Migratory Bird Division
Canadian Wildlife Service
Québec Region

Québec's Landbird Conservation Strategy

Environnement Canada
Service canadien de la faune

Environment Canada
Canadian Wildlife Service

Canada

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PHOTOGRAPHS ON THE COVER

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Pileated Woodpecker: Léo-Guy de Repentigny
Boreal Owl: Bernard Jolicoeur
White-throated Sparrow: Christian Marcotte

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Introduction

The North American Bird Conservation Initiative (NABCI) aims to ensure that populations and habitats of North America's birds are protected, restored and enhanced through coordinated efforts at the international, national, regional and local levels guided by sound science and effective management. This joint initiative was launched in 1999 by Canada, the United-States and Mexico. NABCI integrates and coordinates the existing conservation initiatives for waterfowl, shorebirds, waterbirds and landbirds.

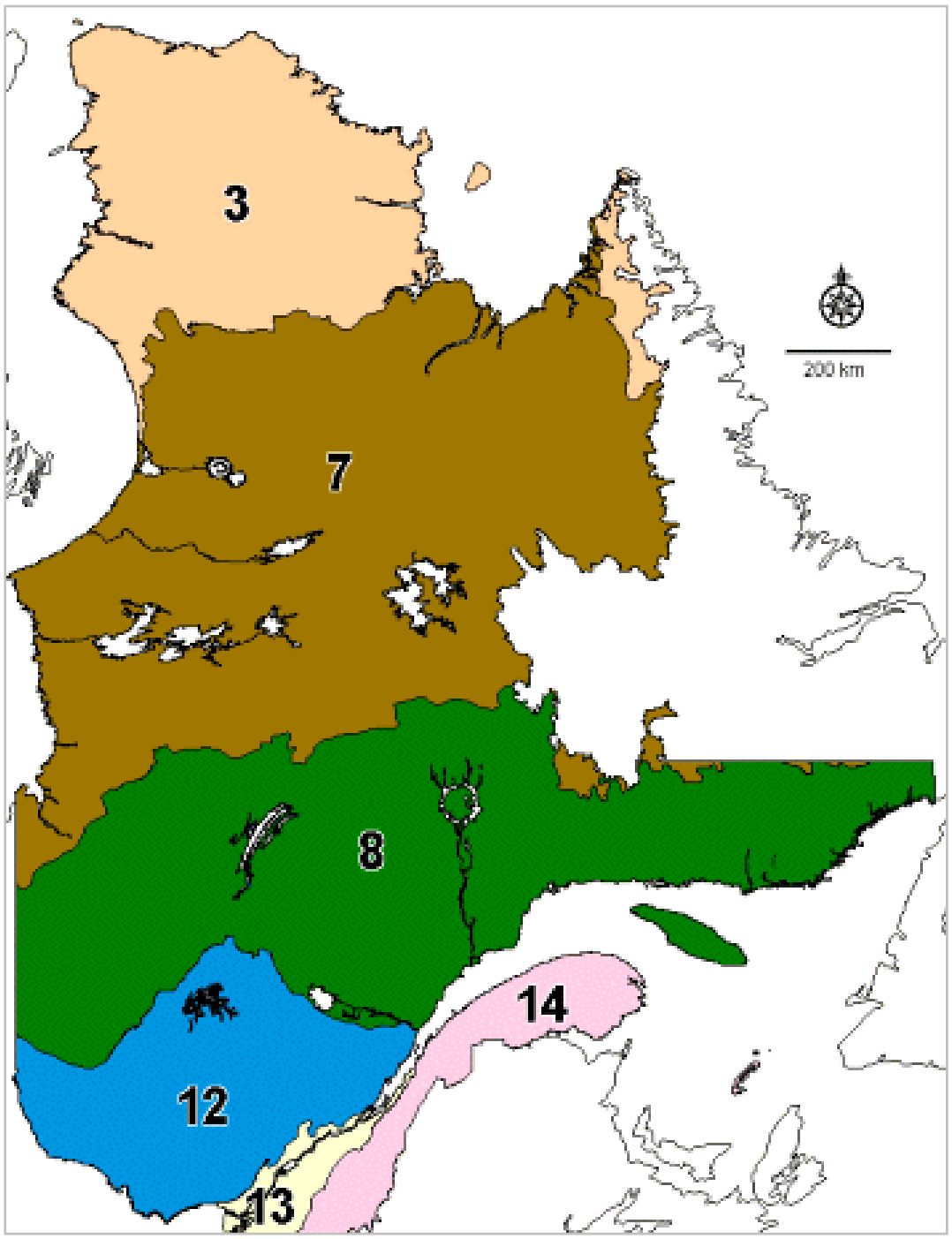
Bohemian Waxwing,
Christian Marcotte

Landbirds are the object of this document. Because of its legal mandate for the conservation of migratory birds, the Canadian Wildlife Service (CWS) plays a major role in the implementation of NABCI. Therefore, in reaction to the concerns identified for landbirds, CWS, in collaboration with numerous partners, has developed a National Landbird Conservation Program, better known as "Partners in Flight-Canada" (PIF). The goal of PIF, a NABCI framework program, is to ensure the long term viability of populations of native Canadian landbirds across their range of habitats. PIF collaborates with PIF U.S. and Mexico for the conservation of birds at the North American scale. PIF acts as the delivery tool of this Québec's Landbird Conservation Strategy (Strategy).

