# COSEWIC's Assessment Process and Criteria

**Updated November 2011**

## Overview of the COSEWIC Process

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) exists to provide Canadians and their governments with advice regarding the status of wildlife species that are nationally at risk of extinction or extirpation.

The COSEWIC process is divided into three sequential steps, each of which has a tangible outcome. These are detailed below.

- selection of wildlife species requiring assessment - the COSEWIC Candidate List;
- compilation of available data, knowledge and information - the COSEWIC status report; and
- assessment of a wildlife species' risk of extinction or extirpation and subsequent designation - the record of COSEWIC assessment results.

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## Candidate Wildlife Species

### *Identifying Candidate Wildlife Species*

Canada supports a great diversity of species. The first step in COSEWIC's task is to choose, from among the thousands of wildlife species, which ones may be most at risk of extinction or extirpation nationally, and are therefore candidates for more detailed assessment through the preparation of a COSEWIC status report.

Candidate wildlife species are wildlife species not yet assessed by COSEWIC that have been identified by the SSCs (Species Specialist Subcommittees) or by the ATK SC (Aboriginal Traditional Knowledge Subcommittee) as candidates for detailed status assessment based on information suggesting a potential to be at risk. Candidates may also include wildlife species in the Not at Risk or Data Deficient categories where new information suggests they may be at risk.

Each SSC annually prepares and maintains a SSC candidate list of wildlife species that it considers at risk of extinction or extirpation nationally. Wildlife species are selected using: the 'May Be At Risk' list in the Monitoring the General Status of Wild Species in Canada Program, as well as information drawn from other multi-jurisdictional monitoring, jurisdictional and international assessment processes (e.g. IUCN and ABI), published ranking systems in the scientific literature, and the expert knowledge of SSC, ATK SC, and COSEWIC members.

### *Eligibility of Candidate Wildlife Species*

Each candidate wildlife species is evaluated for eligibility for COSEWIC assessment. To be eligible, wildlife species must meet certain criteria regarding taxonomic validity, native origin, regularity of occurrence and dependence on Canadian habitat (Table 1). In cases where separate designation below the species level is desirable, justification must be provided according to COSEWIC's Guidelines for Recognizing Designatable Units.

The initial assessment of a candidate wildlife species' eligibility for COSEWIC assessment is completed by the SSC Co-chairs, in consultation with their SSC members. Eligibility is ultimately reviewed and confirmed by COSEWIC as the first step in status determination.

### *Assessing the Relative Priority of Candidate Wildlife Species*

COSEWIC attempts to give priority attention to wildlife species at greatest risk of extinction or extirpation across their ranges in Canada. Eligible candidate wildlife species are prioritized and placed on the SSC candidate lists using a "coarse filter" system. This system blends levels of apparent risk with considerations of taxonomic distinctness, global distribution and proportion of range within Canada to group wildlife species into categories of similar priority. Each SSC will assign their candidate wildlife species into one of three priority groups. Group 1 wildlife species have highest priority for COSEWIC assessment. Wildlife species suspected to be extirpated from Canada would also be included in this group. Group 2 and 3 wildlife species have medium and lower priority for COSEWIC assessment respectively. Wildlife species not in need of assessment are excluded. Priority groups within the SSC candidate lists will be revised and updated on an ongoing basis by the SSC.

Specifics of how wildlife species are assigned to the three priority groups (i.e., which criteria have the strongest influence) will vary with individual SSCs, reflecting the differences in life histories, and information available. Only biological factors are used to prioritize the wildlife species; logistical problems, including anticipated availability of report writers, and of adequate detailed knowledge, are not considered at this level.

High priority species from the SSC candidate lists are reviewed and ranked by COSEWIC, and result in the COSEWIC Candidate List. COSEWIC bases its ranking on prioritization data submitted by each SSC (Prioritization Criteria developed by COSEWIC for ranking wildlife species). The COSEWIC Candidate List identifies the highest priority candidate wildlife species for status report production and includes wildlife species not yet assessed by COSEWIC and those in the Not at Risk or Data Deficient categories, where new information suggests they may be at risk of extinction or extirpation from Canada.

