

## Terms of Reference

### Pre-COSEWIC Peer Review Meeting of American Eel

#### Zonal Advisory Process – Gulf, Central and Arctic, Maritimes, Newfoundland and Labrador, Quebec

200 Kent Street, Ottawa (ON)  
August 31 and September 1, 2010

**Chair: M. Castonguay (DFO Quebec Region)**

#### **Context**

The implementation of the federal Species at Risk Act (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether or not to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

The American eel (*Anguilla rostrata*) was listed on COSEWIC's January 2010 Call for Bids to produce a status report. DFO, as a generator and archivist of information on marine species and some freshwater species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

The American eel was previously classified by COSEWIC as one designatable unit and it was assessed in April 2006 as "Special Concern" with the following justification:

Indicators of the status of the total Canadian component of this species are not available. Indices of abundance in the Upper St. Lawrence River and Lake Ontario have declined by approximately 99% since the 1970s. The only other data series of comparable length (no long-term indices are available for Scotia/Fundy, Newfoundland, and Labrador) are from the lower St. Lawrence River and Gulf of St. Lawrence, where four out of five time series declined. Because the eel is panmictic, i.e. all spawners form a single breeding unit, recruitment of eels to Canadian waters would be affected by the status of the species in the United States as well as in Canada. Prior to these declines, eels reared in Canada comprised a substantial portion of the breeding population of the species. The collapse of the Lake Ontario-Upper St. Lawrence component may have significantly affected total reproductive output, but time series of elver abundance, although relatively short, do not show evidence of an ongoing decline. Recent data suggest that declines may have ceased in some areas; however, numbers in Lake Ontario and the Upper St. Lawrence remain drastically lower than former levels, and the positive trends in some indicators for the Gulf of St. Lawrence are too short to provide strong evidence that this component is increasing. Possible causes of the observed decline, including habitat alteration, dams, fishery harvest, oscillations in ocean conditions, acid rain, and contaminants, may continue to impede recovery.

## **Meeting Objectives**

The overall objective of this meeting is to peer-review DFO information relevant to the COSEWIC status assessment for American eel in Canadian waters, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be made available to COSEWIC, the authors of the species status report, and the co-chairs of the applicable COSEWIC Species Specialist Subcommittee. Output from the peer-review meeting (see below) will be posted on the Canadian Science Advisory Secretariat (CSAS) website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

### **1) Life history characteristics**

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Total and natural mortality rates and recruitment rates (if data is available)
- Fecundity
- Generation time
- Early life history patterns
- Specialised niche or habitat requirements

### **2) Review of designatable units**

See COSEWIC 2008 “Guidelines for Recognizing Designatable Units below the Species Level” (Appendix 1). Discussion on the species will consider available information on population differentiation, which could support a COSEWIC decision of which populations below the species’ level would be suitable for assessment and designation.

### **3) Review the COSEWIC criteria**

(Appendix 2) for the species in Canada as a whole, and for each designatable units identified (if any):

#### **COSEWIC Criterion – Declining Total Population**

- a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.
- b. Identify threats to abundance - where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.
- c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

**COSEWIC Criterion – Small Distribution and Decline or Fluctuation**: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

- a. Summarise the current extent of occurrence (in km<sup>2</sup>) in Canadian waters
- b. Summarise the current area of occupancy (in km<sup>2</sup>) in Canadian waters
- c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.

- d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.
- e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

**COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted:** for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

- a. Tabulate the best scientific estimates of the number of mature individuals;
- b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

#### **4) Describe the characteristics or elements of the species habitat to the extent possible, and threats to that habitat**

Habitat is defined as “in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced”.

The phrasing of the following guidelines would be adapted to each specific species and some could be dropped on a case-by-case basis if considered biologically irrelevant. However, these questions should be posed even in cases when relatively little information is expected to be available, to ensure that every effort is made to consolidate whatever knowledge and information does exist on an aquatic species’ habitat requirements, and made available to COSEWIC.

- a) Describe the functional properties that a species’ aquatic habitat must have to allow successful completion of all life history stages.

In the best cases, the functional properties will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or fecundity of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to clearly communicate uncertainties and knowledge gaps.

- b) Provide information on the spatial extent of the areas that are likely to have functional properties.

Where geo-referenced data on habitat features are readily available, these data could be used to map and roughly quantify the locations and extent of the species’ habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent of occurrence of the types of habitats identified. Many information sources, including Aboriginal Traditional Knowledge (ATK) and experiential knowledge, may contribute to these efforts.