Respecting the national approach of Partners in Flight-Canada, the landbird's issues and challenges specific to Québec have been reflected in this Strategy. The Strategy is largely based on the Landbird Program Strategy and Action Plan of the Canadian Wildlife Service Prairie and Northern Region (Canadian Wildlife Service 2002). This document, as well as ours, respects the Canadian Landbird Monitoring Strategy (Downes *et al*. 2000).

The Strategy is intended to be an orientation document to facilitate discussion among interested partners towards the development of more detailed action plans. The action plans will describe the issues specific to species, ecosystems and land uses within each Bird Conservation Region (BCR). BCRs, based on the ecoregions, provide a framework for the implementation of NABCI at the regional level. In Québec, six BCRs highlight the multiple ecological facets of this vast territory of 1 667 926 km2 (Figure 1): BCR 14 (Atlantic Northern Forest), BCR 13 (Lower Great Lakes and St. Lawrence Plain), BCR 12 (Boreal Hardwood Transition), BCR 8 (Boreal Softwood Shield), BCR 7 (Taiga Shield and Hudson Plains) and BCR 3 (Arctic Plains and Mountains).

Figure 1: Bird Conservation Regions in Québec (adapted from http://www.bsc-eoc.org/international/bcrmain.html, Environment Canada, Canadian Wildlife Service, Québec Region, September 2002)



Landbirds in Québec

Birds represent one of the most visible and best documented components of biodiversity in North America. They actively contribute to ecosystem functionality (e.g. pollination, seed dispersion). Therefore, due to their visibility, the range and diversity of their habitats as well as their ecological role, birds are important indicators of ecosystems' health. There is also an increased awareness of the socioeconomic advantages provided by birds (e.g. hunting, observation, cultural role) which are at the rate of many million dollars annually (Filion *et al.* 1994).

Approximately 280 of the more than 420 Canadian breeding bird species can be classified as landbirds, i.e. having predominantly a terrestrial life cycle (Canadian Landbird Conservation Working Group 1996). In Québec, landbirds form the most diversified bird group, with approximately 180 breeding species. However, although they include some of the most familiar and best-loved birds in Canada, they have shown long term declines over the last decades (Collins and Wendt 1989, Robbins *et al.* 1989, Downes and Collins 2003).

Destruction, fragmentation and degradation of wildlife habitats are believed to be among the primary causes of these declines. Preserving the natural diversity of birds constitutes a major challenge in view of the great number of species occurring in habitats situated in several different countries throughout their biological cycle and, at the same time, the severity of the anthropogenic environmental changes taking place everywhere on the continent.

Horned Lark,
Jean-Luc DesGranges

The Strategy is a tool to initiate the development of conservation and action plans which will allow the implementation of conservation measures and the monitoring of population sizes. This Strategy also establishes the rationale for the landbird section of BCR conservation plans. Moreover, single-species conservation, action and management plans could be developed when necessary. Therefore, this document and the plans that will stem from it will guide CWS, Québec Region (CWS-Qc), and its partners in their efforts to maintain the diversity and abundance of landbirds in Québec.

Landbird conservation concerns

Landbird populations have been affected by numerous changes in their environment. However, our knowledge of landbird population trends and threats is limited by the complexity of ecosystems. In fact, anthropogenic factors that influence natural rhythms add a level of complexity to the multiple linked components of ecosystems.

Information on breeding population sizes is based on less than 50 Breeding Bird Survey (BBS) routes, a North American avian program initiated in the 1960s. Approximately twenty routes show temporal sequences long enough to be included in the calculation of trends. However, BBS only partially covers southern Québec, i.e. the St. Lawrence valley and the watershed of a few tributaries.

The Atlas of the Breeding Birds of Southern Québec (Gauthier and Aubry 1996) presents a synthesis of the knowledge on birds of northern regions based on published information, most of which came from studies conducted by Hydro-Québec but are primarily based on punctual data, such as is found in the database "Étude des populations des oiseaux du Québec" (ÉPOQ) which contains million of observations by bird watchers.

Christmas Bird Counts (CBC) also provide data on winter residents. However, in Québec, as in the case of BBS, they are almost entirely located in the St. Lawrence valley.

Briefly, the available information on trends is restricted to southern Québec and arises from three main sources: BBS, Atlas of the Breeding Birds of Southern Québec and ÉPOQ database. Therefore, trends of widely distributed species are based only on inventories conducted in the southern part of the province and those of northern species are poorly documented.

Managers must use adaptive management to respond to landbird needs, which are part of an ecosystem constantly evolving. Despite the lack of knowledge on landbirds, it is possible to identify certain issues responsible for the observed declining trends. The following sections enumerate the multiple threats influencing landbird species according to four broad environment types typical of the province of Québec: urban environment, agri-environment, forest environment and northern environment. These diverse issues will be described in details, by BCR, in the action and conservation plans. Although not exhaustive, this exercise allows a better understanding of the main conservation challenges specific to each environment.

URBAN ENVIRONMENT (BCRs 13, and parts of 14, 12, 8, 7, 3)

St. Lawrence valley

The St. Lawrence River and its shores create a natural migration corridor for several species of birds. Meanwhile, Québec's inhabitants are mainly concentrated in the St. Lawrence valley. In fact, approximately 95% of the population is distributed in a few major cities along the St. Lawrence River. Consequently, this area supports the greatest diversity of human activities having impacts on wildlife.

