive effects may occur in certain situations.)

Common Name	PIF Priority¹	BCR²	Primary Habitat³	Habitat⁴	Nest⁵	Comment
Red-shouldered Hawk	Longterm Planning	13	Deciduous forest	b	t	Harvest, fragmentation sensitive
Spruce Grouse	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	y	g	Conifer specialist
Spotted Owl	Immediate Action	9	Coniferous forest	y	t, c	Old-growth associate
Red-headed Woodpecker	Management	11, 13	Woodland	b	c	Harvest sensitive, needs wildlife trees
Red-bellied Woodpecker	Longterm Planning	13	Deciduous forest	b	c	Harvest sensitive, needs wildlife trees
Red-breasted Sapsucker	Longterm Planning	5	Mixed forest	b w	c	Harvest sensitive, needs wildlife trees
Williamson's Sapsucker	Longterm Planning	9, 10	Coniferous forest	b	c	Harvest sensitive, needs wildlife trees
White-headed Woodpecker	Longterm Planning	9	Coniferous forest	b	c	Harvest, plantation sensitive, needs wildlife trees
Black-backed Woodpecker	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	y	c	Post-fire salvage sensitive
Yellow-bellied Flycatcher	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	b	g	Harvest, fragmentation desiccates critical moss
Acadian Flycatcher	Longterm Planning	13	Deciduous forest	b	t	Interior forest area sensitive
Gray Flycatcher	Longterm Planning	9	Woodland	b	t	Extensive clearcut harvest sensitive
Pacific-slope Flycatcher	Longterm Planning	5	Woodland	b	t	Clearcut harvest sensitive
Blue-headed Vireo	Longterm Planning	6, 7, 8, 12, 14	Mixed forest	b	t	Clearcut, selection harvest sensitive
Winter Wren	Longterm Planning	5	Coniferous forest	y	s c	Highest abundance in old forest, CWD sensitive
Chestnut-backed Chickadee	Longterm Planning	5	Coniferous forest	y	c	Extensive clearcut harvest sensitive
Boreal Chickadee	Management	4, 6, 7, 8, 12, 14	Coniferous forest	y	c	Prefers mature stands in winter
Bicknell's Thrush	Immediate Action	8, 12, 14	Coniferous forest	b	t s	Clearcut harvest/thinning sensitive
Wood Thrush	Management	12, 13, 14	Mixed forest	b	t s	Interior forest area sensitive
Varied Thrush	Longterm Planning	5	Coniferous forest	b	t	Harvest/fragmentation sensitive
Tennessee Warbler	Longterm Planning	4, 6, 7, 8, 12, 14	Mixed forest	b	g	Extensive clearcut harvest sensitive

(Continued on next page. See notes at end of table.)

Table 3.2 Continued

Common Name	PIF Priority ¹	BCR ²	Primary Habitat ³	Habitat ⁴	Nest ⁵	Comment
Magnolia Warbler	Longterm Planning	6, 7, 8, 12, 14	Mixed forest	b	t	Clearcut harvest sensitive
Cape May Warbler	Longterm Planning	6, 8, 12, 14	Coniferous forest	b	t	Mature conifer associate
Black-throated Gray Warbler	Longterm Planning	5	Mixed forest	b	t	Clearcut harvest negative, thinned areas suitable
Black-throated Green Warbler	Longterm Planning	6, 7, 8, 12, 14	Mixed forest	b	t	Clearcut and heavy selection harvest sensitive
Blackburnian Warbler	Longterm Planning	6, 8, 12, 14	Mixed forest	b	t	Mature forest specialist
Pine Warbler	Longterm Planning	13	Coniferous forest	b	t	Harvesting/fragmentation sensitive
Palm Warbler	Longterm Planning	6, 7, 8, 12, 14	Wetland	b	g	Sensitive to harvest adjacent bogs
Bay-breasted Warbler	Management	6, 7, 8, 12, 14	Coniferous forest	b	t	Mature forest specialist
Cerulean Warbler	Management	13	Deciduous forest	b	t	Clearcut harvest, fragmentation, short rotation-sensitive
Prothonotary Warbler	Management	13	Deciduous forest	b	c	Clearcut harvest sensitive, needs wildlife trees
Louisiana Waterthrush	Longterm Planning	13	Deciduous forest	b	g	Clearcut harvest sensitive
Connecticut Warbler	Management	4, 6, 8, 12	Coniferous forest	b	g	Short term harvest sensitive
Canada Warbler	Management	6, 7, 8, 12, 14	Mixed forest	b	g	Short term harvest sensitive
Rusty Blackbird	Management	4, 6, 7, 8, 12, 14	Coniferous forest	b	s	Clearcut/fragmentation sensitive
Pine Grosbeak	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	y	t	Extensive clearcut sensitive but prefers openings
White-winged Crossbill	Longterm Planning	4, 6, 7, 8, 12, 14	Coniferous forest	y	t	Harvest, rotation, fragmentation sensitive

¹ see Rich et al. (2004) for definitions² Bird Conservation Regions (BCR), see Figure 3.1³ Primary habitat used by the species as described by Rich et al. (2004)⁴ Seasonal habitat concerned. B=breeding, w=winter, y=year round⁵ g=ground nester, s=shrub nester, t=tree nester, c=cavity-nester

Table 3.3 Birds That May be Affected Positively or Negatively by Forestry Operations over the Short- to-Medium Term Depending on the Specific Forestry Action, and That Are on the Watch or Stewardship Lists of the North American Landbird Conservation Plan (Effects depend mainly on treatment, timeline and/or scale.)

Common Name	PIF Priority ¹	BCR ²	Primary Habitat ³	Habitat ⁴	Nest ⁵	Comment
Sharp-tailed Grouse	Longterm Planning	11	Shrublands	y	g	Clearcut harvest beneficial Plantations are negative
Flammulated Owl	Longterm Planning	9, 10	Coniferous forest	b	c	Clearcut harvest sensitive Selection harvest beneficial if suitable forest attributes are retained (especially trees with existing cavities)
Yellow-bellied Sapsucker	Longterm Planning	4, 6, 7, 8, 12, 14	Mixed forest	b	c	Trembling aspen harvest, wildlife tree retention sensitive Selection harvest, opening up coniferous forest beneficial
Red-naped Sapsucker	Longterm Planning	9, 10	Mixed forest	b	c	Trembling aspen harvest, wildlife tree retention sensitive Selection harvest, opening up coniferous forest beneficial
Lewis's Woodpecker	Management	9, 10	Riparian	b	c	Selection harvest, opening up coniferous forest beneficial Wildlife tree/ponderosa pine harvest sensitive. Where safe to do so, retention of "soft snags" is beneficial
Alder Flycatcher	Longterm Planning	4, 6, 7, 8, 12, 14	Riparian	b	t, s	Burning, thinning, selection harvest beneficial Early seral beneficial
Willow Flycatcher	Management	5, 9, 10, 11, 13	Riparian	b	t, s	Herbicide control of deciduous negative Early seral beneficial
Yellow-throated Vireo	Longterm Planning	13	Deciduous forest	b	t	Herbicide control of deciduous negative Large clearcut harvest sensitive
Philadelphina Vireo	Longterm Planning	4, 6, 7, 8, 12, 14	Mixed forest	b	t	Prefers mature forest, edges. Selection harvest beneficial Smaller scale clearcuts, selection harvest, burning beneficial
Hooded Warbler	Longterm Planning	13	Deciduous forest	b	s	Extensive clearcut harvest sensitive Clearcut harvest sensitive
Cassin's Finch	Management	9, 10	Coniferous forest	y	t	Open forest specialist, invades recent selection harvest stands Selection or small clearcut harvest beneficial Large clearcut harvest sensitive

¹ see Rich et al. (2004) for definitions ² Bird Conservation Regions (BCR), see Figure 3.1 ³ Primary habitat used by the species as described by Rich et al. (2004) ⁴ Seasonal habitat concerned. B=breeding, w=winter, y=year round ⁵ g=ground nester, s=shrub nester, t=tree nester, c=cavity-nester

3.1.3 *Additional Bird Conservation Plans Associated with NALCP*

Bird conservation plans for specific physiographic areas are being developed in the U.S. under the NALCP umbrella. Physiographic areas may be similar or different from ecoregions, depending on the area. Several of these plans are available and are relevant for Canadian forest habitats (Table 3.4). Each plan offers additional and more specific information on conservation needs for selected high priority species in each physiographic area. The reader is advised to access plans of interest at the website <http://www.blm.gov/wildlife/pifplans.htm>.