- c) Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information and advice from the Pre-COSEWIC review should provide whatever information is available on both of those points. In addition, the information and advice should include at least a narrative discussion of the magnitude of impact caused by each identified threat when it does occur.

- d) Recommend research or analysis activities that are necessary

Usually the work on the other Guidelines will identify many knowledge gaps.

Recommendations made and enacted at this stage in the overall process could result in much more information being available should a RPA (Recovery Potential Assessment) be required for the species.

#### **5) Describe to the extent possible whether the species has a residence as defined by SARA**

SARA s. 2(1) defines Residence as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating."

#### **6) Threats**

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Guidance is provided in: *Environment Canada, 2007. Draft Guidelines on Identifying and Mitigating Threats to Species at Risk. Species at Risk Act Implementation Guidance.*

List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.
- Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population.
- Distinction should be made between general threats (e.g. agriculture) and specific threats (e.g. siltation from tile drains), which are caused by general activities.
- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

#### **7) Other**

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

## **Working Papers**

Working papers addressing the above terms of reference for the American eel will be submitted for review:

- DFO Newfoundland Region
- DFO Maritimes Region
- DFO Gulf Region
- Province of Quebec
- Province of Ontario

The working papers should be made available for distribution to all participants by **August 20, 2010.**

## **Output of the meeting**

The key conclusions/recommendations will address the basis for assessing status of the Canadian American eel population(s) to be considered by COSEWIC. The final version of the minutes of the meeting will be part of the CSAS Proceedings series. CSAS Research documents are expected from the working papers submitted for review.

## **Participation**

Participation is expected from:

- Relevant DFO Sectors
- Provinces of Ontario and Québec
- COSEWIC status report author

Participation may also include:

- Members of COSEWIC (Co-Chairs and/or SSC experts)
- Other provinces with interest in American eel
- Industry
- Aboriginal groups
- ENGO's
- Academia
- Other invited external experts as deemed necessary

## Appendix 1

### Guidelines for recognizing Designatable Units Below the Species Level

Revised and approved by COSEWIC in April 2008

#### **Preamble:**

It is widely recognised that status assessments and the conservation of biological diversity require that units below the species level (using “species” in the accepted sense of the taxonomic hierarchy) be considered when appropriate. The Species at Risk Act includes “subspecies, varieties or geographically or genetically distinct population” in its definition of wildlife species. This recognizes that conservation of biological diversity requires protection for taxonomic entities below the species level (i.e. Designatable Units or DUs), and gives COSEWIC a mandate to assess those entities when warranted.

#### **Approach to the status assessment of DUs below the species level:**

COSEWIC may assess DUs below the species level when a single status designation is thought not to reflect the probability of extinction of the wildlife species.

Designatable Units should be discrete and evolutionarily significant units of the taxonomic species, where “significant” means that the unit is important to the evolutionary legacy of the wildlife species as a whole and if lost would likely not be replaced through natural dispersion.

Following is a set of guidelines to assist in the identification of Designatable Units for the purpose of status assessment by COSEWIC. The guidelines should be seen as aids for identifying DUs and not as rigid criteria.

#### **Guidelines for the identification of DUs:**

##### **1) Subspecies or varieties:**

A unit may be recognized as a DU if it represents a named subspecies or variety identified in accordance with COSEWIC’s guidelines for naming subspecies and varieties (Appendix E4). COSEWIC may choose not to recognize a named subspecies or variety as a DU if current scientific data do not support its validity.

##### **2) Discrete and evolutionarily significant populations:**

A population or group of populations may be recognized as a DU if it has attributes that make it “discrete” and evolutionarily “significant” relative to other populations.

The first step in identifying DUs is to ask whether the population or group of populations is discrete from other populations.

#### **Discreteness**

A population or group of populations may be considered discrete based on one or more of the following criteria:

1. Evidence of genetic distinctiveness including, but not limited to, inherited traits (e.g. morphology, life history, behaviour) and/or neutral genetic markers (e.g. allozymes, DNA microsatellites, DNA restriction fragment length polymorphisms (RFLPs), DNA sequences).

2. Natural disjunction between substantial portions of the wildlife species' geographic range, such that movement of individuals between separated regions has been severely limited for an extended period of time and is not likely in the foreseeable future and where the disjunction is likely to favour the evolution of local adaptations.

3. Occupation of differing eco-geographic regions that are relevant to the wildlife species and reflect historical or genetic distinction, as may be depicted on an appropriate ecozone or biogeographic zone map (Figs. 1 - 2). Some dispersal may occur between regions, but it is insufficient to prevent local adaptation.