American Goldfinch,
Christian Marcotte

In response to Québec's population growth, human expansion occurred to the detriment of natural areas, which led to the decline of avian diversity. Moreover, our history of French urban design has not favoured the presence of natural parks in cities. Therefore, despite the fact that a few large cities have conserved some natural aspects propitious to certain bird populations (Morneau *et al.* 1999), the urban environment offers, in general, few good habitats for birds. The province of Québec shows a certain delay in relation to urban forestry in its main urban centers. For example, some North American parks benefit from conservation measures, such as snag retention. The enhanced diversity of bird habitats in urban parks could increase the presence of birds in adjacent residential areas (Clergeau *et al.* 2001). Reconciling nature and human needs usually enhances the quality of life in cities (Savard *et al.* 2000). Briefly, urban areas can be considered as ecosystems. They are characterized by a high bird diversity. Thus they contribute significantly to the populations of several species and deserve a special attention.

Additionally, landbird mortality in the urban environment is increased significantly by anthropogenic factors such as collisions with high infrastructures and vehicles, involuntary poisoning due to, for example, the spreading of pesticides for the maintenance of lawns and gardens, human disturbances leading to the desertion of nests, and predation by pets.

Elsewhere in Québec

Elsewhere in the Province, as we go further north, urban centers are smaller and more dispersed, and north of James Bay they are mainly located in coastal areas. However, these agglomerations give rise to numerous human activities which may have substantial local impacts on birds depending on the species.

AGRI-ENVIRONMENT (BCRs 13, and parts of 14, 12, 8, 7)

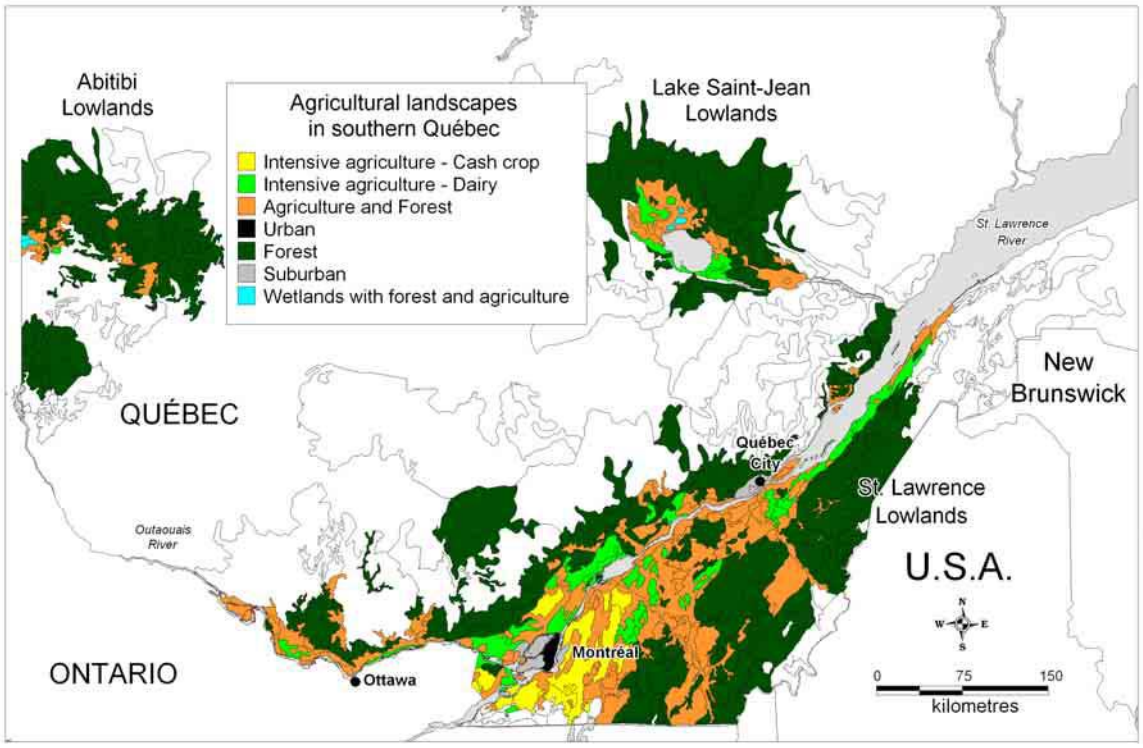
Toward the middle of the XXth century, the numerous open environments created by traditional farming practices favored the establishment of several species specialized on pastures and grasslands. Today, even though the agri-environment still covers 26% of the St. Lawrence valley (Bélanger *et al.* 1999), the diversity and quality of open areas have decreased. As it is often observed, the degradation and fragmentation of agri-environments affect species requiring large sectors to breed, such as the Upland Sandpiper.

In regions where land quality restricts agricultural yields such as in eastern Québec, the Appalachians and many sectors in Abitibi, a great number of farmlands have been abandoned resulting in forest regeneration. Consequently, grassland associated bird species have been replaced by species adapted to seral habitats and forested areas. However, moving south-west, small-scale farming has been replaced by intensive agriculture where corn or soybean monocultures occupy enormous areas. The conversion of traditional pastures and grasslands into commercial farming has led to the destruction of important bird habitats, such as shelterbelts, buffer strips, woodlands and small marshes. We observe a clear intensity gradient of agricultural practices along a "north-east south-west" axis in the St. Lawrence valley (Jobin *et al.* 2003). Agricultural lands in the Montréal periurban area are under intensive production, leaving less room for traditional grassland bird communities.