Table 3.4 Fine-Scale Bird Conservation Plans Relevant to the Forest Industry in Canada

Bird Conservation Plan	Approximate BCR
Lower Great Lakes Plain	13
St. Lawrence Plain	13
Boreal Hardwood Transition	12
Spruce Hardwood Forest	14
Aspen Parklands	11
Central Rocky Mountains	10
Southern Pacific Rainforests	5

3.2 North American Waterfowl Management Plan

3.2.1 *Relevance to the Forest Industry*

The North American Waterfowl Management Plan (NAWMP) is an international (Canada, U.S., Mexico) action plan to conserve migratory waterfowl (ducks, geese, and swans) throughout the continent (NAWMP 1998). The NAWMP was initiated in 1986 and is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, industry, and many individuals. The primary objective of the NAWMP is to restore North American waterfowl populations to levels recorded during the 1970s, a period of relative abundance for waterfowl populations. This objective is noticeably different from the NALCP, as numbers of waterfowl in the 1970s were well-known compared to most landbirds. Notably, there are several species that have already exceeded these population objectives and many other species populations are increasing.

Part one of the NAWMP outlines the strategic direction for plan partners to manage waterfowl populations in the future. This section describes the conservation legacy of the NAWMP and articulates visions to strengthen the NAWMP's biological foundation, its focus on landscape conservation and ways to broaden partnerships. Part two summarizes waterfowl population and habitat objectives. Part three discusses administration of the NAWMP in Canada, Mexico, and the U.S.

The NAWMP hopes to achieve its objectives through conserving and enhancing waterfowl habitat locally at a scale large enough to cumulatively reach continental population objectives. Partners are to work cooperatively towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species, and people. NAWMP projects may be constructed locally, and have an international scope, but are implemented at regional levels through NGOs such as Ducks Unlimited Canada, government agencies, and other partners. Funding for the plan will reach US\$75 million annually in 2007, 70% of which will be spent in Canada and Mexico (Ducks Unlimited 2006).

One of the NAWMP's most relevant concepts to the forest industry is its vision that "Plan partners enhance the capability of landscapes to support waterfowl and other wetland-associated species by ensuring that Plan implementation is guided by biologically based planning, which in turn is refined through ongoing evaluation". The NAWMP recognizes that to achieve its objectives, it needs to strengthen its biological foundation. One of the most important biological information gaps is an understanding of how landscape conditions affect waterfowl abundance, a clear link to potential effects of forestry operations on breeding success, and general wetland quality.

NAWMP projects contribute to the protection and conservation of wetland habitats and associated upland habitats. Plan partners are encouraged to "strive to clearly place waterfowl conservation as a legitimate and necessary component of sustainable landscapes". However, many dozens of bird species other than waterfowl depend on wetlands and all benefit from the NAWMP. The large annual budget and the landscape approach to habitat management seem to offer substantial opportunities for the forest industry to collaborate with plan implementers to help forest companies reach their biodiversity conservation targets.

Bird species covered by the NAWMP can be affected by forestry operations in several ways, mostly in breeding areas. Cavity-nesting ducks can be affected by harvesting when nest trees are removed, when felling of "danger" trees is required (trees which are more likely than sound trees to contain nest cavities), and when short harvest rotations are used, which do not allow trees to grow old enough to develop natural cavities or conditions suitable for woodpecker excavations (Gauthier 1993; Eadie, Mallory, and Lumsden 1995). However, in recent years, most provinces require riparian management areas (RMAs) be left as habitat reserves and buffers around wetlands and rivers. Although individual cavity-nesting ducks may nest at considerable distance from water, most choose nest trees near water (e.g., Bufflehead, >50% nest within 25 m of water—Erskine 1972; Gauthier and Smith 1987). While most provinces have developed RMA guidelines and guidelines for minimizing siltation during forest road construction and maintenance, there remain instances in which water quality or quantity may be affected by forestry operations. Abnormal changes in water quality or quantity may affect riverine waterfowl species. One species, the trumpeter swan, is sensitive to disturbance on breeding ponds and forestry operations or other industrial disturbances adjacent to those wetlands could affect breeding success.

The NAWMP has numerous joint ventures targeted to specific regions, habitats, or waterfowl species groups. Six joint ventures with relevance to the forest industry are operational in Canada (Table 3.5). These joint ventures are one logical avenue of collaboration for forestry companies.

Table 3.5 Joint Ventures in Canada under the North American Waterfowl Management Plan with Relevance to Potential Collaboration with the Forest Industry

Joint Venture	Area of Operation
Eastern Habitat	Ontario, Quebec, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island
Pacific Coast	Coastal British Columbia
Prairie Habitat	BC, Alberta, Saskatchewan, Manitoba
Canadian Intermountain	Interior British Columbia, western Alberta
Black Duck	Ontario, Quebec, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island
Sea Duck	International

Some provinces have their own waterfowl conservation plans which operate independently, but within the overall mandate of the NAWMP. CWS (2003b) describes the conservation plans for British Columbia and Yukon. For other regions of Canada, readers should consult Environment Canada websites for regional waterfowl conservation plans.

3.2.2 Bird Species Affected by Forestry Practices

Of the 39 waterfowl species that occur in Canada and that are covered by the NAWMP, only 8 species are thought to be potentially affected by forestry operations (Table 3.6). Most of these species are cavity-nesting ducks. Half of these species (Bufflehead, Common Goldeneye, Barrow's Goldeneye, Harlequin Duck) are also seaducks and are of relatively high priority within the NAWMP as evidenced by the establishment of the Seaduck Joint Venture. Potential impacts occur mainly during the breeding season. Any impacts during non-breeding seasons are related to potential effects on downstream water quality.

- Bufflehead, Common Goldeneye and Barrow's Goldeneye typically nest in boreal forest areas in natural cavities or woodpecker cavities in large diameter hardwoods or conifers near lakes, sloughs, or slow moving rivers. Timber harvest, thinning, or other silvicultural activities that remove or reduce recruitment of suitable nest trees can affect local breeding distribution and densities (Erskine 1972; Gauthier 1993; Mallory, McNicol, and Weatherhead 1994; Eadie, Mallory, and Lumsden 1995). Wood Ducks and Hooded Mergansers are also cavity-nesting ducks, but tend to nest in trees along brush-lined wetland edges, large and slow-moving streams and quiet backwaters with adjacent hardwood or mixedwood forest. Harvest of riparian, bottomland or flooded hardwood stands may remove nest trees and may negatively affect wetland quality (Dugger, Dugger, and Frederickson 1994; Hepp and Bellrose 1995).
- Common Mergansers nest along large lakes and rivers, often in tree cavities, but also on the ground. Timber harvesting can reduce numbers of suitable nest trees and siltation from forestry operations can reduce stream quality (Mallory and Metz 1999). However, the riparian best management practices typically used by industry are effective at reducing potential impacts on water quality. Harlequin Ducks nest mainly on the ground at the edge of high to moderate gradient streams (Campbell et al. 1990a), but occasionally in tree cavities (Cassirer et al. 1993). Timber harvest was identified as the main source of breeding habitat degradation on the west coast of Canada. Harvesting may remove riparian vegetation, and cause downstream stream flows and siltation (Breault and Savard 1991). Higher breeding

densities have been found in unharvested sections of streams than in logged sections (Freeman and Goudie 1998).

- Trumpeter Swans nest in wetlands but are shy and secretive birds on the breeding grounds (Mitchell 1994). Disturbance at nesting wetlands from forestry operations could cause local problems for individual pairs (Holton 1988).

Most of the above species, however, are not in jeopardy. Harlequin Ducks are probably the species of most concern as eastern North American populations are considered Endangered. Threats are mainly related to conversion of rivers used for breeding to hydroelectric projects, and effects on coastal wintering areas (Montevecchi et al. 1995). The NAWMP suggests that populations of goldeneyes (Common and Barrow's) have remained stable, but populations of Bufflehead, Hooded Mergansers, Wood Duck, and Trumpeter Swan are increasing.