### **Significance**

If a population or group of populations is considered discrete, based on one or more of the above criteria, then its significance may next be considered. A population may be considered significant based on, but not limited to, one or more of the following criteria, each of which can be considered a measure of evolutionary significance:

1. Evidence that the discrete population or group of populations differs markedly from others in genetic characteristics thought to reflect relatively deep intraspecific phylogenetic divergence. Such differences would typically be manifested as qualitative genetic differences at relatively slow-evolving markers (e.g. fixed differences in mitochondrial or nuclear DNA sequences or fixed differences in alleles at multiple nuclear loci). Quantitative (frequency) differences of shared alleles, especially for rapidly-evolving markers such as microsatellites, generally would not be sufficient to meet this criterion.

2. Persistence of the discrete population or group of populations in an ecological setting unusual or unique to the wildlife species, such that it is likely or known to have given rise to local adaptations.

3. Evidence that the discrete population or group of populations represents the only surviving natural occurrence of a wildlife species that is more abundant elsewhere as an introduced population outside of its historical range.

4. Evidence that the loss of the discrete population or group of populations would result in an extensive gap in the range of the wildlife species in Canada.

It is important to recognize that some criteria provide more compelling evidence of "discreteness" and "significance" than others; hence, when identifying a DU, it is important to present the best available evidence for all criteria that are met.

Fig. 1. COSEWIC National Ecological Areas.

