

Action Plan for the Red Crossbill, *percna* subspecies (*Loxia curvirostra percna*) in Canada

Red Crossbill (*percna* subspecies)



2011

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PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies and action plans for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers for the recovery of the Red Crossbill and have prepared this action plan to implement the recovery strategy, as per section 49 of SARA. It has been prepared in cooperation with the Newfoundland and Labrador Department of Environment and Conservation.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment Canada and the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the Red Crossbill and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

ACKNOWLEDGMENTS

The obvious thank you is to the former Red Crossbill Recovery Team for its dedication to the conservation of Red Crossbill. Thanks also go out to all the Environment Canada, Canadian Wildlife Service staff who assisted in the development of this document, including Andrew Boyne, Kim Mawhinney, and Kevin Davidson. A special thank you to Jennifer Burley for writing the socio-economic analysis section of the document.

EXECUTIVE SUMMARY

The Red Crossbill (*Loxia curvirostra percna*) was listed as an Endangered species under the *Species at Risk Act* in May 2005. A Recovery Strategy was posted on the registry in October 2006. The goal of the Recovery Strategy for the Red Crossbill, *percna* subspecies (*Loxia curvirostra percna*) (Environment Canada 2006) is to **restore the species to a self-sustaining population level whereby it is able to withstand stochastic events**. Associated with this goal were three sub-goals: to prevent extirpation of the *percna* subspecies from the island of Newfoundland, to reduce threats such that the population size can be enhanced to a self-sustaining level, and to manage sufficient Red Crossbill habitat to meet the goal.

Very little information is known about the basic ecology of this species as well as its habitat preferences. Until more information is available for this subspecies, initial recovery actions will emphasize the objectives outlined in the Recovery Strategy associated with research and monitoring, with secondary priorities placed on habitat use assessment, outreach, and communication. Critical Habitat is not identified in this Action Plan.

This Action Plan addresses specific actions needed to implement the recovery approaches outlined in the Recovery Strategy, however, it clearly recognizes that the last three approaches below will only be undertaken pending the outcome of the first two approaches. The recovery approaches are:

1. Confirm presence of *percna* subspecies
2. Determine survey areas
3. Develop survey protocols to initiate long-term monitoring
4. Promote public awareness
5. Enhance habitat

Confirmation of the subspecies' presence and acquiring a sense of their distribution are required before moving forward with the remaining recovery approaches. A schedule of studies to identify critical habitat is included but is contingent upon the confirmed presence of the subspecies. An implementation schedule has been developed to outline the priority action items, the timelines for implementation, and the key players in the implementation process.

A socio-economic evaluation of the recovery effort has been conducted. Critical habitat has not been identified and as a result this analysis is limited to highlighting the socio-economic characteristics of potential threats. Within this action plan a number of actions have been identified to meet the recovery objectives and goals. While there are no indirect costs or economic impacts on industry as a result of this action plan, direct costs estimated to implement the activities within this action plan are estimated to cost \$324,000. However, the first two approaches, which are the only two to be implemented initially, would cost substantially less - \$161,000.

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1. SYNOPSIS OF THE RECOVERY STRATEGY AND UPDATE

For full details, please see the associated recovery strategy.

1.1 Associated Recovery Strategy

Environment Canada. 2006. Recovery Strategy for the Red Crossbill, *percna* subspecies (*Loxia curvirostra percna*), in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vii + 29 pp.

Available on the Species at Risk Public Registry (www.sararegistry.gc.ca).

1.2 Species Assessment Information from COSEWIC

Date of Assessment: May 2004

Common Name (population): Red Crossbill (*percna* subspecies)

Scientific Name: *Loxia curvirostra percna*

COSEWIC Status: Endangered

Reason for Designation: The *percna* subspecies of the Red Crossbill is considered a distinctive taxonomic group, with breeding likely restricted to the island of Newfoundland. Various population estimates suggest that it has declined markedly and steadily over the last 50 years along with declines in the extent and quality of its habitat. A few records of the *percna* subspecies exist for Nova Scotia and other locations, but there is not enough information to determine its status there.

Canadian Occurrence: Newfoundland

COSEWIC Status History: Designated Endangered in May 2004.

1.3 Description of the Species

Red Crossbills are medium-sized finches with crossed mandibles; they are distinguished from other North American Red Crossbills by their larger body, stouter bill, darker/duskier plumage, and unique vocalization.

1.4 Populations and Distribution

Red Crossbills (*percna* subspecies) are associated with coniferous forests on the island of Newfoundland. Populations are eruptive and highly transient. As a result, annual locations of the birds may change and are associated with the abundance of conifer cone production. In 2004, the population of the *percna* subspecies in Newfoundland was estimated at 500–1500 individuals (COSEWIC 2004).