Table 3.6 Birds Affected by Forestry Practices That Are Covered by the North American Waterfowl Management Plan

Common Name	Breeding habitat ¹	+/- response ²	T/C/G/W nester ³	Winter habitat ¹	+/- response ²	Comment ⁴
Trumpeter Swan	y	-	W	n	-	local disturbance effects at breeding wetlands
Wood Duck	y	-	C		-	harvesting of forested areas near wetlands can reduce overall habitat quality, species requires wildlife trees for nesting
Harlequin Duck	y	-	G	n	-	sensitive to riparian loss, stream siltation, stream flow changes
Bufflehead	y	-	C	n	-	require wildlife trees for nesting
Common Goldeneye	y	-	C	n	-	require wildlife trees for nesting
Barrow's Goldeneye	y	-	C	n	-	require wildlife trees for nesting
Hooded Merganser	y	-	C	n	-	require wildlife trees for nesting, sensitive to sedimentation
Common Merganser	y	-	C/G	y	-	require wildlife trees for nesting, sensitive to sedimentation of rivers and lakes

¹ y=yes, species and their breeding habitats can be affected by forestry practices; n=no effect from forestry practices

² (-) negative response, (+) positive response

³ T – Tree nester, C – Cavity nester, G – Ground nester, W – Wetland nester

⁴ description of forestry practice effect

3.3 Canadian Shorebird Conservation Plan

3.3.1 *Relevance to the Forest Industry*

The Canadian Shorebird Conservation Plan (CSCP) is a national plan designed to promote the conservation of shorebirds in Canada (Donaldson et al. 2000). The plan is intended to cooperate with other bird conservation initiatives including the U.S. Shorebird Conservation Plan (a parallel plan specific to the U.S., the Western Hemispheric Shorebird Reserve Network (a network of habitat reserves at key shorebird migratory and wintering areas), the North American Waterfowl Management Plan, and Wings Over Water. The CSCP's stated vision is to ensure that "healthy populations of shorebirds are distributed across their range and diversity of habitats in Canada and throughout their global range". Similar to the other three bird conservation plans covered in this report, the CSCP recognizes the need for collaboration at the local, regional, and international scales.

The CSCP was born out of concern for shorebird populations across Canada. According to the CSCP, many shorebird species in Canada show declining population trends over the last two decades. No single cause is responsible for the decline of all species, but a number of factors are likely affecting populations, including wetland drainage, pollution, habitat loss, and disturbance on the nesting and migratory grounds.

The CSCP has 5 stated goals through which it hopes to achieve its objective of healthy populations of shorebirds throughout their natural ranges:

1. sustain the distribution, diversity, and abundance of shorebird populations within Canada and restore populations of declining, threatened, and endangered species;
2. secure and enhance sufficient high quality habitat to support healthy populations of shorebirds throughout their ranges in Canada;
3. ensure that information on shorebird conservation needs and practices is widely available to decision makers, land managers and the public;
4. ensure that coordinated shorebird conservation efforts are in place, on the ground, throughout the range of Canadian shorebird species; and
5. ensure that shorebird conservation efforts are guided by common principles throughout the Western Hemisphere.

Goals 2 and 4 are the most relevant to the forest industry as they are related to habitat for shorebirds. However, forestry operations have very few potential effects on shorebird habitat or populations, mainly because >90% of shorebird species breed in Arctic tundra, grasslands, or dune habitats, and most migratory habitats are marine mudflats and beaches, agricultural fields, grasslands, and wetland shorelines. Nevertheless, forestry operations could have negative effects on wetland, estuarine, or coastal mudflat quality and any actions to reduce such effects would be positive for shorebirds in general. Forestry operations may also positively affect a few species because harvesting opens up forests to create more suitable breeding habitat conditions. There may be opportunities for the forest industry to work with the CSCP to reduce potential local effects on shorebird breeding, foraging, and migratory habitats.

The main method of conserving shorebirds is through the Western Hemispheric Shorebird Reserve Network (WHSRN). The WHSRN is a network of critical habitats for shorebirds and is administered by the same group that administers the CSCP. To date, 54 sites in Canada have been designated as important shorebird sites (Donaldson et al. 2000). Since most of these reserves are wetlands or coastal migratory habitats, this conservation method has little direct relevance to the forest industry.

Some provinces have their own shorebird conservation plans which operate independently, but within the overall mandate of the CSCP. For example, Ontario (<http://www.on.ec.gc.ca/wildlife/plans/shorebirdplan-e.html>), Northwest Territories and Nunavut (<http://www.pnr-rpn.ec.gc.ca/nature/migratorybirds/sb/dc31s12.en.html>), the Prairie provinces (Alberta, Saskatchewan and Manitoba; <http://www.pnr-rpn.ec.gc.ca/nature/whp/pcscp/df10s00.en.html>), and British Columbia and Yukon (CWS 2003c) have their own shorebird conservation plans. Readers are advised to consult these regional plans for more specific information on shorebird conservation.

3.3.2 *Bird Species Affected by Forestry Practices*

We suggest that of the 47 shorebird species covered by the CSCP, only 4 species could potentially be of relevance to forestry operations (Table 3.7) but only during the breeding season. No effects would occur during non-breeding seasons. Three of these species (Lesser Yellowlegs, Greater Yellowlegs, and Solitary Sandpiper) breed in wet boreal forest habitat. Both species of yellowlegs are ground nesters that nest in open or lightly treed muskeg, bog, and wetland edge habitat adjacent to coniferous forests. Yellowlegs use trees as perches from which to monitor intruders in their nesting areas. Open areas created by forest harvesting, road right-of-way development, and seismic lines have created suitable nesting habitat when located near wetlands (Campbell et al. 1990b; Tibbitts and Moskoff 1999); therefore, forestry operations may have positive effects in some situations.

The Solitary Sandpiper is the only North American shorebird that nests in trees. It uses old nests of thrushes, blackbirds, and jays for nesting, often in small coniferous trees (Moskoff 1995). Harvesting of forests along wetland edges could reduce nesting habitat by removing trees but because Solitary Sandpipers often use young trees for nesting, any effects would be short-term and could even be positive at larger spatial scales.

The American Woodcock breeds in southeastern Canada and prefers forests with openings for breeding habitat, especially early seral stage forests and abandoned farmlands with forest patches (Keppie and Whiting 1994). Harvest of forest can create breeding habitat over the moderate- to long-term as long as a mosaic of seral stages is retained or cutblocks are small (Ruffed Grouse Society 2006). At present, this species is not generally incorporated in landscape-level habitat planning in Canada, but is an obvious candidate for such conservation actions.

Table 3.7 Birds Affected by Forestry Practices That Are Covered by the Canadian Shorebird Conservation Plan

Common Name	Breeding habitat¹	+/- response²	T/C/G/W nester³	Winter habitat¹	Comment⁴
Greater Yellowlegs	y	+	g	n	nests in wet logged areas in very early seral
Lesser Yellowlegs	y	+	g	n	nests in wet logged areas in very early seral
Solitary Sandpiper	y	-/+	t	n	nests along forest/wetland edges
American Woodcock	y	+	g	n	logging and early seral stages beneficial

¹ y=yes, species and their breeding habitats can be affected by forestry practices; n=no effect from forestry practices

² (-) negative response, (+) positive response, (-/+) neutral response

³ t - Tree nester, c - Cavity nester, g - Ground nester, w - Wetland nester

⁴ description of forestry practice effect

3.4 Wings Over Water

3.4.1 *Relevance to the Forest Industry*

The Waterbird Conservation Plan for the Americas: North American Waterbird Conservation Plan (NAWCP), was launched in 1998 to link conservation efforts of waterbirds and their habitats in an international broad-based voluntary partnership. Wings Over Water (WOW), Canada's Waterbird Conservation Plan, is the Canadian component of NAWCP (Milko et al. 2003). The purpose of the plan is to sustain or restore, through the lands and waters of North America, Central America, and the Caribbean, the distribution, diversity and abundance of populations and habitats of waterbirds. Waterbirds include seabirds that are found in marine and coastal areas, inland colonial waterbirds (terns, gulls, cormorants, and herons), and other wetland related species (grebes, loons, rails, cranes, coots, and bitterns; Kushlan et al. 2002). The intent is to provide a management similar to that afforded ducks, geese, and swans by the North American Waterfowl Management Plan.

WOW provides a useful framework for waterbird conservation in Canada, but is relatively brief in comparison to the NALCP. It is divided into 4 main sections which discuss conservation challenges, planning, goals, and implementation. WOW's vision is to "ensure populations of waterbirds are sustained or restored throughout their historical range in Canada and globally". This vision is very similar to that of the CSCP. Of the 93 species covered by WOW, 30% are showing declining population trends and 26% are showing increasing population trends. The remainder are either stable or have insufficient data to reveal trends.

WOW states 4 goals that it hopes to achieve by fulfilling its objectives:

1. sustain the natural distribution, diversity and abundance of waterbirds within Canada, and restore populations of priority species and those in decline;
2. secure and enhance sufficient high quality habitat to support robust populations of waterbirds throughout their ranges in Canada;
3. ensure that information for the conservation of waterbirds is widely available to decision makers, the public, and all those whose actions affect populations; and
4. ensure that coordinated conservation efforts for waterbirds are guided by common principles, and are in place throughout the range of those species that occur in Canada.