## COSEWIC Status Report

### *Commissioning New Status Reports and Updates*

By establishing the COSEWIC Candidate List, COSEWIC has identified wildlife species for which status reports are desirable. In addition, COSEWIC tracks the status of wildlife species previously designated as Extirpated, Endangered, Threatened and Special Concern by preparing updated status reports.

COSEWIC wildlife species status reports summarize the information that is the basis for status determinations. Each report is an up-to-date compilation and analysis of all relevant, available, and credible biological information concerning a wildlife species and its status in Canada. For effective assessment, this information must include distribution, extent of occurrence, area of occupancy, abundance (including population estimates or number of occurrences, where available), population and habitat trends, and factors or threats limiting the wildlife species. For more details about the contents and structure of a status report, see Instructions for the Preparation of COSEWIC Status Reports.

Contracts for new status reports and update status reports are opened for a competitive bid on the COSEWIC web site. Applicants (bidders) will be expected to submit a work plan and budget, a statement of qualifications, and a statement indicating willingness to cede intellectual property and moral rights to the Crown on behalf of COSEWIC. The call for bids is posted for at least three weeks. After the deadline for bid submissions has passed, the applicants are evaluated by the relevant SSCs according to a specified protocol, and a winning bid is chosen. The SSC Co-chairs commence to negotiate with the successful applicant, resolving further details of the work plan, costs, possible travel plans, and timelines in consultation with the Secretariat.

In some situations where it is suspected that the status of a wildlife species has not changed since last assessment, COSEWIC may decide to prepare a short status appraisal summary, which outlines relevant best available information pertaining to status. Status appraisal summaries will generally be prepared by a member (or members) of the relevant SSC. This summary, along with the existing status report, is sent for review, and the assessment is conducted in a specific way to expedite the process. In these cases, a fully updated status report is not required. More details on the status appraisal process are provided on the Wildlife Species Assessment web page.

The information below on status report preparation and wildlife species status assessment pertains to assessments based on new or fully updated status reports only.

### *Status Report Review and Approval Process*

Once a Draft status report is received from a report writer and approved by the SSC Co-chair(s), it is distributed by the Secretariat to all the SSC members, and any external experts recommended by the SSC for peer review. It is also distributed to the chair(s) of the recovery team (if the wildlife species is already assessed by COSEWIC and has a recovery team in place), to the range jurisdiction(s), to any relevant WMBs, and to the ATK SC. Comments and suggestions are sent to the SSC Co-chair and forwarded to the writer with instructions from the Co-chair for those changes that must be incorporated into the report.

The result is the Provisional Status Report. The involvement of commissioned report writers nominally ends here. If however, the SSC feels that additional changes are required, it may make any modifications needed to produce the Interim Report. Ideally, the Provisional and Interim Reports are identical.

The Interim status report is forwarded by the SSC Co-chair to the Secretariat which distributes it to the range jurisdiction(s), the relevant WMBs, the ATK SC, to the SSC members, the chair(s) of the recovery team (if the wildlife species is already assessed by COSEWIC and has a recovery team in place) and if required, any external experts (inside or outside government agencies) for final review normally at least six months before a Wildlife Species Assessment Meeting.

All COSEWIC members will receive Interim Status Reports at least two months prior to the COSEWIC Wildlife Species Assessment Meeting at which they will be discussed. At this stage, the reports include the recommendations of status from the SSC. Once 2

month-interim reports have been sent to COSEWIC members, they cannot be withdrawn or assessment deferred without the approval of COSEWIC. Any change made to a 2-month interim report after it has been sent to COSEWIC members which is likely to influence the application of the quantitative criteria must be brought to the attention of the COSEWIC members before or at the Wildlife Species Assessment Meeting at which the species is being assessed.

New information, knowledge or data that are significant to the designation of the wildlife species should be presented to the Wildlife Species Assessment Meeting in written form and COSEWIC may then defer consideration of the wildlife species until a subsequent meeting, or proceed with the assessment (and the member will ensure that the SSC Co-chair is given the information to incorporate into the report).