Farming also covers important sectors in the Abitibi lowlands and Lake Saint-Jean, but practices are less intensive (Figure 2).

The conversion of grasslands, pastures and woodlands into intensive cultures has led to bird habitat degradation, destruction of breeding cover and alteration of feeding areas of many landbird species. This has caused the decline of landbirds associated with dairy farms such as several species of sparrows and swallows, Bobolinks and Eastern Meadowlarks (Jobin *et al.* 1996; Falardeau and DesGranges 1991; Jobin *et al.* 1998; DesGranges *et al.* 1994). Moreover, the number of crop harvests in a year has increased over time and the first harvest occurs sooner. When harvesting coincides with the breeding period of grassland birds, it may become a significant mortality factor. Furthermore, in comparison to grasslands traditionally dominated by millet, new cropping practices, such as the culture of alfalfa or other grass seedlings, have had various impacts on land uses by species visiting the agri-environment.

Figure 2: Distribution of agricultural landscapes in the St. Lawrence Lowlands, Lake Saint-Jean and Abitibi (Jobin et al. 2003)



Blackbirds take advantages of the resources offered by certain cultures. The presence of these birds may be detrimental to producers and townsmen, particularly when blackbirds invade crop fields during their migration or roost in cities or their surroundings.

Additionally, the use of chemical and biological products for agricultural purposes can reduce considerably food resources by killing insects and other invertebrate populations. These products contaminate birds either indirectly, for example by water quality degradation, or directly, by the ingestion of toxins.

In the agri-environment, agricultural wildlands are often neglected in terms of conservation, even if they offer essential habitats for many declining species such as Brown Thrasher, Golden-winged Warbler and Field Sparrow (Downes and Collins 2003, Sauer *et al.* 2003). The loss of agricultural wildlands, combined with the fact that they are transitional in nature and that they receive little importance for conservation in general, could, in part, be responsible for these declines. As natural shelterbelts, riparian strips contribute to the survival of certain bird populations (Deschênes *et al*. 2001, Jobin *et al.* 2003).

The intensification of farming practices is also directly associated with wetland degradation. Destruction of large marshes seems to have stopped since the last decade, but destruction of smaller wetlands still persists through agricultural drainage and loss of woodland borders for

the establishment of larger productive areas (Desponts 1995). Moreover, cranberries producers are increasingly interested in unexploited peat bogs in order to increase production. Wetlands are essential for many landbird species; in Québec, during migration for example, they are used by six species of swallows, which represent millions of individuals.

These different issues are partly the reason why most plant and animal species at risk in Québec are associated with agricultural landscapes in southern Québec (Dunn *et al.* 2000; Askins 1993).

Bank Swallow colony,
Christian Marcotte

FOREST ENVIRONMENT (BCRs 13, 14, 12, 8, 7)

In Québec, 1 229 324 km2, more than 70% of the landmass is covered by forests (Ministère des Ressources naturelles, de la Faune et des Parcs du Québec 2003). The crown owns approximately 90% of the forest, of which half is composed of productive forests that are accessible for logging. Issues and challenges encountered by forest landbirds are grouped within two types: deciduous and boreal.

Deciduous forest

The warmest climatic conditions of our province prevail in the deciduous forest. This forest hosts about fifty tree species, dominated by hardwood species, such as maples, birches and aspens (Ministère des Ressources naturelles, de la Faune et des Parcs du Québec 2003). Nevertheless, a certain number of coniferous trees grow in the southern forests of Québec: white and red pines, hemlock, red spruce and cedar. Forest stands are generally composed of trees of various ages, but most are young. Trees in the deciduous forest can grow to impressive dimensions, but unfortunately, only a few specimens can still be observed today. However, this region still has some of the most beautiful broadleaved woodlands in Québec.

Deciduous forest,
Luc Bélanger

Because Québec's population is concentrated along the St. Lawrence valley, agriculture intensification coupled with urbanization has led to the deforestation, fragmentation and isolation of the deciduous forest (Bélanger and Grenier 2002, Société de la faune et des parcs du Québec 2002). Logging practices in the deciduous forest are mostly controlled by the private sector. Actually, farm woodlots compose the majority of the forested parcels of land and few old growth forests remain. During the last decades, the destruction of farm woodlots has, among other things, accelerated following an increase in pig farming and its needs for fields to dispose of the manure (Société de la faune et des parcs du Québec 2002). This resulted in the fragmentation of hardwood forest stands threatening bird species requiring large continuous forested areas.

Woodlot owners prefer rapidly growing conifer trees, such as balsam firs, over slower growing deciduous trees. The disappearance of hardwood stands and the even-aged structure of the remaining stands reduce the availability of habitats for birds associated with deciduous forests. In the St. Lawrence valley, the presence of large mature deciduous woodlands is essential for many species limited to southern Québec, such as the Wood Thrush, Scarlet Tanager and Cerulean Warbler.