For more comprehensive information on the global and greater North American Red Crossbill distribution, refer to the COSEWIC assessment (COSEWIC 2004) and the recovery strategy (Environment Canada 2006).

1.5 Threats

Threats to the Red Crossbill (*percna* subspecies) are not entirely clear due to the lack of information available for this subspecies. The threats to the Red Crossbill *percna* include habitat loss or degradation (tree diseases, forest fires, tree loss from insects, forest conversion from fire suppression, reduced cone production from spruce budworm, forest loss from urbanization and agriculture, and tree harvest from forestry), exotic or invasive species (food competition from red squirrels), and changes in ecological dynamics or natural processes (nest predation from jays and squirrels, competition from seed-eating finches, and the Allee effect¹).

1.6 Goals and Objectives for the Red Crossbill (*percna* subspecies)

1.6.1 Goals

The goal of the Red Crossbill Recovery Strategy (Environment Canada 2006) is to **restore the species to a self-sustaining population level whereby it is able to withstand stochastic events**. Three sub-goals were identified that will need to be met to accomplish this goal:

1. Prevent extirpation of the *percna* subspecies from the island of Newfoundland.
2. Reduce more complex and root causes of threats to the species, such that the population size can be enhanced to a self-sustaining level.
3. Manage sufficient Red Crossbill, *percna* subspecies, habitat to support a self-sustaining population.

¹ An effect of population density on population growth, by which there is a fall in reproductive rate at very low population densities and a positive relationship between population density and the reproduction and survival of individuals. Thus low-density populations run a greater risk of declining.

These goals are considered to be the population and distribution objectives for the species.

1.6.2 Recovery Approaches

Five approaches to meeting the above objectives were identified in the Recovery Strategy for Red Crossbill (*percna* subspecies) in Canada (Environment Canada 2006).

1. Confirm presence of *percna* subspecies
2. Determine survey areas
3. Develop survey protocols to initiate long-term monitoring
4. Enhance habitat
5. Promote public awareness

1.7 Critical Habitat addressed in the Recovery Strategy

Critical Habitat has not been identified for the Red Crossbill (*percna* subspecies).

2. RECOVERY ACTIONS

2.1 Scope of the Action Plan

This action plan outlines recovery actions for the Canadian range of the Red Crossbill (*percna* subspecies) which is limited to insular Newfoundland. The recovery of a species is dependent upon reliable information concerning the species' status and biological requirements throughout its range. Information on the Red Crossbill (*percna* subspecies) remains lacking in this regard. As a result, recovery actions at this time should be focused on the collection of pertinent biological information. Subsequent to these efforts, more focus can be applied to critical habitat identification and protection, threat mitigation, and stewardship priorities.

2.2 Critical Habitat

Critical habitat can not be identified for the subspecies until the presence of the subspecies is confirmed. Confirming the presence of the subspecies is the focus of this action plan.

2.2.1 Schedule of studies to identify critical habitat

A schedule of studies was provided in the Recovery Strategy for the Red Crossbill (Environment Canada 2006). Some activities within the schedule of studies have been completed or are underway. The remaining activities in the schedule of studies are contingent on the confirmation of the presence of the subspecies. Even if the presence of

the subspecies is confirmed, work to identify critical habitat will be limited by a lack of information on the basic ecology of the subspecies. Studies will be even more difficult to complete given the nomadic nature of the species. A new schedule of studies will be provided in the future in an updated recovery strategy for the species.

2.3 Actions and Performance Measures

The actions identified in this Action Plan are based on the five recovery approaches identified in the Recovery Strategy for Red Crossbill (*percna* subspecies) in Canada (Environment Canada 2006). Approaches 1 and 2 are the key approaches addressed by this Action Plan. Confirmation of the species' presence and a sense of their distribution are required before moving forward with the subsequent recovery approaches (i.e. approaches 3, 4, and 5). Table 1 provides further detail.

In addition to actions associated with the two approaches outlined above, this Action Plan advocates the gathering of preliminary habitat information as outlined in the Schedule of studies to identify critical habitat (section 2.2.1).

The following sections identify specific actions for each recovery approach.

2.3.1 Confirm presence of *percna* subspecies

2.3.1.1 Develop and implement tools to confirm the presence of Red Crossbill (*percna* subspecies)

Analysis of Red Crossbill calls combined with bill morphometrics is considered the most accurate method to distinguish the *percna* subspecies from other subspecies while in the field (see Adkisson 1996). Limited numbers of audio recordings of *percna* exist, but these can be used to match call with bill size to assist with identification. Additionally, the response of the *percna* subspecies to playback of songs/calls of other Red Crossbill subspecies needs to be determined. Further effort should be made to collect recordings of Red Crossbills in Newfoundland for comparative analysis. Regarding capture of Red Crossbills, it will be necessary to develop a protocol for capture and measurement techniques to allow for consistent and comparable capture efforts throughout the range of *percna*.