The SSC Co-chair ensures that the final status designation and any revisions suggested and approved by COSEWIC at the Wildlife Species Assessment Meeting are incorporated into the Interim Status Report. The SSC Co-chair provides the Secretariat with a high quality, clean final copy of the report for publication. The Secretariat translates the report, adding a summary of the COSEWIC assessment, and arranges it for publication. The resulting **COSEWIC Assessment and Status Report** is then posted on the SARA public registry as a downloadable (PDF and html) document soon after the Wildlife Species Assessment Meeting.

## COSEWIC Status Assessment and Designation

For each wildlife species considered at a Wildlife Species Assessment Meeting, COSEWIC considers each of five items sequentially to determine a Canadian status designation:

1. Is there sufficient information presented in the report to determine wildlife species eligibility?
2. Given sufficient information, is the wildlife species eligible for assessment?
3. Is the status report adequate and acceptable for assessment purposes?
4. What status is suggested by application of approved COSEWIC quantitative assessment criteria and guidelines (i.e., rescue effect)?
5. Does the suggested status conform to the COSEWIC definition for the proposed status category?

Each of these steps is outlined below.

*1. Is there sufficient information presented in the report to determine wildlife species eligibility?*

The SSC Co-chair introduces the wildlife species highlighting features such as taxonomy and occurrence in Canada relevant to eligibility for COSEWIC assessment. If it is apparent that there is insufficient information to determine eligibility for assessment, either the report will be rejected because available information is not included in the report, or a finding of Data Deficient will be considered because the relevant information is included in the report.

*2. Given sufficient information, is the wildlife species eligible for assessment?*

Given sufficient information, the SSC Co-chair establishes eligibility for COSEWIC assessment (Table 1). If the proposed designation is for a designatable unit(s) below the species level, a justification for this is presented following the COSEWIC Designatable Units Guidelines. After discussion, the Committee may: choose to accept the SSC's recommendation for eligibility of the wildlife species; alter the parameters of the wildlife species to be considered (e.g. combine or divide designatable units); or return the report to the SSC as ineligible for assessment.

*3. Is the status report adequate and acceptable for assessment purposes?*

Once it has been determined that the wildlife species is eligible for assessment, the appropriate SSC Co-chair then briefly reviews the status report, summarizes the discussion of the SSC, presents the results of the straw ballots, and then presents the rationale for the status assessment recommended by the SSC. After discussion, Committee members may choose to let the report stand for status assessment or move that it be withdrawn for further work. In general, assessment of a wildlife species is deferred if the Committee believes that the report has not included significant relevant, currently available knowledge, information or data; or does not present an adequate, clear, or objective analysis of the available information.

*4. What status is suggested by application of approved COSEWIC quantitative assessment criteria and guidelines (i.e., rescue effect)?*

Once the status report has been accepted, the Committee proceeds to discuss the appropriate status designation. As a first step in this deliberation, information in the status report is used to assess the wildlife species according to the quantitative COSEWIC criteria (Table 2).

Contextual considerations are then reviewed, and if thought to be significant, may be used to modify the initial quantitative assessment. Such considerations include rescue potential from outside of Canada, and other life-history characteristics that may not have been adequately assayed by the quantitative assessment (Tables 3 and 4). This discussion is concluded by the SSC Co-chair by reviewing the assessment criteria scores, and proposing a motion to assess the species at the status category recommended by the SSC.

5. Does the suggested status conform to the COSEWIC definition for the proposed status category?

As a final step in the assessment process, the Committee considers all the information, analysis, and discussion presented at the meeting, and evaluates if the status category suggested by the application of the criteria and guidelines is consistent with the definition of the status category used by COSEWIC (Table 5). If there is inconsistency, the status representing the most appropriate definition will take precedence, and any variance between the status definition and the quantitative criteria will be explained.

**Table 1. Determining eligibility of wildlife species for status assessment.**

COSEWIC considers without prejudice all wildlife species as defined by SARA, notwithstanding the extent of their extra-limital range (i.e., the range of the wildlife species outside Canada), subject to the following criteria:

### A) Taxonomic validity

COSEWIC would normally only consider species and subspecies or varieties that have been established as valid in published taxonomic works or in peer reviewed communications from taxonomic specialists. COSEWIC would not normally consider other designatable units unless they can be shown to be genetically distinct, separated by a major range disjunction, or biogeographically distinct (refer to Guidelines for Recognizing Designatable Units, Appendix F5). Justification for considering designatable units must be provided.