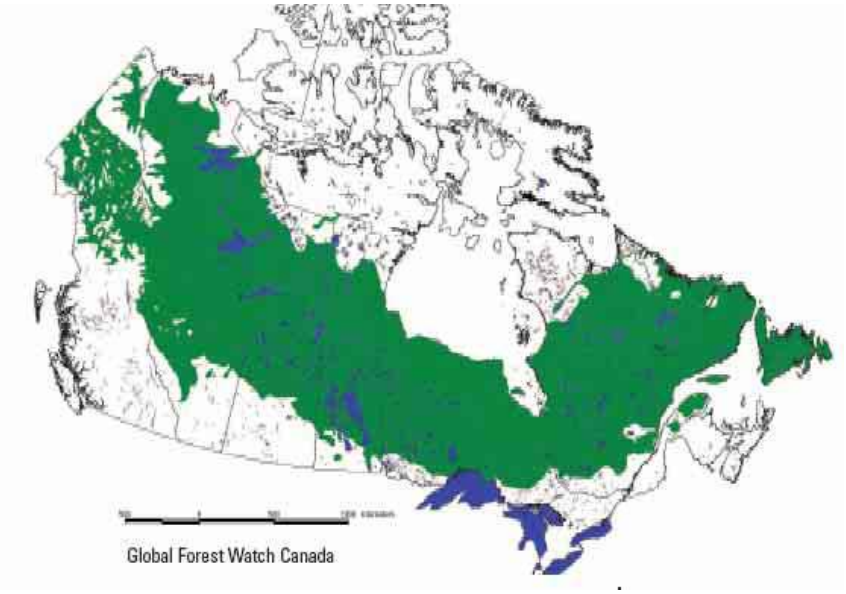
Moreover, the elimination of large trees and snags is a logging technique currently used in the St. Lawrence valley, especially in the maple syrup industry. The rarity of these structural elements affects several species such as woodpeckers and some raptors. Standing dead trees are at the base of the biological recycling done by bacteria, mushrooms, lichens and insects on which many bird species feed on. Also, more than twenty landbird species excavate cavities in the trunk of these trees to nest.

To these direct impacts of anthropogenic activities on landbirds, we must add the degradation of residual forests by acid rain (Darveau *et al.* 1997) and ice storms (Blais *et al.* 2001).

Boreal forest

Within the context of NABCI, the boreal forest is composed of the mixed forest dominated by balsam fir, the continuous boreal forest and the open boreal forest, both dominated by black spruce. Coniferous forests of the Appalachians and Gaspésie have been grouped under the name "Atlantic Northern Forest" because of their boreal character (Figure 3).

Figure 3: Canada's Boreal Forest Region, with permission from the Boreal Canadian Initiative, December 2003



Mixed forest

The mixed forest marks the transition between the deciduous and the continuous boreal forests. The forest cover is composed of hardwood and softwood species and is dominated by balsam fir, yellow birch and white birch. White and red pines are at the northern limit of their distribution and sugar maples grow on slopes and tops of hills. In this southern part of the boreal forest, spruce budworms are an important factor in the dynamics of balsam fir stands.

Certain species of birds, such as the Blackburnian Warbler, seem to prefer mixed forest stands to pure hardwood or softwood stands (Girard *et al.* in prep.). These species could then be affected by logging and the often resultant regeneration of mixed forest stands into pure stands. These practices can lead to the homogenization of the forest and therefore reduce the structural diversity necessary for these birds. These issues present a challenge for the conservation of the mixed forest as some associated tree species require quite specific conditions to grow.

Continuous boreal forest

The continuous boreal forest covers more than two thirds of the forested area of the province (Ministère des Ressources naturelles, de la Faune et des Parcs du Québec 2003). It is composed of relatively dense stands of balsam firs, black and white spruces, jack pines and tamaracks, and shade intolerant hardwoods such as white birchs, trembling aspens and balsam poplars. These hardwoods are associated with successional communities established after a disturbance (fire, windfall, insect infestation, forestry).

The continuous boreal forest shelters more than one hundred landbird species distributed according to the nature and age of forest stands, the presence of undergrowth, sun exposure, moisture content, etc. Certain species are ubiquitous whereas others are closely linked to one or many of these factors which limits their abundance or restrict their distribution to specific habitats.

However, the boreal forest has been logged for many decades. The continuous boreal forest is essentially public. The Québec government gives contracts called Timber Supply and Forest Management Agreements (TSFMA). Logging and forest regeneration have greatly altered forested landscapes and hence the diversity of associated landbird species (Drapeau *et al.* 2000, 2001). For example, the Golden-crowned Kinglet, Brown Creeper, Boreal Chickadee and Three-toed Woodpecker all show diminishing population sizes due to the depletion of mature and overmature stands (Drapeau *et al.* 2003). Moreover, the systematic elimination of structural elements such as standing dead trees and wood residues affects many population of landbirds (Darveau and Desrochers 2001; Drapeau *et al.* 2002).

The recurrence of fire and insect outbreaks are part of the boreal forest's natural biological cycle, but they threatens the stability of wood supply for forest industries. During the last decades, efficient mechanisms have been put in place to control these disturbances. Thus, natural rhythms have been significantly altered threatening the original biological diversity. For example, the Black-backed Woodpecker prefers the recently burned forest with mature trees; these forest stands are unfortunately targeted for recuperation (Nappi *et al.* in press).