Red Crossbill calls can be distinguished by ear with some familiarity (Groth 1993a), however, analysis using audiospectrography is recommended. Audiospectrograms allow for analysis of call types across a wide range of frequencies (see Groth 1993a). Flight calls, alarm calls and excitement calls have been linked to population distinctiveness (Groth 1993a). Gathering call and song information under multiple circumstances and conditions will be a requirement for this type of analysis. Correspondingly, morphological data will offer further insight into subspecies differentiation. Groth 1993a describes the measurement

methodology that can be used to compare to his research findings, thus allowing for the opportunity to identify the different subspecies found in Newfoundland.

The development of an annotated CD / mp3 file / podcast that contains a series of Red Crossbill songs and calls is needed. This compilation should contain known *percna* calls and songs, as well as songs and calls for other Red Crossbill subspecies known to be found in eastern North America. Additionally, the calls and songs for other local cardueline finches should be included, as well as other year-round species known to be found in comparable habitat to Red Crossbill. Correspondingly, there is a need to train employees of stakeholders who may be regularly in the forest and exposed to potential Red Crossbill habitat. Having an established training program for industry employees and the general public could greatly enhance the number of reported Red Crossbill sightings, and improve the likelihood that the species is identified correctly. Additionally, associated with this training program, there is a need to develop criteria for the type of information to collect and where it can be submitted to ensure consistency among observations.

To gain more insight into the morphology of the Red Crossbill in Newfoundland, it is important to capture and measure Red Crossbills from multiple locations throughout insular Newfoundland while also recording their songs and calls. Red Crossbill may be captured with mist nets (Groth 1993a) or other avian trapping tools. In an effort to assign specific call/song types to individual birds, it is important that captured Red Crossbills have their songs/calls recorded for subsequent analysis. Upon completion of morphological processing, individual Red Crossbill can also be recorded while in captivity. Captivity does not affect individually specific features of flight call structure (Groth 1993a).

Correspondingly, captured Red Crossbill can also have blood and feather samples collected from each individual to augment the initiative outlined in section 2.3.1.2.

2.3.1.2 Conduct a genetic assessment of subspecies

Red Crossbill subspecies (especially in northern areas) are known to be highly nomadic and eruptive, depending somewhat on productive cone crops (Adkisson 1996). Despite this potential for high levels of movement, it has been contended that no case of interbreeding among subspecies has been described (Knox 1990, Groth 1993b). Knox (1990) suggests that erupting crossbills, or their offspring, may return to core breeding areas thus permitting development of local adaptation and geographic variation. However, Questiau et al. (1999) determined that there is mixing of the mitochondrial lineages of Red Crossbill within continents, and concluded that mitochondrial lineages are not strictly related to individual subspecies. Based on this research, the obvious implications for the *percna* subspecies would be tied to the presence and possible inter-breeding of other Red Crossbill subspecies within insular Newfoundland or the emigration of *percna*. Further genetic analysis will be required to determine the extent of

overlap among subspecies and the viability of the *percna* subspecies, as well as to determine if *percna* are genetically distinct from other subspecies of Red Crossbill.

2.3.2 Determine survey areas and conduct surveys

2.3.2.1. Select survey sites

Once it is determined through the actions outlined in section 2.3.1 that the Red Crossbill (*percna* subspecies) persists within insular Newfoundland, surveys will be required. Surveys will be necessary for three reasons; 1) to determine habitat preferences to both assess abundance and determine habitat associations for the purposes of critical habitat identification; 2) to assess population status and distribution; and 3) to lay the foundation for a long-term monitoring program for crossbills and other boreal bird species of interest. The surveys should be conducted over a large area and incorporate various habitat types most likely inhabited by Red Crossbill (*percna* subspecies). Ultimately, this survey effort should easily translate into a larger monitoring program. The following are preliminary attributes that will be essential for surveying crossbills, while also dealing with basic habitat use. Surveys should:

1. have assigned routes throughout insular Newfoundland;
2. be conducted in as many seasons as possible, including winter;
3. represent different forest types and ages, as well as areas designated for forest harvesting in an effort to assess bird use changes during forest regeneration; and
4. utilize cone crop information to determine route placement to the extent possible.