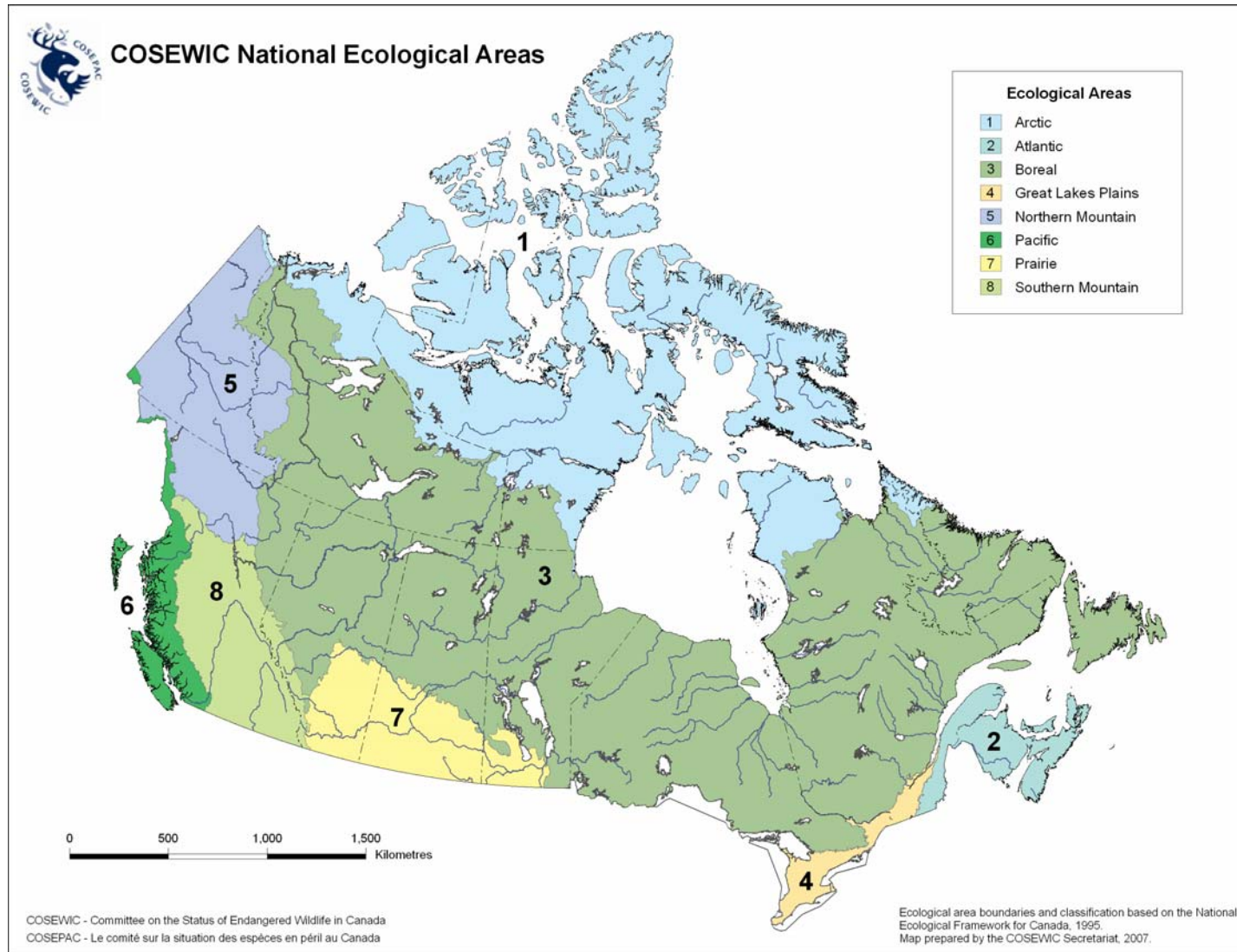
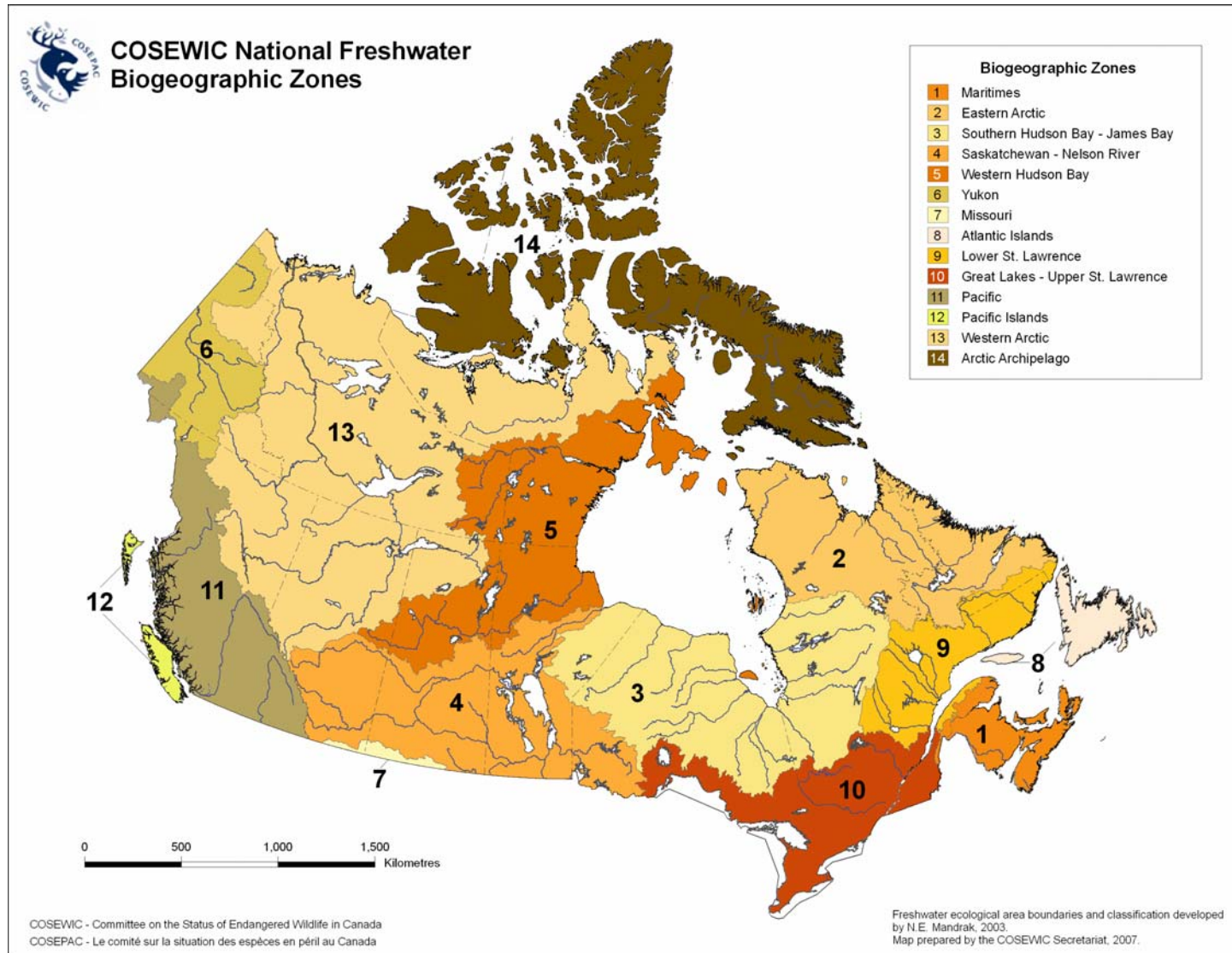




Fig. 2. COSEWIC National Freshwater Biogeographic Zones.