Boreal forest,
Daniel Bordage

Our relative success in the control of natural cycles can not be extrapolated to other scales. Climate change could have unexpected impacts on landbird populations. It may be beneficial for certain species, but detrimental to others. Already, some species such as the Boreal Chickadee and the Gray Jay, two residents of the boreal forest, show signs of population declines.

The openings created by power lines and forestry roads have favored the expansion of skunks, raccoons, crows and starlings. These predators threaten some populations of forest landbirds (Darveau *et al.* 1997; Boulet and Darveau 2000).

Additionally, contamination problems in the boreal forest are still recorded (DesGranges 1989). The reinsertion of heavy metals such as mercury into the food chain due to, for example, the flooding of forested areas for the establishment of reservoirs, still prevails (DesGranges *et al.* 1998; DesGranges *et al.* 1999). Moreover, acid rains affect certain bird populations. Also, mine tailings are problematic, especially in Abitibi (L. Champoux pers. comm.). The cumulative impact of these contamination sources could be significant.

OPEN BOREAL FOREST ENVIRONMENT AND NORTHERN ENVIRONMENT (BCRs 7, 3)

The open non commercial boreal forest covers a vast territory composed of tundra on the plateaus and conifers in the valleys in the southern part, and mainly tundra in the northern part. As latitude increases, forest buffer strips are replaced by smaller trees and shrubs and then only subsist in protected valleys. The vastness of this territory compensates for its low productivity. The northern environment contributes therefore greatly to the global population size of many landbird species.

Lapland Longspur,
Jean-Luc DesGranges

The issues and challenges related to the tundra and taiga environments differ from those encountered in the commercial forest. Although the open boreal forest is less accessible, hence offering a certain protection, it appears that the openings created by the establishment of roads and transport corridors for hydroelectric and mining projects affect the composition of bird communities, but at different scales. And finally, the northern environment is often identified as the most vulnerable to climate changes.

Briefly, our knowledge of landbirds associated with the northern environment is limited. Despite the efforts made, the main studies remain too localized and therefore, our knowledge is too fragmentary for the majority of landbird species. Even if certain species of raptors and game birds, such as ptarmigan, are better documented, the available information is nevertheless incomplete, partial, and punctual. A better knowledge of the dynamics of these populations and their habitats is essential to maintain the diversity of bird communities in the northern environment.

Evening Grosbeak,
Christian Marcotte

Québec's Landbird Conservation Strategy

Goal

With its Five-year Action Plan for the implementation of NABCI in Québec (Bélanger *et al.* 2003), the Canadian Wildlife Service, Québec Region, supports and values the protection of all birds and all habitats in Québec. The goal of this Strategy fits in this context: to maintain the diversity and abundance of Québec's landbirds.

Strategic Orientations

The Canadian Wildlife Service, Québec region, has defined four strategic orientations for the conservation of landbirds in Québec: 1) monitoring; 2) research; 3) conservation; and 4) education and awareness. These strategic orientations are in accordance with NABCI's vision for the protection of all birds and all habitats in Québec.

This Strategy does not pretend to cover every issue and challenges, but it is a mean to start discussions on landbird conservation to establish action, conservation and management plans in collaboration with numerous partners. These future plans will identify the conservation measures specific to each BCR. Moreover, they will prioritize species, habitats, and geographic areas in a hierarchical manner. They will also identify short-term and long-term action items. Finally, they will seek to maintain an equilibrium between a reactionary approach (based on urgency, i.e. abundance, threats, distribution, etc.) and a proactive approach (based on other criteria, i.e. economic, level of knowledge, possibilities of partnership, importance of species, etc.). The identified actions under each strategic orientation are thus examples and will be refined and modified with the involvement of the different partners.

Monitoring

Strategic orientation 1

It is essential to fill the knowledge gaps on Québec's landbirds by adequate monitoring programs. Proper knowledge of changes in distribution, abundance, demography and habitats is necessary to identify efficient conservation actions and measure their efficiency.

Great Horned Owl nest, Jean-Luc DesGranges

Potential actions

Action 1a: Identify species and geographic areas that require additional knowledge.

In Québec, our knowledge of bird distribution, trends and habitat uses in boreal and northern regions is deficient because the majority of monitoring programs take place in the southern regions. We have also less information on the extent and localization of migration corridors, staging and wintering areas than on breeding areas. Therefore, efforts must be allocated to fill these gaps.

Action 1b: Improve or expand existing surveys, or develop new surveys, to address priority gaps in species or geographic coverage.

It is important to review existing monitoring programs to improve their global coverage in terms of habitats and species monitored (Hétu *et al.* 2002) and taking into account needs, costs, logistic feasibility, human resources availability (professional and amateur birdwatchers), etc. For example, the review of actual monitoring programs and the establishment of new programs should consider species which are not covered by inventories, such as diurnal raptors and some nocturnal birds as well as landbirds using wetlands. Furthermore, for some species, the monitoring level should include more then trends, i.e. abundance, reproductive success and survival rates.

It would be important to promote the use of checklists across the whole province (BCRs 14, 12, 8, 7, 3) in order to increase the coverage of the EPOQ database, managed by the *Association québécoise des groupes d'ornithologues* (AQGO).

Likewise, the Breeding Bird Survey (BBS), coordinated by CWS in Canada, should be expanded to better cover the boreal forest (BCRs 14, 8, 7). BBS is one of the rare tools providing a large scale overview of population trends for several landbirds. The presence of recently built forestry roads offers an opportunity to improve coverage in this region.