Goal 2 is the most relevant to the forest industry as it is clearly related to habitat. However, forestry operations have very few potential effects on waterbird habitat or populations, except on the Pacific coast of Canada, mainly because >90% of waterbird species breed in non-forested or otherwise non-merchantable forest lands.

We suggest that only 5 of the 93 species covered by WOW are of relevance to forestry operations in Canada (Table 3.8). Most of the seabirds either nest in other countries and in Canada occur only in the marine environment (e.g., petrels, shearwaters, albatrosses) or nest in Canada on rocky coastal islets with little or no merchantable timber (e.g., storm-petrels, alcids, gannets, cormorants). Most inland colonial-nesting waterbirds (e.g., gulls, terns, cormorants) also nest on untreed islets. Other waterbirds (loons, grebes, rails, and bitterns) nest in marshy wetlands and could only be affected by forestry operations indirectly through water quality. Although forestry operations could lead to potential impacts to wetlands from leaching of fuel, or sedimentation of wetlands from erosion and road-building, environmental guidelines followed by the forest industry reduce that potential.

Some provinces and territories have regional waterbird conservation plans including British Columbia and Yukon (CWS 2003d, 2003e). Readers are advised to consult regional Environment Canada websites for other regional waterbird conservation plans.

3.4.2 *Bird Species Affected by Forestry Practices*

Of the 5 species covered by WOW that could be affected by forestry operations, four nest in trees and one nests on the ground (Table 3.8). Potential impacts could occur only during the breeding season. No impacts would occur during non-breeding seasons. Only one of these five species (Marbled Murrelet) is a high priority species within WOW.

- Marbled Murrelets nest almost exclusively in large trees within old forests along the coast. Populations are widely believed by government and conservation organizations to be declining as a direct result of logging of old forest nesting habitat (Kaiser et al. 1994; Beissinger 1995; Nelson 1997; Burger 2002). Potential impacts would mainly be through direct loss of nesting habitat (old and large trees) and indirectly through fragmentation of nesting habitat, which is thought to increase depredation of nestlings.
- Great Blue Herons nest in trees, usually colonially but not always, and usually in older forest near wetland or marine foraging areas (Butler 1992). Harvesting can remove trees used for nesting or cause abandonment of active colonies if conducted in close proximity (i.e., especially during the March-August breeding season; Werschkul, McMahan, and Leitschuh 1976).
- Green Herons nest singly in trees and large shrubs, but would only be affected if riparian areas were harvested.
- Bonaparte's Gulls usually nest singly, often in large coniferous trees near edges of lakes and wetlands (Burger and Gochfield 2002). Harvesting could remove nesting habitat.
- Sandhill Cranes nest on the ground in undisturbed wetlands or bogs (Tacha, Nesbitt, and Vous 1992). Repeated disturbances (as could occur during harvesting along nesting wetland edges) could result in nest desertion and may increase the likelihood of predation on unattended nests (Safina 1993). One study in British Columbia suggested that wetlands without an RMA were used for nesting less than wetlands with RMAs (Cooper 1996).

Table 3.7 Birds Affected by Forestry Practices That Are Covered by the Canadian Shorebird Conservation Plan

Name	Breeding habitat¹	+/- response²	T/C/G/W nester³	Winter habitat¹	+/- response²	Comment⁴
Greater Yellowlegs	y	+	g	n		nests in wet logged areas in very early seral
Lesser Yellowlegs	y	+	g	n		nests in wet logged areas in very early seral
Solitary Sandpiper	y	-/+	t	n		nests along forest/wetland edges
American Woodcock	y	+	g	n		logging and early seral stages beneficial

¹ y=yes, species and their breeding habitats can be affected by forestry practices; n=no effect from forestry practices

² (-) negative response, (+) positive response, (-/+) neutral response

³ t – Tree nester, c – Cavity nester, g – Ground nester, w – Wetland nester

⁴ description of forestry practice effect

3.5 Summary of the Relevance of the Four Major Canadian Bird Management Plans to Forest Management

The four bird management plans reviewed in this report have clear but mainly indirect relevance to forest management in Canada. The plans themselves have no legal or regulatory ramifications for the forest industry. Nor do the plans provide specific management recommendations useful for conserving habitat in managed forests. However, the plans do provide guidance on goals and objectives for national and international conservation of birds. We suspect the plans will provide regulators with ideas for incorporating conservation of some forest bird species into provincial or territorial regulations, especially for high priority species and their habitats. A summary of numbers of bird species relevant to each of these plans is provided in Table 3.9.

The development of regional conservation plans based on Bird Conservation Regions is also well underway in Canada, and those regional plans will also likely highlight species of high management concern for regulators. Although regional plans based on BCRs are a spin-off from the overall NABCI program, they will link indirectly to the four major Canadian bird plans and may guide much of the future bird management in Canada for the vast majority of bird species which are not also covered by the Species At Risk Act.

Table 3.9 Summary of Number of Bird Species in Canadian Federal Bird Plans

Plan Type	Total Number of Bird Species	Bird Species Potentially Affected by Forestry	% of Bird Species Potentially Affected by Forestry
North American Landbird Conservation Plan (NALCP)	448	48*	10.7%
North American Waterfowl Management Plan (NAWMP)	39	8	20.5%
Canadian Shorebird Conservation Plan (CSCP)	47	4	8.5%
Wings over Water (WOW)	93	5	5.3%
TOTAL	627	65	10.3%

* Watch and Stewardship Lists only

4.0 SPECIES AT RISK ACT

The federal Species At Risk Act (SARA) applies to species at risk as assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (SARA 2004). SARA came fully into force on June 1, 2004 and has radically changed the course of bird conservation in Canada. SARA is concerned with *extirpated*, *endangered*, *threatened* or *special concern* species. *Extirpated* species no longer exist in Canada but exist in the wild elsewhere; *endangered* species are those that face imminent extirpation or extinction; *threatened* species are likely to become endangered if limiting factors are not reversed; and *special concern* species are impacted by factors that are causing populations to decline and/or are vulnerable due to small ranges or populations.

The relevance of SARA to the forest industry is significant. In some provinces, under SARA, forest companies are encouraged and in some cases, required to consider conservation of habitat for all SARA-listed species (Tables 4.1 and 4.2). Many of these species use forest habitat and are directly relevant to the forest industry (Table 4.1). For example, over the last decade, the three forest-dwelling bird species that have been the focal points for forest management in Canada have been Marbled Murrelet, Northern Spotted Owl and the “Queen Charlotte” Northern Goshawk. In Canada, all three of these species occur only in British Columbia and tend to account for a majority of biodiversity conservation efforts by forest

companies with tenures in the species' respective ranges. One extremely important component of SARA is the requirement for the protection of a SARA-listed bird species' "residence". At this time, there are no definitions of residence available for any species, but many definitions are now under development. The definitions of residence will probably vary greatly between species.

There are three Schedules, or lists of species that are covered by SARA. Species referred to as Schedule 1 species were assessed and listed as extirpated, endangered, or threatened, prior to the Act ratification. Bird species listed on Schedules 2 and 3 are in the process of being assessed, with status as yet undetermined, or they will be assessed in the future. The timing of these assessments remains uncertain.

All Schedule 1 species must have a national *Recovery Strategy* in place within three years (for endangered species) or four years (for extirpated and threatened species) after the Act came into force. A *Recovery Strategy* is a guidance document that outlines strategies and methods to recover a species to a point where it is no longer considered Endangered or Threatened or eventually can be de-listed from SARA. The *Recovery Strategy* offers ideas, methods, and potential actions at the strategic level, without providing details on how any of those would be accomplished. The *Recovery Strategy* is developed by a *Recovery Team* (a multi-stakeholder group of government, industry, NGOs, and private individuals). Representatives of the forest industry are or will be invited to join the *Recovery Team* for any species with potential impacts on the forest industry. A National *Recovery Plan* will then be prepared for each species. *Recovery Plans* provide the on-the-ground framework for achieving recovery of a species, with details on specific actions and timelines.

Recovery Plans currently exist for four species of birds that are potentially affected by forestry operations: Acadian Flycatcher, Hooded Warbler, Marbled Murrelet and the eastern population of Harlequin Duck. *Recovery Plans* are under development for additional endangered and threatened species. To review the existing Recovery Plans consult Environment Canada's SARA website http://www.speciesatrisk.gc.ca/recovery/default_e.cfm.