Due to the potential for Red Crossbill to have a strong affiliation with pine, it is recommended that several survey sites be assigned specifically to areas of known pine concentrations.

2.3.2.2. Survey for Red Crossbill

A priority for the Newfoundland and Labrador landbird program is the development of a comprehensive landbird monitoring conservation plan and implementation plan. However, Red Crossbill (*percna* subspecies) should not be held to the timelines needed for the development of these larger programs. Again, once confirmation of the subspecies' presence is completed, small scale Red Crossbill surveys will be established at the key sites indicated in section 2.3.2.1, while allowing for future incorporation into broader landbird monitoring. These surveys are intended to gain insight into local populations of Red Crossbill, and their habitat associations for the purposes of critical habitat identification.

2.3.2.3. Identify habitat associations and utilization

In conjunction with Red Crossbill (*percna* subspecies) surveys, a habitat use assessment should be conducted at each location that has Red Crossbill present.

These surveys are important for critical habitat identification. The exact habitat variables collected at these will need to be determined, but should include location coordinate, tree type, tree height, tree age, cone abundance, cone density, canopy cover, patch size, distance to water, nearby waterbody types, and understory composition. To the extent possible, it should be noted whether the Red Crossbill at this location were nesting, foraging, or transients through the area. This information will assist with the development of habitat models that may be used to identify critical habitat. Additionally, similar habitat use assessments will need to be completed at randomly selected locations where Red Crossbill are not found within that given time period. This will allow for comparison of habitat between used and unused sites.

2.3.3. Develop monitoring protocols to initiate long-term monitoring²

2.3.3.1. Develop a landbird monitoring program for insular Newfoundland

Establishing a landbird monitoring program that will be robust enough to effectively monitor for Red Crossbill is a priority for the recovery of the *percna* subspecies. However, a large scale landbird monitoring program of this scale as is recommended will not be limited to the Red Crossbill recovery program for its development and implementation. It will therefore be a larger effort across multiple governments, stakeholders, and branches of Environment Canada, and should not be reflected in the costs associated with Red Crossbill recovery.

Due to the nomadic and eruptive nature of Red Crossbill, any attempt to monitor for Red Crossbill should involve a multi-species approach. Understanding the distribution of the subspecies, including a sense of relative abundance and/or density, will assist in several facets of the recovery program. Accurate abundance data will help identify habitat use, and in conjunction with cone crop data, will better highlight this subspecies' food requirements. Due to the sporadic and inconsistent nature of Red Crossbill occurrence across the landscape, and the growing concern for other bird species within the boreal forest, it is recommended to develop a broad scale monitoring program to be inclusive of all landbirds, or at least of species within the forest guild that includes Red Crossbill.

There is extensive literature available regarding the development and effectiveness of landbird monitoring techniques (Rosenstock et al. 2002, Norvell et al. 2003). Overall there are two primary techniques used in landbird monitoring: 1) relative abundance indices; and 2) empirical modeling techniques that directly estimate bird density (Rosenstock et al. 2002). There will be a need to discuss, in detail, the primary objectives of the monitoring program to ensure that any selected methodology reflect what will be needed for long-term Red Crossbill recovery in Newfoundland.

² The remaining actions (i.e. sections 2.3.3, 2.3.4, 2.3.5, and 2.3.6 are to be addressed only in the event that Red Crossbill (*percna* subspecies) have been confirmed to still be present on the island of Newfoundland.

The development of this monitoring program will need a detailed methodology to ensure that all relevant habitat types are properly represented. This monitoring program would benefit other landbird species at risk and species of interest within Newfoundland, while fostering an opportunity to gain more insight on the status of crossbill congeners and other cardueline finches. It is recommended to associate a winter survey component to this landbird monitoring effort. Crossbill are non-migratory and may breed during the winter months when food resources allow.

As a monitoring program of this scale would involve considerable effort, its conduct will be beyond the scope of any single government agency and its success will be dependent on the enrollment and participation of government, industry, and private partners. The development of this program is broader than the recovery program for Red Crossbills, but its creation would be of significant importance to its delivery.

2.3.3.2. Assess Red Crossbill movement patterns

In the event that Red Crossbill (*percna* subspecies) is determined to still be present on the island of Newfoundland, assessment of movement patterns will be important. Initial efforts to assess movement patterns of Red Crossbill (*percna* subspecies) across the landscape will require banding efforts and the ability to recapture crossbill at other locations. A banding program could lead into a capture-mark-recapture program that, if completed properly and with adequate sample size, can offer insight into distribution, movement, survival rates, and potentially a population estimate – important demographic data that should be part of an integrated monitoring scheme (Downes et al. 2000). As a result, there is a need to establish permanent and roaming banding stations throughout Newfoundland as well as to work cooperatively with other banding programs in neighbouring Provinces or regions. Red Crossbill can be captured with the use of mist nets using callbacks to lure other individuals (Groth 1993a). When one member of a pair is captured in a mist net, the call often attracts and facilitates the capture of the second individual shortly thereafter (Groth 1993b).