### B) Native wildlife species

COSEWIC would normally only consider native wildlife species. A native wildlife species is a wildlife species that occurs in Canada naturally, or that has expanded its range into Canada without human intervention from a region where it naturally occurred, has produced viable populations, and has persisted in Canada for at least 50 years.

A wildlife species is, in the absence of evidence to the contrary, presumed to have been present in Canada for at least 50 years.

### C) Regularity of occurrence

COSEWIC would normally only consider wildlife species which occur or formerly have occurred regularly in Canada, including regular or seasonal migrants but excluding vagrants.

### D) Special cases

Notwithstanding the above guidelines, a taxon may be considered eligible if there are clear conservation reasons for consideration (for example high risk of extinction). In particular, a wildlife species which does not meet the eligibility criteria but which is at risk in its primary range outside of Canada could be considered for designation.

Reasons for considering a special case must be presented and supporting information must be provided; this should normally be reviewed and agreed to by COSEWIC before a status report is prepared.

**Table 2. COSEWIC quantitative criteria and guidelines for the status assessment of wildlife species.**

COSEWIC's revised criteria to guide the status assessment of wildlife species. These were in use by COSEWIC by November 2001, and are based on the revised IUCN Red List categories (IUCN 2001[1]). Some minor changes to definitions were made in 2011 to make COSEWIC criteria more consistent with IUCN criteria. An earlier version of the quantitative criteria was used by COSEWIC from October 1999 to May 2001 (http://www.cosewic.gc.ca/eng/sct0/original_criteria_e.cfm). For definitions of terms, see COSEWIC's Glossary of Definitions and Abbreviations (Appendix C).

| Indicator | Endangered | Threatened |
|---|---|---|
| **A. Decline in Total Number of Mature Individuals** | | |
| A1. An observed, estimated, inferred or suspected reduction in total number of mature individuals over the last 10 years or 3 generations, whichever is the longer, where the causes of the reduction are: clearly reversible **and** understood **and** ceased, based on (and specifying) any of the following:<br>(a) direct observation<br>(b) an index of abundance appropriate to the taxon<br>(c) a decline in index of area of occupancy, extent of occurrence and/or quality of habitat<br>(d) actual or potential levels of exploitation<br>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites. | Reduction of ≥ 70% | Reduction of ≥ 50% |
| A2. An observed, estimated, inferred or suspected reduction in total number of mature individuals over the last 10 years or 3 generations, whichever is the longer, where the reduction or its causes may not have ceased **or** may not be understood **or** may not be reversible, based on (and specifying) any of (a) to (e) under A1. | Reduction of ≥ 50% | Reduction of ≥ 30% |
| A3. A reduction in total number of mature individuals, projected or suspected to be met within the next 10 years or 3 generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1. | Reduction of ≥ 50% | Reduction of ≥ 30% |
| A4. An observed, estimated, inferred, projected or suspected reduction in total number of mature individuals over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased **or** may not be understood **or** may not be reversible, based on (and specifying) any of (a) to (e) under A1. | Reduction of ≥ 50% | Reduction of ≥ 30% |

[1] IUCN (2001). IUCN *Red List Categories and Criteria: Version 3.1.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, U.K.