The Christmas Bird Count (CBC), coordinated by Bird Studies Canada, is a useful tool to follow population trends of winter bird residents in Québec. A greater participation of birdwatchers in the northern regions (BCRs 14, 12, 8, 7, 3) would help us obtain a better idea of bird distribution in winter.

The potential of migration monitoring stations as a tool to follow landbird populations of the boreal forest and the northern regions should be fully evaluated in order to be recognized (Savard and Ibarzabal 2001; BCRs 8, 7, 3). The Canadian Migration Monitoring Network has been developed to detect bird population trends from poorly accessible regions. Some bird population trends are solely based on the interpretation of these data. In Québec, the only station is located near Tadoussac (Savard and Ibarzabal 2001). Other sites should be developed to monitor a greater number of species. Updating the Atlas of the Breeding Birds of Southern Québec should also be considered and evaluated.

Landbirds are good indicators of the health of our ecosystems; on the one hand, their mobility allows them to react quickly to environmental changes and, on the other hand, they can easily be observed. Monitoring of the structure (species composition, richness and abundance) of bird communities across time and space would document changes in ecosystems (BCRs 13, 14, 12, 8, 7, 3). Such monitoring would facilitate the modeling of the impact of climate changes on bird communities.

Moreover, the establishment of a monitoring program for species whose optimal habitat is limited could help orient the actions to maintain viable populations (BCRs 13, 14, 8, 7). As some habitats are affected by the homogenization of forest stands, it would be important to monitor these habitats temporally and spatially. In fact, because bird conservation measures usually concentrate on habitat management rather than population management, we should also evaluate the possibility to follow habitats within the framework of existing bird monitoring programs.

Action 1c: Encourage research on monitoring to ensure continued improvement in sampling design, data collection protocols, analysis procedures, etc.

Methodological improvements of monitoring programs would help reduce many biases and thus facilitate comparisons among different programs, and between years. For example, it would be interesting to develop new precise methods to follow landbird populations through time, especially in remote and northern regions (BCRs 14, 12, 8, 7, 3). In fact, population monitoring throughout the vastness of the boreal forest poses important logistical and financial constraints. The use of geomatics (geographic information system, airborne and spaceborne imagery) combined with efficient statistical and modeling methods (DesGranges *et al.* 2001) would be useful to design optimal sampling schemes. Methods based on volunteer participation need to be carefully evaluated as to the soundness of the data collected, i.e. as to their potential and limitations.

Moreover, the coordination of monitoring programs would ensure efficient use of human and financial resources, sharing of knowledge and would facilitate understanding of population dynamics throughout the annual life cycle.

Action 1d: Train and encourage volunteers to participate in monitoring surveys.

Monitoring programs are strongly volunteer-driven in populated areas. Thus a particular attention should be given to data collection and analysis and to adequate training of volunteers. Likewise, forestry partners interested in undertaking voluntary wildlife monitoring programs should be provided with supervision or expertise to improve the quality of the information collected in the field. Incentives are thus necessary to encourage participation to monitoring programs. Participation possibilities must be announced and recognized. The use of different technologies, such as the Internet, to promote participation and training is fundamental, particularly to establish a network of observers in remote regions such as northern Québec. Moreover, in regions where it is impossible to involve enough volunteers, automated listening stations could be developed as an inventory tool.

Action 1e: Ensure that monitoring results are available and used for research and conservation.

Original databases, including metadata, should be made available to everyone to maximize use of the data. Moreover, the regular compiling, interpretation and reporting of monitoring data would help maintain volunteer interest as well as encourage use of the data by scientists and managers.

Finally, it is important to mention that partnerships with people in the field lead towards concrete research, conservation and management actions. Although monitoring programs cannot occasionally identify the causes of the detected changes, they serve important function in identifying some research priorities.

Spruce Grouse,
Christian Marcotte

Research

Strategic orientation 2

Scientific research allows the understanding of many issues concerning the conservation of landbirds by looking at, for example, bird species biology, habitat dynamics, different potential threats to survival, etc. A greater understanding of the complete life cycle of landbirds certainly leads to better management of their populations. Research is essential to identify the causes of the trends observed by the monitoring programs in order to put in place adequate conservation measures. Well documented research projects can also be used in an irregular or even regular monitoring framework when the research is replicated in the future.

Potential actions

Action 2a: Study landbird population status in regard to national conservation priorities (BCRs 14, 13, 12, 8, 7, 3).

At the continental and national level, many landbird species have been identified has priority species. We need to identify the size of breeding populations in Québec, the importance of the preferred habitats (in terms of extent and distribution), the wintering areas and the migratory corridors used. Understanding the ecology of these species is essential to evaluate the impacts of natural resource development projects and to propose mitigation measures.

Action 2b: Determine the needs, in terms of essential habitats, to maintain bird populations, especially in the St. Lawrence valley and in the boreal forest (BCRs 13, 14, 12, 8, 7, 3).

Conservation actions are often based on habitat management. It is necessary to understand the critical components of habitats to ensure bird reproduction and survival. The loss of hardwood stands in the St. Lawrence valley has reached a level at which certain species could possibly express difficulties to survive. The elimination of stumps in many remaining woodlots is also a threat to bird reproductive success. Moreover, our knowledge of habitats, especially in the boreal forest, is even more limited.