For Schedule 1 Special Concern species, national *Management Plans* will be developed (e.g., Lewis's woodpecker—Beauchesne and Cooper 2004; flammulated owl—Cooper et al. 2005). *Management Plans* are similar to *Recovery Plans* except that the objective is to stabilize populations, given that Special Concern species are not as imminently vulnerable as Endangered or Threatened species. Each of the *Recovery* or *Management Plans* for forest-dependent species will have recommendations that will be relevant to the forest industry.

For species at risk with cross-border management needs (i.e., most species), there may also be an international management plan under the auspices of The Commission for Environmental Cooperation (CEC). The CEC is an international organization created by Canada, Mexico and the U.S. under the North American Agreement on Environmental Cooperation. The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law (see the CEC website <http://www.cec.org/>). These *North American Conservation Action Plans* contain agreements between governments to provide for management of designated endangered species. At this time there are six *North American Conservation Action Plans* for endangered species, but none are for bird species affected by forestry operations in Canada. The forest industry should be alert for relevant plans that may be forthcoming.

Provisions under SARA are intended to work in conjunction with provincial wildlife and habitat protection guidelines for species at risk. Most provinces and territories have their own lists of bird species of conservation concern. Although the terminology varies across the provinces/territories, they all have a similar hierarchy of designations equivalent to SARA's Endangered, Threatened and Special Concern. Readers are advised to consult their own provincial/territorial lists for species of high conservation concern.

For example, in British Columbia the *Identified Wildlife Management Strategy* (IWMS, <http://www.env.gov.bc.ca/wld/identified>) provides mechanisms for protecting habitat for species at risk; these include Wildlife Habitat Areas (WHA) and General Wildlife Measures (GWM). A WHA is a unit of habitat recommended for the maintenance, enhancement, or restoration of Red-listed wildlife (endangered or threatened in BC), threatened and endangered habitats, and those wildlife species identified as being regionally important. GWMs describe the management practices (e.g., seasonal timing windows for silviculture work) that must be implemented within an approved WHA or other spatially defined area.

Table 4.1 Species At Risk Act Bird Species Relevant to Forest Management

Species	Subspecies/Population	Region/Province
Endangered		
Yellow-breasted Chat	<i>auricollis</i>	BC
Red Crossbill	<i>percna</i>	NL
Acadian Flycatcher		ON
Spotted Owl		BC
Williamson's Sapsucker		BC
Western Screech-Owl	<i>macfarlanei</i>	interior BC
Kirtland's Warbler		ON
Prothonotary Warbler		ON
White-headed Woodpecker		BC
Threatened		
Northern Goshawk	<i>laingi</i>	coastal BC
Marbled Murrelet		coastal BC
Hooded Warbler		ON
Special Concern		
Yellow-breasted Chat	<i>virens</i>	ON
Harlequin Duck	eastern population	NU QC NB NS NL
Barrow's Goldeneye	eastern population	QC NB PE NS NL
Ferruginous Hawk		AB SK MB
Red-shouldered Hawk		ON QC NB
Great Blue Heron	<i>fannini</i>	BC
Flammulated Owl		BC
Western Screech-Owl	<i>kennicottii</i>	coastal BC
Bicknell's Thrush		QC NB NS
Cerulean Warbler		ON QC
Louisiana Waterthrush		ON QC
Lewis's Woodpecker		BC
Red-headed Woodpecker		SK MB ON QC

Table 4.2 Species At Risk Act Bird Species Not Relevant to Forest Management

Species	Subspecies/Population	Region/Province
Endangered		
Northern Bobwhite		ON
Whooping Crane		NT AB NT NU AB SK MB ON QC
Eskimo Curlew		NB PE NS NL
Horned Lark	<i>strigata</i>	coastal BC
Barn Owl	eastern population	ON QC
Burrowing Owl		BC AB SK MB
Piping Plover	<i>melodus</i> and <i>circumcinctus</i>	AB SK MB ON QC NB PE NS NL
Mountain Plover		AB SK
King Rail		ON
Greater Sage-Grouse	<i>urophasianus</i>	AB SK
Loggerhead Shrike	<i>migrans</i>	MN ON QC
Henslow's Sparrow		ON
Roseate Tern		QC NB NS
Sage Thrasher		BC AB SK
Threatened		
Short-tailed Albatross		BC
Least Bittern		MB ON QC NB
Peregrine Falcon	<i>anatum</i>	all Canada
Ross's Gull		NT NU MB
Sprague's Pipit		AB SK MB
Pink-footed Shearwater		BC
Loggerhead Shrike	<i>excubitorides</i>	AB SK MN
Special Concern		
Long-billed Curlew		BC AB SK
Peregrine Falcon	<i>pealie</i>	BC
Peregrine Falcon	<i>tundrius</i>	YT NT NU QC NL
Ivory Gull		NT NU NL
Ancient Murrelet		BC
Barn Owl	western population	BC
Short-eared Owl		all Canada
Yellow Rail		NT BC AB SK MB ON QC NB
Savannah Sparrow	<i>princeps</i>	NS

5.0 CONCLUSIONS

The four bird management plans reviewed in this report have clear but predominantly indirect relevance to forest management in Canada. The plans provide generalized guidance on goals and objectives for national and international conservation of birds. All of the plans contain estimates of species abundance and population trends. Wings Over Water provides estimates of Canadian breeding populations relative to

North America and to the world (since many species in WOW also occur outside of North America). The North American Landbird Conservation Plan provides the relative importance of certain regions (biomes) for each species, whereas the North American Waterfowl Management Plan provides population estimates for North America as a whole and for the “mid-continent”, or interior part of North America. The Canadian Shorebird Conservation Plan is a national plan designed to promote the conservation of shorebirds in Canada, mainly by promoting coordinated conservation efforts, and by securing or enhancing high quality shorebird habitats. The CSCP is intended to cooperate with other bird conservation initiatives including the U.S. Shorebird Conservation Plan, the Western Hemispheric Shorebird Reserve Network, the North American Waterfowl Management Plan, and Wings Over Water.

Each plan discusses potential threats to bird populations and habitats, and provides some generalized discussion on conservation needs. One or two objectives and/or goals of each plan speak to the impact of land use on bird populations in general, and to the relationship of industry, including the forest industry, to bird conservation. The plans all state that multi-stakeholder partnerships are needed in order for conservation planning to achieve its goals and objectives. The plans contain few details on how conservation objectives will be met, nor do they provide any “on-the-ground” recommendations of conserving bird habitat. Three of the plans (NALCP, CSCP, and WOW) default mainly to current and future regional bird conservation planning based on the Bird Conservation Region concept, to provide those details.

Challenges associated with attaining the objectives of each plan vary considerably, primarily due to the ecology of the bird species groups. Birds covered by the NALCP tend to breed over large geographic areas and at relatively low densities within any given occupied habitat. Waterfowl also occur over broad geographic areas, and breeding occurs in a range from low densities over wide areas to semi-colonial, but waterfowl concentrate greatly during migration and on wintering areas. Shorebirds tend to breed over large geographic areas but each species is limited to occupying specific habitats. Shorebirds are then very concentrated during migration and winter. Waterbirds tend to concentrate during the breeding season at very specific and relatively small sites, with some species’ populations dependent on only a handful of sites, while other species breed over large geographic ranges but at only very specific habitats.

It is suggested that the forest industry can work with the four bird plan partners to develop and implement local and regional forest bird conservation measures. For example, the NAWMP places a major emphasis on joint ventures and numerous local projects implemented on a regional scale to attain desired continental waterfowl populations. Thus, there can be opportunities for the forest industry to collaborate with appropriate joint ventures in the NAWMP, and locally within operational areas to work with partners to foster conservation of bird populations.

The Species At Risk Act has significant implications for the forest industry in areas with endangered and threatened forest bird species. In some provinces, under SARA, forest companies are encouraged and in some cases, required to consider conservation of habitat for all SARA-listed species, many of which use forest habitat and are directly relevant to the forest industry. At this time, there are six *North American Conservation Action Plans* for endangered species, but none are for bird species affected by forestry operations in Canada. The forest industry should be alert for relevant forthcoming plans.

The four bird plans reviewed in this report do not provide specific recommendations particularly useful to the forest industry, and we suggest that the forest industry will need to rely on provincial and corporate guidelines, biodiversity management policy, effective operational-level planning and practices, and the formation of partnerships with other stakeholders, to help attain the goals and objectives of the four federal bird conservation plans discussed herein.

REFERENCES

- Altman, B. and R. Sallabanks. 2000. Olive-sided flycatcher (*Contopus cooperi*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 502. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Baltz, M. E. and S. C. Latta. 1998. Cape May warbler (*Dendroica tigrina*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 332. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Beauchesne, S.M. and J.M. Cooper. 2004. Lewis's Woodpecker Recovery Team. *National management plan for the Lewis's woodpecker (Melanerpes lewis) in Canada*. Ottawa, ON: Recovery of Nationally Endangered Wildlife (RENEW).
- Beissinger, S.R. 1995. Population trends of the Marbled Murrelet projected from demographic analysis. In *Ecology and conservation of the Marbled Murrelet*, C.J. Ralph, G.L. Jr. Hunt, M.G. Raphael and J.F. Piatt, tech. eds. General technical report PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.
- Benkman C. W. 1992. White-winged crossbill. In *The birds of North America*, ed. A. Poole and F. Gill, No. 27. Philadelphia, PA: The Birds of North America, Inc.; Washington, DC: The American Ornithologists' Union.
- Bird Studies Canada. 2006. Bird conservation regions of Canada. <http://www.bsc-eoc.org/international/bcrmain.html> (accessed 18 July 2006).
- Blackburn, I. R., G. MacInnes, M. Mana and O. Thomas. 1997. *Spotted owl management plan: Strategic component*. Spotted Owl Management Inter-Agency Team. Province of British Columbia.
- Blancher, P.J. 2003. *Importance of Canada's boreal forest to landbirds*. Canadian Boreal Initiative and Boreal Songbird Initiative, Bird Studies Canada, Port Rowan, ON.
- Boulet, M., M. Darveau and L. Boulanger. 2003. Nest predation and breeding activity of songbirds in riparian and nonriparian black spruce strips of central Quebec. *Canadian Journal of Forest Research* 33:922-930.
- Breault, A. and J-P,L. Savard. 1991. *Status report on the distribution and ecology of harlequin Ducks in British Columbia*. Canadian Wildlife Service Technical Report Series No. 110, Pacific and Yukon Region, Delta, BC.
- Burger, A.E. 2002. *Conservation assessment of Marbled Murrelets in British Columbia: A review of the biology, populations, habitat associations, and conservation*. Technical Report Series No. 387. Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.
- Burger, J.A. and M. Gochfield. 2002. Bonaparte's gull (*Larus philadelphia*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 634. Philadelphia, PA: The Birds of North America, Inc.
- Butler, R.W. 1992. Great blue heron (*Ardea herodias*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 25. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990a. *The birds of British Columbia, Volume 1, Nonpasserines, Introduction, Loons through waterfowl*. Royal British Columbia Museum and Canadian Wildlife Service.

- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. *The birds of British Columbia, Volume 2, Nonpasserines, Diurnal birds of prey through wWoodpeckers*. Royal British Columbia Museum and Canadian Wildlife Service. 662 pp.
- Canadian Wildlife Service (CWS). 2003a. *Landbird conservation plan*. Migratory bird conservation plans: compendium report, March 2003. Pacific and Yukon Region, Environment Canada, Delta, BC. 71 pp.
- . 2003b. *Waterfowl conservation plan*. Migratory bird conservation plans: compendium report, March 2003. Delta, BC: Pacific and Yukon Region, Environment Canada.
- . 2003c. *Shorebird conservation plan*. Migratory bird conservation plans: compendium report, March 2003. Delta, BC: Pacific and Yukon Region, Environment Canada.
- . 2003d. *Seabird conservation plan*. Migratory bird conservation plans: compendium report, March 2003. Delta, BC: Pacific and Yukon Region, Environment Canada.
- . 2003e. *Waterbird conservation plan*. Migratory bird conservation plans: compendium report, March 2003. Delta, BC: Pacific and Yukon Region, Environment Canada.
- Cassirer, E.F., G. Shirato, F. Sharpe, C.R. Groves and R.N. Anderson. 1993. Cavity nesting by Harlequin Ducks in the Pacific Northwest. *Wilson Bulletin* 105:691-694.
- Confer, John L. 1992. Golden-winged warbler. In *The birds of North America*, ed. A. Poole and F. Gill, No. 20. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Connelly, J. W., M. W. Gratson, and K. P. Reese. 1998. Sharp-tailed grouse (*Tympanuchus phasianellus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 354. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Conway, C. J. 1999. Canada warbler (*Wilsonia canadensis*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 421. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Cooper, J.M. 1995. *Status of the Williamson's sapsucker in British Columbia*. Wildlife Working Report No. WR-69. Victoria, BC: British Columbia Wildlife Branch.
- Cooper, J.M. 1996. *Status of the sandhill crane in British Columbia*. Wildlife Bulletin. No. B-83, Victoria, BC: British Columbia Wildlife Branch.
- Cooper, J.M. and C. Gillies. 2000. Breeding distribution of Lewis' Woodpecker in the East Kootenay Trench in relation to fire history. In *At Risk: Proceedings of a conference on the biology and management of species and habitats at risk*, ed. L.M. Darling, 423-428. Victoria, BC: Ministry of Environment.
- Cooper, J.M., E.T. Manning, A. Deans and R. Howie. 2005. *Flammulated owl management plan for British Columbia*. Report for Ministry of Water, Land and Air Protection, Penticton, BC.
- Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff and L. Sztukowski. 2004. *Scientific evaluation of the status of the Northern Spotted Owl*. Portland, OR: Sustainable Ecosystems Institute.
- Donaldson, G.M., C. Hyslop, R.I.G. Morrison, H.L. Dickson, and I. Davidson. 2000. *Canadian shorebird conservation plan*. Canadian Wildlife Service Catalogue No. CW69-15/5-2000E.

- Ducks Unlimited. 2006. <http://www.ducks.org/Conservation/GovernmentAffairs/1616/NAWCAHome.html> (accessed 17 July 2006).
- Dugger, B.D., K.M. Dugger and L.H. Frederickson. Hooded merganser (*Lophodytes cucullatus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 98. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Eadie, J.M., M.L. Mallory and H.G. Lumsden. 1995. Common Goldeneye (*Bucephala clangula*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 170. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Erskine, A.J. 1972. *Buffleheads*. Monograph Series, No.4. Ottawa, ON: Canadian Wildlife Service.
- Evans-Ogden, L. J. and B. J. Stutchbury. 1994. Hooded Warbler (*Wilsonia citrina*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 110. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Forest Products Association of Canada (FPAC). 2006. Wildlife management: Migratory birds. <http://www.fpac.ca/en/sustainability/management/wildlife/birds.php> (accessed 19 July 2006).
- Freeman, S. and R.I. Goudie. 1998. *Abundance, distribution and habitat use of Harlequin Ducks in the Nahatlatch River*. Report No. CWRP 97-79, Surrey, BC: Forest Renewal BC, Ministry of Environment, Lands and Parks.
- Gauthier, G. 1993. Bufflehead (*Bucephala albeola*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 67. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Gauthier, G. and J.N.M. Smith. 1987. Territorial behaviour, nest site availability, and breeding density in Buffleheads. *Journal of Animal Ecology* 56:171-184.
- Greenlaw, J. S. 1996. Eastern Towhee (*Pipilo erythrophthalmus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 262. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Greenlaw, J.S. and J.D. Rising. 1994. Sharp-tailed Sparrow (*Ammodramus caudacutus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 112. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Gross, D. A., and P. E. Lowther. 2001. Yellow-bellied Flycatcher (*Empidonax flaviventris*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 566. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Hahn, T. P. 1996. Cassin's Finch (*Carpodacus cassinii*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 240. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Hamel, P. B. 2000. Cerulean Warbler (*Dendroica cerulea*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 511. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Hepp, G.R. and F.C. Bellrose. 1995. Wood Duck (*Aix sponsa*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 169. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

- Holton, G. 1988. An overview of Trumpeter Swans in the Grande Prairie region, 1957-1986. In *Proceedings and papers of the 10th Trumpeter Swan Society Conference*, ed. D. Compton, 11-17. Maple Plain, MN: The Trumpeter Swan Society.
- Imbeau, L., P. Drapeau, and M. Mönkkönen. 2003. Are forest birds categorised as “edge species” strictly associated with edges? *Ecography* 26:514-520.
- James, R.D. 1999. *Updated COSEWIC status report on the Kirtland's Warbler Dendroica kirtlandii in Canada*. Ottawa, ON: Committee on the Status of Endangered Wildlife in Canada.
- Kaiser, G.W., H.J. Barclay, A.E. Burger, D. Kangasniemi, D.J. Lindsay, W.T. Munro, W.R. Pollard, R. Redhead, J. Rice and D. Seip. 1994. *National recovery plan for the Marbled Murrelet*. Report No. 8, Recovery of Nationally Endangered Wildlife Committee (RENEW). Canadian Wildlife Federation, Ottawa, ON.
- Keppie, D.M. and R.M. Whiting, Jr. 1994. American Woodcock (*Scolapax minor*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 100. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Kushlan, J. A., M. Steinkamp, K. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Syderman, J. Trapp, J. Wheeler, and K. Wohl. 2002. *Waterbird conservation for the Americas: The North American waterbird conservation plan*, Version 1. Washington, DC: Waterbird Conservation for the Americas.
- Lowther, P.E. 1999. Alder Flycatcher (*Empidonax alnorum*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 446. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Machtans, C.S. and P.B. Latour. 2003. Boreal forest songbird communities of the Liard Valley, Northwest Territories, Canada. *Condor* 105:27-44.
- Mallory, M.L., D.K. McNicol, and P.J. Weatherhead. 1994. Habitat quality and reproductive effort of Common Goldeneyes nesting near Sudbury, Canada. *Journal of Wildlife Management* 58:552-560.
- Mallory, M and K. Metz. 1999. Common Merganser (*Mergus merganser*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 442. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Manning, Cooper and Associates. 2005. *2004 Northern Goshawk monitoring of TFL 37, Woss, BC*. Manning, Cooper and Associates report for Canfor Ltd, Englewood Division, Woss, BC.
- Mayfield, Harold F. 1992. Kirtland's Warbler. In *The birds of North America*, ed. A. Poole and F. Gill, No. 19. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- McClaren, E.L. and C.L. Pendergast. 2003. *Relationship between forest age class distribution around Northern Goshawk nests and occupancy and nest productivity patterns at three spatial scales*. Nanaimo, BC: British Columbia Ministry of Water, Land and Air Protection.
- Milko, R., L. Dickson, R. Elliot, and G. Donaldson. 2003. *Wings Over Water: Canada's waterbird conservation plan*. Canadian Wildlife Service, Environment Canada, Catalogue No. CW66-219/2003.
- Mitchell, C.D. 1994. Trumpeter Swan (*Cygnus buccinator*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 276. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

- Montevocchi, W.A., A. Bourget, J. Brazil, R.I. Goudie, A.E. Hutchinson, B.C. Johnson, P. Kehoe, P. Laporte, M. A. McCollough, R. Milton, and N. Seymour. 1995. *National recovery plan for the Harlequin Duck in eastern North America*. Recovery of Nationally Endangered Wildlife (RENEW) Report No. 12. Ottawa, ON: Canadian Wildlife Service.
- Moskoff, W. 1995. Solitary Sandpiper (*Tringa solitaria*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 156. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Moskoff, W., and S. K. Robinson. 1996. Philadelphia Vireo (*Vireo philadelphicus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 214. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- National Council [of the Paper Industry] for Air and Stream Improvement, Inc. (NCASI). 2001. *Accommodating birds in managed forests of North America: A review of bird-forestry relationships*. Technical Bulletin No. 822. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.
- . 2004. *Bird-forestry relationships in Canada: Literature review and synthesis of management recommendations*. Tech. Bulletin No. 892. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.
- Natural Resources Canada (NRCAN). 2005. Environment Canada Western Boreal Conservation Initiative (WBCI). <http://www.pnr-rpn.ec.gc.ca/boreal> (accessed 17 July 2006).
- North American Bird Conservation Initiative (NABCI). 2000. *The North American bird conservation initiative in the United States: A vision of American bird conservation*. Arlington, VA: U.S. NABCI Committee.
- North American Waterfowl Management Plan (NAWMP). 1998. *North American waterfowl management plan. Expanding the vision*. 1998 Update. <http://www.nawmp.ca/pdf/update-e.pdf>.
- Nelson, S.K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 276. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Nolan, V., Jr., E. D. Ketterson, D. A. Cristol, C. M. Rogers, E. D. Clotfelter, R. C. Titus, S. J. Schoech, and E. Snajdr. 2002. Dark-eyed Junco (*Junco hyemalis*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 716. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Pitocchelli, J. 1993. Mourning Warbler. In *The birds of North America*, ed. A. Poole and F. Gill, No. 72. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Preston, C.R. and R.D. Beane. 1993. Red-tailed Hawk (*Buteo jamaicensis*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 52. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dun, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. *Partners in flight: North American landbird conservation plan*. Ithaca, NY: Cornell Lab of Ornithology.

- Richardson, M., and D. W. Brauning. 1995. Chestnut-sided Warbler (*Dendroica pensylvanica*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 190. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Rimmer, C. C., K. P. McFarland, W. G. Ellison, and J. E. Goetz. 2001. Bicknell's Thrush (*Catharus bicknelli*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 592. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Rodewald, P. G., and R. D. James. 1996. Yellow-throated Vireo (*Vireo flavifrons*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 247. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Rosenberg, K.V., and P.J. Blancher. 2005. Setting numerical population objectives for priority landbird species. In *Bird conservation and implementation in the Americas: Proceedings of the Third International Partners in Flight Conference*, Volume I, ed. C.J. Ralph and T.D. Rich, 57-67. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-191. Albany, CA.
- The Ruffed Grouse Society. 2006. <http://www.ruffedgrousesociety.org/history.asp> (accessed 19 July 2006).
- Tibbitts, T.L. and W. Moskoff. 1999. Lesser Yellowlegs (*Tringa flavipes*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 427. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Safina C. 1993. Population trends, habitat utilization, and outlook for the future of the sandhill crane in North America: A review and synthesis. *Bird Populations* 1:1-27.
- Sallabanks, R., and F. C. James. 1999. American Robin (*Turdus migratorius*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 462. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- SARA. 2004. Species At Risk Act. Public Registry. <http://www.sararegistry.gc.ca> (accessed 19 July 2006).
- Schroeder, R.L. 1984. *Habitat suitability index models: Blue Grouse*. FWS/OBS-82/10.81. Washington DC: U.S. Fish and Wildlife Service.
- Sedgwick, J. A. 2000. Willow Flycatcher (*Empidonax traillii*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 533. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Simon, N.P.P., F.E. Schwab and R.D. Otto. 2002. Songbird abundance in clear-cut and burned stands: a comparison of natural disturbance and forest management. *Canadian Journal of Forest Research* 32:1343-1350.
- Tacha, T.C., S.A. Nesbitt and P.A. Vous. 1992. Sandhill Crane (*Grus canadensis*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 31. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Thayer Birding Software LLC. 2005. Birds of Canada. <http://www.thayerbirding.com> (accessed 20 July 2006).
- Vickery, P.D. and W.G. Shriver. 2005. The road map to North American bird conservation. *Conservation Biology* 19: 2044-2047.

- Walters, E. L., E. H. Miller, and P. E. Lowther. 2002. Yellow-bellied Sapsucker (*Sphyrapicus varius*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 662. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.
- Werschkul, D.F., E. McMahon and M. Leitschuh. 1976. Some effects of human activities on the Great Blue Heron in Oregon. *Wilson Bulletin* 88:660-662.
- Wilson, W. H., Jr. 1996. Palm Warbler (*Dendroica palmarum*). In *The birds of North America*, ed. A. Poole and F. Gill, No. 238. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

APPENDIX A

SCIENTIFIC NAMES OF BIRDS MENTIONED IN THIS REPORT

Common Name	Scientific Name
Red-throated Loon	<i>Gavia stellata</i>
Short-tailed Albatross	<i>Phoebastria albatrus</i>
Pink-footed Shearwater	<i>Puffinus creatopus</i>
Least Bittern	<i>Ixobrychus exilis</i>
Great Blue Heron	<i>Ardea herodias</i>
Green Heron	<i>Butorides virescens</i>
Trumpeter Swan	<i>Cygnus buccinator</i>
Wood Duck	<i>Aix sponsa</i>
Harlequin Duck	<i>Histrionicus histrionicus</i>
Bufflehead	<i>Bucephala albeola</i>
Common Goldeneye	<i>Bucephala clangula</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Common Merganser	<i>Mergus merganser</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Northern Goshawk	<i>Accipiter gentilis</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Broad-winged Hawk	<i>Buteo platypterus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
American Kestrel	<i>Falco sparverius</i>
Merlin	<i>Falco columbarius</i>
Prairie Falcon	<i>Falco mexicanus</i>
Ruffed Grouse	<i>Bonasa umbellus</i>
Spruce Grouse	<i>Falcipennis canadensis</i>
Blue Grouse	<i>Dendragapus obscurus</i>
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>
Yellow Rail	<i>Coturnicops noveboracensis</i>
King Rail	<i>Rallus elegans</i>
Sandhill Crane	<i>Grus canadensis</i>
Whooping Crane	<i>Grus americana</i>
Piping Plover	<i>Charadrius melodus</i>

(Continues on next page.)