| Indicator | Endangered | Threatened |
|---|---|---|
| **B. Small Distribution Range and Decline or Fluctuation** | | |
| B1. Extent of occurrence estimated to be | < 5,000 km² | < 20,000 km² |
| **and/or** | | |
| B2. Index of area of occupancy estimated to be | < 500 km² | < 2,000 km² |
| **and (for either B1 or B2)** estimates indicating at least two of a–c: | | |
| a. Severely fragmented **or** known to exist at: | ≤ 5 locations | ≤ 10 locations |
| b. Continuing decline, observed, inferred or projected, in any of (i) extent of occurrence, (ii) index of area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations, (v) number of mature individuals. | | |
| c. Extreme fluctuations in any of (i) extent of occurrence, (ii) index of area of occupancy, (iii) number of locations or subpopulations, (iv) number of mature individuals. | | |
| **C. Small and Declining Number of Mature Individuals** | | |
| C. Total number of mature individuals estimated to be: | <2,500 | < 10,000 |
| **and one of either C1 or C2:** | | |
| C1. An estimated continuing decline in total number of mature individuals of at least: | 20% within 5 years or two generations, whichever is longer, up to a maximum of 100 years in the future | 10% within 10 years or three generations, whichever is longer, up to a maximum of 100 years in the future |
| **or** | | |
| C2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals | | |
| **and at least one of the following:** | | |
| a.(i) No subpopulation estimated to contain | > 250 mature individuals | > 1000 mature individuals |
| **or** | | |
| a.(ii) one subpopulation has | ≥ 95% of all mature individuals | 100% of all mature individuals |
| **or** | | |
| b. There are extreme fluctuations in number of mature individuals. | | |

| Indicator | Endangered | Threatened |
|---|---|---|
| **D. Very Small or Restricted Total Canadian Population** | | |
| D. Total number of mature individuals very small or restricted in the form of either of the following: | | |
| D1. Population estimated to have | < 250 mature individuals | < 1000 mature individuals |
| **or** | | |
| D2. **For threatened only**: Canadian population with a very restricted index of area of occupancy (typically < 20 km²) or number of locations (typically ≤ 5) such that it is prone to the effects of human activities or stochastic events within a very short time period (1-2 generations) in an uncertain future, and is thus capable of becoming endangered or extinct in a very short time period. | Does not apply | Index of area of occupancy < 20 km²<br>**or**<br>≤ 5 locations |
| **E. Quantitative Analysis** | | |
| E. Quantitative analysis (population projections) showing the probability of extinction or extirpation in the wild is at least | 20% within 20 years or 5 generations, whichever is longer, up to a maximum of 100 years | 10% within 100 years |

**Special Concern:**
those wildlife species that are particularly sensitive to human activities or natural events but are not endangered or threatened wildlife species.

Wildlife species may be classified as being of Special Concern if:

(a) the wildlife species has declined to a level of abundance at which its persistence is increasingly threatened by genetic, demographic or environmental stochasticity, but the decline is not sufficient to qualify the wildlife species as Threatened; or
(b) the wildlife species may become Threatened if factors suspected of negatively influencing the persistence of the wildlife species are neither reversed nor managed with demonstrable effectiveness; or
(c) the wildlife species is near to qualifying, under any criterion, for Threatened status; or
(d) the wildlife species qualifies for Threatened status but there is clear indication of rescue effect from extra-limital subpopulations.

**Examples of reasons why a wildlife species may qualify for "Special Concern":**

- a wildlife species that is particularly susceptible to a catastrophic event (e.g., a seabird population near an oil tanker route); or
- a wildlife species with very restricted habitat or food requirements for which a threat to that habitat or food supply has been identified (e.g., a bird that forages primarily in old-growth forest, a plant that grows primarily on undisturbed sand dunes, a fish that spawns primarily in estuaries, a snake that feeds primarily on a crayfish whose habitat is threatened by siltation; or
- a recovering wildlife species no longer considered to be Threatened or Endangered but not yet clearly secure.

**Examples of reasons why a wildlife species may not qualify for "Special Concern":**

- a wildlife species existing at low density in the absence of recognized threat (e.g., a large predatory animal defending a large home range or territory); or
- a wildlife species existing at low density that does not qualify for Threatened status for which there is a clear indication of rescue effect.

**Guidelines for use of Extinct or Extirpated**

A wildlife species may be assessed as extinct or extirpated from Canada if:

- there exists no remaining habitat for the wildlife species and there have been no records of the wildlife species despite recent surveys; or
- 50 years have passed since the last credible record of the wildlife species, despite surveys in the interim; or
- there is sufficient information to document that no individuals of the wildlife species remain alive.

**Guidelines for use of Data Deficient**

Data Deficient should be used for cases where the status report has fully investigated all best available information yet that information is insufficient to: a) satisfy any criteria or assign any status, or b) resolve the wildlife species' eligibility for assessment.