Briefly, understanding the ecological processes governing these habitats and the requirements specific to each species is fundamental to adequately manage the diversity of this vast territory. Because species often used more than one habitat throughout their life cycle and that habitat quality varies between years, it is important to document the role of each habitat for a given species and this over several years.

Action 2c: Study the specific and cumulative impacts of the different anthropogenic development activities on bird populations (BCRs 14, 8, 7).

There is an obvious need to understand the impacts of human activities on landbirds. In Québec, the intensity, frequency and severity of these activities vary considerably from one region to another. It is important to take advantage of this diversity to distinguish anthropogenic threats from natural disturbances on landbird reproductive success. Also, the impact of climate changes is still relatively unknown. The presence of pristine boreal forests constitutes a great opportunity to evaluate the changes susceptible of affecting wildlife. The impact of climate changes could also be significant in different parts of the province due to an increase of degree-days which could modify the agricultural landscape as well as the northern and forest landscapes.

Pine Grosbeak,
Léo-Guy de Repentigny

Conservation

Strategic orientation 3

Information obtained from monitoring and scientific programs will lead to the development of conservation actions which will identify, protect, and manage the habitats essential for the maintenance of viable landbird populations in Québec. Action plans developed with partners will identify needed actions and regroup them according to: priority species, priority regions, habitats and issues. We enumerate here only a few of the possible actions to ensure the protection of landbirds in Québec.

Potential actions

Action 3a: Support policies and processes which favour the sustainable use of natural resources (BCRs 13, 14, 12, 8, 7, 3).

Because of their diversity, their population dynamics and their mobility, birds do not always respond perfectly to traditional conservation actions. A community approach must be superposed to more classic species approaches. Conservation efforts must be directed at several scales (i.e. regional, landscape and local) to ensure that sufficient habitats are adequately distributed in the breeding area to meet bird community needs. The landscape approach requires a planning methodology which favours the sustainable development of resources. Within this context, CWS-Qc could influence land planning to better respond to birds' needs, for example, by encouraging competent authorities to modify or adopt laws, regulations, policies and practices beneficial to bird populations and which support the objectives of the action and conservation plans.

In the same manner, environmental impact assessments for land development projects offer an opportunity to intervene in land management in favour of bird conservation, particularly during the establishment of conservation measures to minimize impacts on birds and their habitats.

Dark-eyed Junco,
Léo-Guy de Repentigny

Action 3b: Participate in existing conservation efforts and initiate new partnerships for the conservation of landbirds.

Extended partnerships favor the synergy of bird conservation activities by sharing of knowledge and enhancing collaboration opportunities. It is important to encourage existing partnerships efforts and initiate new ones if necessary. Moreover, it would be equally important to watch for new funding opportunities at the international, national and regional levels from which landbird conservation could benefit.

Education and awareness

Strategic orientation 4

Even if the education of individuals and organizations is inherent to the partnerships for bird conservation, it must be sustained and promoted. However, education is often based on scientific knowledge that is not accessible to the majority of the population. We must correct this difficulty to access information because it generates myths and misconceptions which are often translated into non appropriate bird conservation actions.

The conservation of landbirds in Québec depends also on the involvement and aptitudes of those interested. The success of the Strategy thus depends on a number of elements ranging from general public outreach to the active commitment of distinct partners (e.g. financially). Outreach must therefore join and involve a large spectrum of stakeholders and actions.

Potential action

Action 4a: Establish a communication program for the conservation of landbirds (BCRs 13, 14, 12, 8, 7, 3).

There exist many different potential outreach tools for the general public, land management stakeholders and wildlife partners to increase awareness on the importance of the conservation of landbirds and their habitats in Québec. According to the audience, it is possible to publish articles in general science magazines and in scientific journals, to diffuse information during events, to make presentation in schools, to produce diverse outreach documents such as posters, information leaflets, Internet pages, etc. The conservation and action plans will detail the elements of the communication program. For example, the monitoring programs initiated by Environment Canada's Biosphere and EMAN (Ecological Monitoring and Assessment Network) involving local people could be developed in order to include the monitoring of birds.

Conclusion

Québec's Landbird Conservation Strategy, as proposed by CWS-Qc, is flexible in order to facilitate the collaboration of everyone. The Strategy must be considered as a working document to favor discussion among the interested parties. The diverse strategic orientations proposed intend to pinpoint the specific issue particular to Québec's landbirds in order to reach the objective of maintaining the diversity and abundance of landbirds throughout the territory in the near future.

The Strategy cannot alone identify every issue and challenge related to landbirds and offer all the answers. In collaboration with numerous partners, the Strategy must lead to the development of more detailed conservation and action plans. These plans should take into account, for example, the problems specific to each species, ecosystems and land uses in each Bird Conservation Region (BCR). Therefore, these future plans will list the actions to be taken in order to incorporate the regional specifications of each BCR.

The consultation of interested partners and stakeholders will be facilitated by a cooperative network for the conservation of birds and their habitats in Québec, entitled "The Flight" and coordinated by CWS-Qc. To get more information on this network and on NABCI, it is possible to consult the CWS-Qc NABCI Internet site at the following address: http://www.qc.ec.gc.ca/ICOAN-NABCI/ICOAN-NABCI.html.

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