This work combined with the genetic analyses noted in section 2.3.1.2 may provide insight into immigration and emigration of Newfoundland Red Crossbills.

Similarly, isotopic analysis may be applicable to Red Crossbill. Stable-isotope techniques have improved over the last several years and it may be possible to make *a posteriori* determinations of an animal's location using a multistate capture-recapture model (Clark et al. 2004, Powell 2004). Red Crossbill (*percna* subspecies) are thought to be non-migratory. Further assessment of isotope values may provide insight into any large scale movement, or immigration of other Red Crossbill to insular Newfoundland.

Considering the lack of information on the subspecies status, distribution and habitat use, any studies focused toward the assessment of movement should be considered as secondary priorities until more attention and effort are applied to objectives of higher priority. These include determining subspecies presence, conducting initial surveys, determining habitat use, and the establishment of a long-term monitoring program.

Government staff can be trained in Red Crossbill capture, banding, and song/call recording techniques to allow for quick response to locations with known Red Crossbill presence when appropriate and/or required. Having multiple staff members trained around the island will allow for more complete coverage of the island to maximize the ability to capture and record individual Red Crossbill.

2.3.3.3. Determine demographic data and generate a Population Viability Analysis

In Canada there are ongoing demographic surveys already in existence for birds, but with limited application in Newfoundland and Labrador, including the Monitoring Avian Productivity and Survivorship (MAPS) Program (managed by The Institute for Bird Populations), the Breeding Biology Research and Monitoring Database (BBird) (managed by the Biological Resources Division, U.S. Geological Survey), and nest record schemes (Downes et al. 2000). Each of these programs has its limitations, especially with regard to their applicability to Red Crossbill, and none presently has the capacity to effectively monitor bird population variables in Canada (Downes et al. 2000).

Corresponding to the results of the assessment of movement patterns section (outlined in section 2.3.3.2.), the next step would be to use the updated demographic data to generate a population viability analysis model. A sustainable Red Crossbill population is the primary goal of the Recovery Strategy, however determining the appropriate population size is difficult, if not impossible, considering the present lack of information on the subspecies' demography. Considering that existing bird monitoring programs are insufficient to assess Red Crossbill demographics, it will be necessary to generate methods and programs to gather the proper information. The programs outlined sections 2.3.2.2. and 2.3.3.2. will be the first steps in gathering demographic information for Red Crossbill in Newfoundland, and the development of a population viability analysis (PVA).

Nonetheless, and despite the data shortcomings, it is recommended to pioneer a PVA for Red Crossbill based on demographic data collected from the literature. As the programs outlined in this Action Plan begin to provide regional data, it can be utilized in the PVA model to allow more refinement for the *percna* subspecies. However, considering the paucity of data available, it is recommended to defer this action until there is a base amount of data to use in the model creation.

2.3.4. Promote awareness

2.3.4.1. Implement general education campaign

General education programs are intended to increase the profile of the Red Crossbill among the general public, as well as the awareness of the potential threats to the Red Crossbill. Additionally, public awareness campaigns can make information available to the public concerning the mitigation options and considerations for protecting/conserving Red Crossbill in Newfoundland. Landbird species tend to be little known to the general public in Newfoundland and Labrador. Highlighting the endangered status of the Red Crossbill within insular Newfoundland would be beneficial in gaining support for Red Crossbill conservation, in addition to adding another tool for gathering information on Red Crossbill distribution and habitat use around the Province.

Standard educational materials need to be developed to educate stakeholders (resource management agencies and industry) and the general public on the Red Crossbill and their plight. Brochures, posters, and web material are the standard avenues for the distribution of information and these products need to be created and/or enhanced where needed. Distribution of these materials can be done through government offices, provincial and national parks, non-government groups (NGOs) such as natural history societies, and interested members of the general public. These materials can be used as a tool to report incidental sightings of Red Crossbill to responsible government agencies within insular Newfoundland.

Public awareness campaigns can also be used to educate the public on volunteer bird monitoring projects – most notable relating to Red Crossbill would be Project FeederWatch and Christmas Bird Counts.

2.3.4.2. Create a targeted education campaign

Specific education campaigns need to be created and focused toward organizations, businesses, and/or private citizens that may undertake activities that threaten Red Crossbills. Directed information on Red Crossbill, that would include species descriptions, call and song types, biology, and habitat use should be available for the forest industry, including pulp and paper companies, sawmills, domestic harvesters, as well as natural history organizations and other environmental groups dealing with forest or bird related activities.