*Examples:*

- Records of occurrence are too infrequent or too widespread to make any conclusions about extent of occurrence, population size, threats, or trends.
- Surveys to verify occurrences, when undertaken, have not been sufficiently intensive or extensive or have not been conducted at the appropriate time of the year or under suitable conditions to ensure the reliability of the conclusions drawn from the data gathered.
- The wildlife species' occurrence in Canada cannot be confirmed or denied with assurance.

Data Deficient should **not** be used if: a) the choice between two status designations is difficult to resolve by COSEWIC, or b) the status report is inadequate and has not fully investigated all best available information (in which case the report should be rejected), or c) the information available is minimally sufficient to assign status but inadequate for recovery planning or other such use.

**Table 3. Guidelines for modifying status assessment based on rescue effect.**

COSEWIC's approach to assigning status is, first, to examine the Canadian status of a wildlife species or other Designatable Unit below the species level in isolation and then, if deemed appropriate, to consider the potential for "rescue" from extra-regional subpopulations (e.g., from across an international boundary or from another Designatable Unit within Canada). The rescue effect is the immigration of gametes or individuals that have a high probability of reproducing successfully, such that extirpation or decline of a wildlife species, or some other Designatable Unit, can be mitigated. If the potential for rescue is high, the risk of extirpation may be reduced, and the status may be downgraded. COSEWIC addresses this by applying the following guidelines developed by IUCN for this purpose (Gardenfors et al. 1999[2]).

| | |
|---|---|
| **Likelihood of propagule migration** | |
| Are there any extra-regional populations within a distance from which propagules could reach the region? Are there any effective barriers preventing dispersal to and from extra-regional subpopulations? Is the wildlife species capable of long-distance dispersal? Is it known to do so? | If there are no extra-regional populations or propagules are not able to disperse to the region, the regional subpopulation behaves as an endemic and the status category should be left unchanged. |
| **Evidence for the existence of local adaptations** | |
| Are there any known differences in local adaptation between regional and extra-regional subpopulations, i.e. is it probable that individuals from extra-regional populations are adapted to survive within the region? | If it is unlikely that individuals from extra-regional subpopulations would be able to survive within the region, the status category should be left unchanged. |
| **Availability of suitable habitat** | |
| Are current conditions of habitats and/or other environmental (including climatological) requirements of the taxon in the region such that immigrating propagules are able to successfully establish themselves (i.e. are there inhabitable patches), or has the taxon disappeared from the region because conditions were not favourable? | If there is not enough suitable habitat and current conservation measures are not leading to an improvement of the habitat within a foreseeable future, immigration from outside the region will not decrease extinction risk and the status category should be left unchanged. |

[2] Gardenfors, U., J.P.Rodriquez, C. Hilton-Taylor, C. Hyslop, G. Mace, S. Molur and S. Poss. 1999. *Draft guidelines for the application of Red List criteria at national and regional levels*. Species 31-32:58-70.

**Status of extra-regional subpopulations**

| | |
|---|---|
| How abundant is the taxon in neighbouring regions? Are the populations there stable, increasing or decreasing? Are there any important threats to those subpopulations? Is it probable that they produce an appreciable number of emigrants, and will continue to do so for the forseeable future? | If the taxon is more or less common outside the region and there are no signs of subpopulation decline, and if the taxon is capable of dispersing to the region and there is (or soon will be) available habitat, downgrading the category is appropriate. If the population size of extra-regional subpopulations is declining, the 'rescue effect' is less likely to occur, hence downgrading the status category may not be appropriate. |

**Degree of dependence on extra-regional sources**

| | |
|---|---|
| Are extant regional populations self-sustaining (i.e. have they shown a positive reproductive rate over the years) or are they dependent on immigration for long-term survival (i.e. are the regional populations sinks)? | If there is evidence that a substantial number of propagules regularly reach the region and the population still has a poor survival, the regional population may be a sink. If so, and there are indications that the immigration will soon cease, upgrading the status category may be appropriate. |

**Table 4: Policy for modifying status assessment based on quantitative criteria**

COSEWIC, IUCN and other groups recognize the need for additional assessment tools. Specifically, there is a need to consider life-history variation amongst wildlife species and other taxa. COSEWIC has developed the following guideline:

In addition to the quantitative guidelines, COSEWIC will base its assessment on the degree to which various life-history characteristics (e.g., age & size at maturity, dispersal strategy, longevity) affect extinction probability and the likelihood that the wildlife species is vulnerable to the Allee effects of density dependence.