Common Name	Scientific Name
Mountain Plover	<i>Charadrius montanus</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Solitary Sandpiper	<i>Tringa solitaria</i>
Eskimo Curlew	<i>Numenius borealis</i>
Long-billed Curlew	<i>Numenius americanus</i>
American Woodcock	<i>Scolopax minor</i>
Bonaparte's Gull	<i>Larus philadelphia</i>
Ross's Gull	<i>Rhodostethia rosea</i>
Ivory Gull	<i>Pagophila eburnea</i>
Roseate Tern	<i>Sterna dougallii</i>
Marbled Murrelet	<i>Brachyramphus marmoratus</i>
Ancient Murrelet	<i>Synthliboramphus antiquus</i>
Band-tailed Pigeon	<i>Columba fasciata</i>
Mourning Dove	<i>Zenaida macroura</i>
Barn Owl	<i>Tyto alba</i>
Flammulated Owl	<i>Otus flammeolus</i>
Eastern Screech-Owl	<i>Megascops asio</i>
Western Screech-Owl	<i>Megascops kennicottii</i>
Great Horned Owl	<i>Bubo virginianus</i>
Northern Hawk Owl	<i>Surnia ulula</i>
Northern Pygmy-Owl	<i>Glaucidium gnoma</i>
Burrowing Owl	<i>Athene cinicularia</i>
Spotted Owl	<i>Strix occidentalis</i>
Barred Owl	<i>Strix varia</i>
Great Gray Owl	<i>Strix nebulosa</i>
Long-eared Owl	<i>Asio otus</i>
Short-eared Owl	<i>Asio flammeus</i>
Boreal Owl	<i>Aegolius funereus</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>
Common Nighthawk	<i>Chordeiles minor</i>
Common Poorwill	<i>Phalaenoptilus nuttallii</i>
Whip-poor-will	<i>Caprimulgus vociferus</i>
Black Swift	<i>Cypseloides niger</i>
Chimney Swift	<i>Chaetura pelagica</i>
Vaux's Swift	<i>Chaetura vauxi</i>

(Continues on next page.)

Common Name	Scientific Name
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Calliope Hummingbird	<i>Stellula calliope</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>
Belted Kingfisher	<i>Ceryle alcyon</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker	<i>Picoides villosus</i>
White-headed Woodpecker	<i>Picoides albolarvatus</i>
American Three-toed Woodpecker	<i>Picoides dorsalis</i>
Black-backed Woodpecker	<i>Picoides arcticus</i>
Northern Flicker	<i>Colaptes auratus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Olive-sided Flycatcher	<i>Contopus cooperi</i>
Western Wood-Pewee	<i>Contopus sordidulus</i>
Eastern Wood-Pewee	<i>Contopus virens</i>
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
Acadian Flycatcher	<i>Empidonax virescens</i>
Alder Flycatcher	<i>Empidonax alnorum</i>
Willow Flycatcher	<i>Empidonax traillii</i>
Least Flycatcher	<i>Empidonax minimus</i>
Hammond's Flycatcher	<i>Empidonax hammondii</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>
Gray Flycatcher	<i>Empidonax wrightii</i>
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Say's Phoebe	<i>Sayornis saya</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Northern Shrike	<i>Lanius excubitor</i>

(Continues on next page.)

Common Name	Scientific Name
Blue-headed Vireo	<i>Vireo solitarius</i>
Cassin's Vireo	<i>Vireo cassinii</i>
Yellow-throated Vireo	<i>Vireo flavifrons</i>
Hutton's Vireo	<i>Vireo huttoni</i>
Warbling Vireo	<i>Vireo gilvus</i>
Philadelphia Vireo	<i>Vireo philadelphicus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Gray Jay	<i>Perisoreus canadensis</i>
Steller's Jay	<i>Cyanocitta stelleri</i>
Blue Jay	<i>Cyanocitta cristata</i>
Clark's Nutcracker	<i>Nucifraga columbiana</i>
Black-billed Magpie	<i>Pica pica</i>
Common Raven	<i>Corvus corax</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>
Mountain Chickadee	<i>Poecile gambeli</i>
Chestnut-backed Chickadee	<i>Poecile rufescens</i>
Boreal Chickadee	<i>Poecile hudsonicus</i>
Tufted Titmouse	<i>Baeolophus bicolor</i>
Bushtit	<i>Psaltriparus minimus</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>
Pygmy Nuthatch	<i>Sitta pygmaea</i>
Brown Creeper	<i>Certhia americana</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
House Wren	<i>Troglodytes aedon</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>
Golden-crowned Kinglet	<i>Regulus satrapa</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Eastern Bluebird	<i>Sialia sialis</i>
Western Bluebird	<i>Sialia mexicana</i>
Mountain Bluebird	<i>Sialia currucoides</i>
Townsend's Solitaire	<i>Myadestes townsendi</i>
Veery	<i>Catharus fuscescens</i>

(Continues on next page.)

Common Name	Scientific Name
Gray-cheeked Thrush	<i>Catharus minimus</i>
Bicknell's Thrush	<i>Catharus bicknelli</i>
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
Wood Thrush	<i>Catharus mustelinus</i>
American Robin	<i>Turdus migratorius</i>
Varied Thrush	<i>Ixoreus naevius</i>
Bohemian Waxwing	<i>Bombycilla garrulus</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Blue-winged Warbler	<i>Vermivora pinus</i>
Golden-winged Warbler	<i>Vermivora chrysoptera</i>
Tennessee Warbler	<i>Vermivora peregrina</i>
Orange-crowned Warbler	<i>Vermivora celata</i>
Nashville Warbler	<i>Vermivora ruficapilla</i>
Northern Parula	<i>Parula americana</i>
Yellow Warbler	<i>Dendroica petechia</i>
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
Magnolia Warbler	<i>Dendroica magnolia</i>
Cape May Warbler	<i>Dendroica tigrina</i>
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler	<i>Dendroica townsendi</i>
Black-throated Green Warbler	<i>Dendroica virens</i>
Blackburnian Warbler	<i>Dendroica fusca</i>
Pine Warbler	<i>Dendroica pinus</i>
Kirtland's Warbler	<i>Dendroica kirtlandii</i>
Prairie Warbler	<i>Dendroica discolor</i>
Palm Warbler	<i>Dendroica palmarum</i>
Bay-breasted Warbler	<i>Dendroica castanea</i>
Cerulean Warbler	<i>Dendroica cerulea</i>
Black-and-white Warbler	<i>Mniotilta varia</i>
American Redstart	<i>Setophaga ruticilla</i>
Prothonotary Warbler	<i>Protonotaria citrea</i>
Ovenbird	<i>Seiurus aurocapillus</i>
Northern Waterthrush	<i>Seiurus noveboracensis</i>

(Continues on next page.)

Common Name	Scientific Name
Louisiana Waterthrush	<i>Seiurus motacilla</i>
Connecticut Warbler	<i>Oporornis agilis</i>
Mourning Warbler	<i>Oporornis philadelphia</i>
MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Hooded Warbler	<i>Wilsonia citrina</i>
Canada Warbler	<i>Wilsonia canadensis</i>
Yellow-breasted Chat	<i>Icteria virens</i>
Scarlet Tanager	<i>Piranga olivacea</i>
Western Tanager	<i>Piranga ludoviciana</i>
Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Spotted Towhee	<i>Pipilo maculatus</i>
Vesper Sparrow	<i>Pooecetes gramineus</i>
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>
Fox Sparrow	<i>Passerella iliaca</i>
Song Sparrow	<i>Melospiza melodia</i>
Lincoln's Sparrow	<i>Melospiza lincolnii</i>
White-throated Sparrow	<i>Zonotrichia albicollis</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Lazuli Bunting	<i>Passerina amoena</i>
Rusty Blackbird	<i>Euphagus carolinus</i>
Pine Grosbeak	<i>Pinicola enucleator</i>
Purple Finch	<i>Carpodacus purpureus</i>
Cassin's Finch	<i>Carpodacus cassinii</i>
Red Crossbill	<i>Loxia curvirostra</i>
White-winged Crossbill	<i>Loxia leucoptera</i>
Pine Siskin	<i>Carduelis pinus</i>
Evening Grosbeak	<i>Coccothraustes vespertinus</i>