Specific programs can be developed to educate government and industry staff that regularly work in the forest. These programs should include identification tips, specific habitat variables to be aware of, and mechanisms for reporting sightings.

Correspondingly, section 2.3.1.1 outlines the development of an annotated CD / mp3 file / podcast that contains a series of Red Crossbill songs and calls. While this product is needed as a reference tool for identifying the species, it can also be used as an educational tool to inform industry employees on the various bird species in the Newfoundland boreal forest. The general public could also greatly benefit from a product of this nature.

2.3.4.3. Develop stewardship initiatives

Stewardship opportunities for this species are limited at this time. However, as more information becomes available on habitat use and consistent areas of occupancy, stewardship programs should be suggested to relevant organizations that may include communities, NGOs, the forest industry sector, and/or private landowners.

2.3.5 Enhance Habitat

Actions associated with enhancing habitat cannot be addressed until the presence of the subspecies can be confirmed, as well as its distribution and habitat preferences determined.

2.3.6 Critical Habitat Identification

2.3.6.1. Develop habitat model

There is a need for a habitat model for Red Crossbill in Newfoundland to determine primary habitat use variables for species occupancy and breeding. This will aid in the designation of critical habitat, as well as outline how to manage habitat across the insular Newfoundland landscape. Presently, there are no models at the needed level of detail being used to describe Red Crossbill habitat use (Environment Canada 2006). It is therefore recommended that once *percna* is confirmed to still be present on insular Newfoundland, and preliminary habitat data are collected that a baseline habitat model be developed and expanded as data becomes available. Associated with the habitat model, it will be necessary to assess for the presence of Red Crossbill in areas flagged as potential habitat by the model. This can be done in conjunction with the ongoing efforts described in section 2.3.2.

2.3.6.2. Identify potential habitat threats, and assess impacts in each area

Until information on the presence and distribution of the *percna* subspecies can be determined it is premature to identify and assess the impacts of threats to habitat. Nonetheless, outlining the potential threats to the species is warranted given the level of information that is already known for the species.

If it is determined that there is a relationship between pine and Red Crossbill habitat requirements, forest management activities which result in the protection of existing pine, the planting of pine, and the encouragement of natural pine regeneration can be promoted. Within a mixed conifer plantation, seasonal

changes in crossbill diet that may have been related to seed weight, cone toughness, and seedfall phenology of predominant conifers have been documented, indicating the importance of mixed conifer habitat (Marquiss and Rae 1994; Wren 2001).

2.4 Implementation Schedule

The Minister of the Environment will endeavour to support implementation of this plan subject to availability of resources and varying species at risk conservation priorities.

Table 1. Implementation Schedule

Action	Priority	Threats or concerns addressed	Timeline
Action 1 - Develop and implement tools to confirm the presence of Red Crossbill including song and call analysis, morphology measurements, and training forest workers in identification. (see section 2.3.1.1)	Urgent	N/A	2011-2012
Action 2 - Conduct a genetic assessment of subspecies to determine subspecies relatedness, and <i>percna</i> population viability. (see section 2.3.1.2)	Beneficial	N/A	2011-2012
Action 3 - Select survey sites based on forest type, age, etc., that are throughout insular Newfoundland. (see section 2.3.2.1)	Urgent	1. Forest fire 2. Urbanization 3. Agricultural expansion 4. Forest harvesting 5. Allee effect	2011-2013
Action 4 - Survey for Red Crossbill to determine abundance and critical habitat identification. (see section 2.3.2.2)	Urgent	1. Forest fire 2. Urbanization 3. Agricultural expansion 4. Forest harvesting 5. Allee effect	2011-2012 onward
Action 5 - Identify habitat associations and utilization at the survey locations to assist with critical habitat ID. (see section 2.3.2.3)	Necessary	All Threats	2011-2014

Action 6 - Develop a landbird monitoring program for insular Newfoundland ³ . (see section 2.3.3.1)	Urgent	1. Forest fire 2. Urbanization 3. Agricultural expansion 4. Forest harvesting 5. Allee effect	2011-2012
Action 7 - Assess Red Crossbill movement patterns with stable-isotopes and mark-recapture techniques to determine large-scale and small-scale movement patterns. (see section 2.3.3.2)	Necessary	1. Tree disease 2. Forest fire 3. Fire suppression 4. Tree loss by insects 5. Forest conversion 6. Urbanization 7. Agricultural expansion 8. Forest harvesting	Pending outcome of approaches 1 and 2
Action 8 - Determine demographic data and generate a Population Viability Analysis. (see section 2.3.3.3)	Necessary	All threats	Pending outcome of approaches 1 and 2
Action 9 - Implement general education campaign to increase the profile of the Red Crossbill and the awareness of the potential threats to the species. (see section 2.3.4.1)	Beneficial	1. Domestic forest harvest 2. Forest fires	Pending outcome of approaches 1 and 2
Action 10 - Create a targeted education campaign oriented toward educating specific groups that may have more direct contact with the species. (see section 2.3.4.2)	Beneficial	1. Domestic forest harvest 2. Forest fires	Pending outcome of approaches 1 and 2
Action 11 - Develop stewardship initiatives as more knowledge becomes available to further address education and habitat conservation. (see section 2.3.4.3)	Necessary	1. Tree disease 2. Forest fire 3. Fire suppression 4. Tree loss by insects 5. Forest conversion 6. Urbanization 7. Agricultural expansion 8. Forest harvesting	Pending outcome of approaches 1 and 2

³ To be completed by Environment Canada's Canadian Wildlife Service independent of the Red Crossbill Program. The landbird monitoring strategy will be important for the overall Red Crossbill Program, in terms of determining population status and monitoring the population over the long term, but the Red Crossbill program is not the sole driver behind its development. Red Crossbill surveys as outlined in Actions 3, 4 and 5 are specifically focusing on Red Crossbill, but are meant to feed into the larger landbird monitoring program once developed.

3. MEASURING PROGRESS

The overall success of recovery will be measured against progress towards the population and distribution objectives of restoring the species to a self-sustaining population level whereby it is able to withstand stochastic events.

As the means to achieving those objectives, success against action plan implementation will be measured every five years against the following performance indicators:

- The presence of the Red Crossbill (*percna* subspecies) is determined, and/or more insight into the Red Crossbill subspecies present in Newfoundland is gained.
- Genetic characteristics of Red Crossbills in Newfoundland are analyzed, and are interpreted.
- Survey locations are selected that properly represent Red Crossbill habitat in Newfoundland.
- Surveys are conducted throughout insular Newfoundland.
- Habitat variables are defined and collected at multiple locations.
- Adequate baseline information is obtained to guide critical habitat identification

The following performance indicators will not be relevant until the presence of the *percna* subspecies is confirmed and subsequent recovery actions have taken place.

- An effective monitoring program is in place in multiple locations around insular Newfoundland.
- Abundance, population size and distribution are better understood, and able to inform recovery actions.
- A PVA model using demographic data from the literature is developed.
- Techniques are developed to assess movement of Red Crossbill – these may include isotope assessment, genetic assessment, and a mark-recapture program.
- More sightings of Red Crossbill being reported from stakeholders and the public.
- More public and community involvement with Red Crossbill conservation.
- More educational products that can be used for general and targeted audiences.
- Stewardship initiatives are generated and funded.
- A habitat model is developed, and surveys conducted for Red Crossbill within the proposed suitable habitat.
- Habitat of sufficient quality to sustain all life processes of the species is available.
- Land management practices which promote Red Crossbill recovery are established

4. SOCIO-ECONOMIC EVALUATION

4.1 Socio-Economic Overview

This section evaluates, to the extent possible, given data and information limitations, the potential socio-economic costs associated with implementing this action plan and the potential benefits to be derived as per Section 49 (1) (e) of SARA.

4.2 Costs

This action plan has identified a number of actions to meet the objectives and goals outlined in both the recovery strategy and action plan. The incremental socio-economic costs associated with the implementation of these recovery actions are evaluated in this section. However, it is difficult to determine the ultimate cost at this time as the subspecies has not yet been confirmed to still be present in Newfoundland, and its habitat preferences are still unclear.

4.2.1 Direct Costs

To-date there has been limited research conducted on the Red Crossbill (*perca* subspecies) and as a result the sub-species' presence and habitat is not known. Given this limitation and the need to partner with multiple stakeholders, the extent and level of effort required to conduct these activities is uncertain at this time. While cost estimates are provided in Table 2 for the implementation of this action plan, they are subject to change as more data are collected on the species providing a better estimate for the level of effort required to implement each action. The total cost to implement the five year action plan is estimated to be approximately \$324,000⁴ which includes salary dollars, volunteer time, travel, equipment as well as other costs. However, the first two approaches, which are the only two to be implemented initially, would cost substantially less - \$161,000.

⁴ Future costs were converted to present day costs using a 4% discount rate.

Table 2 Cost of Activities in the Implementation schedule (five years)⁵

Approach	Priority	Government	Other Stakeholders
Confirm presence of <i>percna</i> subspecies	Urgent	\$18,000	\$18,000
Determine survey areas and survey for Red Crossbill	Urgent	\$105,000	\$20,000
Develop survey protocols to initiate long-term monitoring ⁶	Necessary ⁷	\$25,000	\$6,000
Promote awareness	Beneficial ⁷	\$67,000	\$6,000
Critical Habitat Identification	Necessary ⁷	\$42,000	\$17,000
Total Costs		\$257,000	\$67,000

4.2.2 Indirect Costs

Given limited data and information on the *percna* subspecies population, distribution and critical habitat, this action plan focuses mainly on research and monitoring activities. At this time, there are no restrictions, impacts or indirect costs to any stakeholders as a result of implementing this action plan.

4.3 Benefits

Potential benefits of the recovery of the Red Crossbill (*percna* subspecies) cannot be easily quantified. While protection and recovery benefits are likely to result from public education and awareness, other benefits such as, biodiversity, ecosystem and birdwatching benefits will be deferred until the presence, population status and distribution of the *percna* subspecies has been confirmed and critical habitat has been identified. Although critical habitat has not been identified, this action plan includes activities towards identifying critical habitat and achieving the recovery goal which could result in benefits to Newfoundland and Labrador, and Canada, such as positive impacts on biodiversity and the value individuals place on preserving biodiversity as well as protection and enhancement of boreal old growth forest ecosystems.

5. ASSOCIATED PLANS

The Recovery Strategy for the Red Crossbill (*percna* subspecies) in Canada was completed in 2006, and this is the only Action Plan identified in the strategy. An additional action plan may be required if sufficient information is obtained to identify critical habitat.

⁵ Costs were estimated in 2007 Cdn \$ for all years and discounted at a rate of 4% to bring future values to present day values.

⁶ This is part of a larger initiative therefore costs only refer to activities incurred specifically for the *percna* subspecies. Please see Table 2 Implementation Schedule.

⁷ Implementation will be contingent on the results of the first two approaches.

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7. RECOVERY IMPLEMENTATION GROUP(S) OR PLANNER(S)

Former Red Crossbill Recovery Team (dissolved in 2010)⁸

Members (alphabetical order)

Stephen Balsom, R.P.F.
Corner Brook Pulp and Paper Limited

Joe Brazil (Co-Chair) (Retired in 2009)
Newfoundland and Labrador Department of Environment and Conservation

Basil English
Newfoundland and Labrador Department of Natural Resources

Jim Evans
Abitibi-Consolidated Company of Canada

John Gosse
Parks Canada Agency

Brian Hearn
Natural Resources Canada

Bruce Mactavish
Contractor/Consultant/Birding Community

William Montevecchi
Memorial University of Newfoundland

Peter Thomas (Co-Chair)
Environment Canada - Canadian Wildlife Service

Ian Warkentin
Sir Wilfred Grenfell College

⁸ The Red Crossbill Recovery Team was dissolved in 2010, and will be replaced by the Newfoundland and Labrador Landbird Recovery Team to address the recovery needs of all *At Risk* landbirds in Newfoundland and Labrador.

APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that plans also may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but also are summarized below in this statement.

This action plan will clearly benefit the environment by promoting the recovery of the Red Crossbill (*percna* subspecies). The potential for the plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to relevant sections in this document (e.g., description of species, populations and distribution, implementation actions, effects on other species, and, particularly, the socio-economic evaluation) and in the recovery strategy (e.g., description of the species' habitat and biological needs, ecological role, and limiting factors; effects on other species; and the recommended approaches for recovery).

The goal in the development of recovery actions is to minimize the potentially adverse impacts of these actions on other species, particularly native ones. Although specific habitat associations are not yet known for *percna*, any strategies that increase the extent and/or quality of Red Crossbill habitat (which at this time is considered to be a mosaic of cone-producing conifers) will likely be beneficial for other species with similar habitat requirements.

Management of non-native, interspecific competitors and predators in Red Crossbill habitat may be deemed necessary for recovery *only* if food competition and/or nest predation are confirmed as limiting factors. Such management efforts must ensure that other species, particularly native ones, are not negatively impacted. Indirect management through environmental modifications to make areas unattractive or unproductive to food competitors will not likely be considered an option, as such a strategy would be expected to negatively impact crossbills and/or other species.

Restoration of pine is also suggested as a possible method of recovery, pending further study. Given that red and eastern white pine are native to Newfoundland, regeneration of these species may be beneficial to a host of other native species. Modifying current habitat may in turn negatively impact species that rely on predominantly black spruce and balsam fir stands. However, this would likely be at a very small scale.