All else being equal:

- wildlife species with delayed age at maturity tend to be at greater risk of extinction than wildlife species with early age at maturity;
- for indeterminately growing organisms (wildlife species that continue to grow after attaining maturity), larger wildlife species tend to be at greater risk of extinction than smaller wildlife species;
- wildlife species with low dispersal tend to be at greater risk of extinction than wildlife species with high dispersal; and
- wildlife species with non-overlapping generations tend to be at greater risk of extinction than wildlife species with overlapping generations.

**Table 5. COSEWIC status categories.**

Extinct (X) **- A wildlife species that no longer exists.**

Extirpated (XT) **– A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.**

Endangered (E) **- A wildlife species facing imminent extirpation or extinction.**

Threatened (T) **- A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.**

Special Concern (SC) **- A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.**

Data Deficient (DD) **- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.**

Not At Risk (NAR***) -* **A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.**

**Table 6. COSEWIC definitions associated with quantitative criteria.**

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**Area of Occupancy**: The area within 'extent of occurrence' that is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that the extent of occurrence may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of the wildlife species/Designatable Unit considered (in such cases, this area of occupancy does not need to occur within Canada). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data. To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. Different types of taxa have different scale-area relationships. (Source: adapted from IUCN 2010)

**Continuing Decline**: A recent, current or projected future decline (which may be smooth, irregular or sporadic), that is liable to continue unless remedial measures are taken. Fluctuations will not normally count as continuing declines, but an observed decline should not be considered as a fluctuation unless there is evidence for this. (Source: IUCN 2010). *Estimated continuing decline* (under criterion C1) had quantitative thresholds and requires a quantitative estimate (IUCN 2011).

**Demographic Stochasticity:** Random variation in demographic variables, such as birth rates and death rates, sex ratio and dispersal, for which some individuals in a population are negatively affected but not others. In small populations, these random events increase the risk of extinction.

**Environmental Stochasticity:** Random variation in physical environmental variables, such as temperature, water flow, and rainfall, which affect all individuals in a population to a similar degree. In small populations, these random events increase the risk of extinction.

**Estimated:** Information that is based on calculations that may include statistical assumptions about sampling, or biological assumptions about the relationship between an observed variable (e.g., an index of abundance) to the variable of interest (e.g., number of mature individuals). These assumptions should be stated and justified in the documentation. Estimation may also involve interpolation in time to calculate the variable of interest for a particular step (e.g., a 10-year reduction based on observations or estimations of population size 5 and 15 years). (Source: IUCN 2008[1])

**Extent of Occurrence:** The area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species.

**Extreme Fluctuation:** Changes in distribution or in the total number of mature individuals of a wildlife species (designatable unit) that occur rapidly and frequently, and are typically of more than one order of magnitude. (Source: adapted from IUCN 2001)

**Generation**: Generation length is the average age of parents of a cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, the more natural, i.e. pre-disturbance, generation length should be used. (Source: adapted from IUCN 2010). Revised guidance on calculating generation length is available in section 4.4 of IUCN 2011.

**Inferred:** Information that is based on indirect evidence, on variables that are indirectly related to the variable of interest, but in the same general type of units (e.g., number of individuals or area or number of subpopulations). Inferred values rely on more assumptions than estimated values. Inference may also involve extrapolating an observed or estimated quantity from known subpopulations to calculate the same quantity for other subpopulations. Whether there are enough data to make such an inference will depend on how large the known subpopulations are as a proportion of the whole populations, and the applicability of the threats and trends observed in the known subpopulations to the rest of the taxon. The method of extrapolating to unknown subpopulations depends on the criteria and on the type of data available for the known subpopulations. (Source: IUCN 2008)

**Location:** The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. Where the most serious plausible threat does not affect all of the taxon's distribution, other threats can be used to define and count locations in those areas not affected by the most serious plausible threat. (Source: IUCN 2010, 2011). In the absence of any plausible threat for the taxon, the term "location" cannot be used and the subcriteria that refer to the number of locations will not be met. (Source: IUCN 2010, 2011).