## Appendix 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<sup>1</sup>). An earlier version of the quantitative criteria was used by COSEWIC from October 1999 to May 2001. For definitions of terms marked in bold italics, see COSEWIC's Glossary of Definitions and Abbreviations (Appendix C).

Indicator	Endangered	Threatened
<b>A. Declining Population</b>		
Reduction in size of mature individuals based on any of the following 4 options and specifying a-e as appropriate:		
1. population size reduction that is observed, estimated, inferred or suspected over the last 10 years or 3 generations, whichever is the longer, where the causes of the reduction are: clearly reversible <b>and</b> understood <b>and</b> ceased, based on (and specifying) one or more a-e below.	Reduction of ≥ 70%	Reduction of ≥ 50%
2. population size reduction that is observed, estimated, inferred or suspected over the last 10 years or 3 generations, whichever is the longer, where the reduction or its causes may not have ceased <b>or</b> may not be understood <b>or</b> may not be reversible, based on (and specifying) one or more a-e below.	Reduction of ≥ 50%	Reduction of ≥ 30%
3. population size that is 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) one or more a-e below.	Reduction of ≥ 50%	Reduction of ≥ 30%
4. population size reduction that is observed, estimated, inferred, projected or suspected 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 includes both the past and the future, <b>and</b> where the reduction or its causes may not have ceased <b>or</b> may not be understood <b>or</b> may not be reversible, based on (and specifying) one or more a-e below.	Reduction of ≥ 50%	Reduction of ≥ 30%
<ul style="list-style-type: none"> <li>(a) direct observation</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.</li> </ul>		

<sup>1</sup> IUCN 2001. *IUCN Red List Categories and Criteria: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Indicator	Endangered	Threatened
<b>B. Small Distribution, and Decline or Fluctuation</b>		
1. Extent of occurrence	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
<b>or</b>		
2. Area of occupancy	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
<b>and</b> (for either B1 or B2) specifying at least two of a–c:		
a. Severely fragmented <b>or</b> known to exist at # locations:	≤ 5 locations	≤ 10 locations
b. Continuing decline, observed, inferred or projected, in one of more of the following:		
(i) extent of occurrence,		
(ii) area of occupancy,		
(iii) area, extent and/or quality of habitat,		
(iv) number of locations or populations,		
(v) number of mature individuals.		
c. Extreme fluctuations in one of more of the following:	> 1 order of magnitude	>1 order of magnitude
(i) extent of occurrence,		
(ii) area of occupancy,		
(iii) number of locations or populations,		
(iv) number of mature individuals.		
<b>C. Small Population Size and Decline</b>		
Number of mature individuals:	<2,500	< 10,000
<b>and</b> one of the following two:		
1. An estimated continuing decline rate of at least (whichever is longer, up to a maximum of 100 years in the future):	20% within 5 years or two generations	10% within 10 years or three generations
<b>or</b>		
2. continuing decline, observed, projected, or inferred, in numbers of mature individuals and at least one of the following (a-b):		
a. population structure in the form of one of the following:	(i) no population estimated to contain > 250 mature individuals	(i) no population estimated to contain > 1000 mature individuals
	(ii) at least 95% of mature individuals in one population	(ii) all mature individuals are in one population
b. extreme fluctuations in number of mature individuals.		

Indicator	Endangered	Threatened
<b>D. Very Small Total Population or Restricted Distribution</b>		
1. Total number of mature individuals estimated to be:	< 250	< 1000
or		
2. <b>Applies to threatened only:</b> Population with a very restricted area of occupancy (typically < 20 km <sup>2</sup> ) 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 in an uncertain future, and is thus capable of becoming endangered or extinct in a very short time period.	Does not apply	Area of occupancy < 20 km <sup>2</sup>  or ≤ 5 locations

#### E. Quantitative Analysis

Indicating the probability of extinction in the wild to be at least:	20% within 20 years or 5 generations (up to a maximum of 100 years)	10% within 100 years
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#### 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:

- 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
- 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
- the wildlife species is near to qualifying, under any criterion, for Threatened status; or
- the wildlife species qualifies for Threatened status but there is clear indication of rescue effect from extra-limital populations.

#### 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.