**Mature Individuals (Number of)**: The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity, the following points should be borne in mind:

- Mature individuals that will never produce new recruits should not be counted (e.g. densities are too low for fertilization).
- In the case of populations or subpopulations with biased adult or breeding sex ratios, it is appropriate to use lower estimates for the number of mature individuals that take this into account.
- Where the (sub)population size fluctuates, use a lower estimate. In most cases this will be much less than the mean.
- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals).

- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.
- Re-introduced individuals must have produced viable offspring before they are counted as mature individuals.
  (Source: IUCN 2010)

**Observed:** Information that is directly based on well-documented observations of all known individuals in the population. (Source: IUCN 2008)

**Population**: The term "population" is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. (Source: IUCN 2001). The interpretation of this definition depends critically on an understanding of the definition of "mature individuals". For application of Criteria A, C, and D, the word population usually applies to the "Canadian population". See also "Subpopulation".

**Projected:** Same as "estimated", but the variable of interest is extrapolated in time towards the future. Projected variables require a discussion of the method of extrapolation (e.g., justification of the statistical assumptions or the population model used) as well as the extrapolation of current or potential threats into the future, including their rates of change. (Source: IUCN 2008)

**Quantitative Analysis:** An estimate of the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analyses should make full use of all relevant available data. If there is limited information, available data can be used to provide an estimate of extinction risk (for instance, estimating the impact of stochastic events on habitat). In presenting quantitative analyses, the assumptions, the data used and the uncertainty in the data or quantitative model must be documented. (Source: adapted from IUCN 2001).

**Reduction:** A reduction is a decline in the number of mature individuals of at least the amount (%) stated under COSEWIC criterion A over the time period (years) specified, although the decline need not be continuing. A reduction should not be interpreted as part of a fluctuation unless there is reasonable evidence for this. The downward phase of a fluctuation will not normally count as a reduction. (Source: adapted from IUCN 2001)

**Rescue Effect:** Immigration of gametes or individuals that have a high probability of reproducing successfully, such that extirpation or decline of a population, or some other Designatable Unit, can be mitigated. If the potential for rescue is high, the risk of extirpation may be reduced.

**Severely Fragmented:** A situation where most individuals are found in small and relatively isolated populations (in certain circumstances this may be inferred from habitat information). Severe fragmentation results in a reduced probability of recolonization of

habitat patches where populations go extinct, which increases extinction risk for the wildlife species. (Source: adapted from IUCN 2001)

**Subpopulation:** As used in Criteria B and C, Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less). Subpopulation size is measured as numbers of mature individuals only. (Source: IUCN 2001).

**Suspected:** Information that is based on circumstantial evidence, or on variables in different types of units. For example, evidence of qualitative habitat loss can be used to infer that there is a qualitative (continuing) decline, whereas evidence of the amount of habitat loss can be used to suspect a population reduction at a particular rate. In general, a suspected population reduction can be based on any factor related to population abundance or distribution, including the effects of (or dependence on) other taxa, so long as the relevance of these factors can be reasonably supported. (Source: IUCN 2008)

**Total Population:** The total number of mature individuals of a wildlife species in Canada. Equivalent to the term "population" as employed by IUCN 2001. (Source: adapted from IUCN 2001)

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[1] IUCN. (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.

[2] Gardenfors, U., J.P. Rodriquez, C.P. Hilton-Taylor, C. Hyslop, G. Mace, S. Molur and S. Poss. 1999. Draft guidelines for the application of Red List criteria at national and regional levels. Species 31-32:58-70

[3] IUCN. (2008). IUCN Standards and Petitions Working Group. 2008. Guidelines for Using the IUCN Red List Categories and Criteria. Version 7.0. Prepared by the Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessments Sub-Committee in August 2008. Downloadable from http://intranet.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf.

[4]IUCN Standards and Petitions Subcommittee. 2011. Guidelines for Using the IUCN Red List Categories and Criteria. Version 9.0. Prepared by the Standards and Petitions Subcommittee in September 2011. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf