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# Data Sources and Methods for the Global Trends in Bird Species Survival Indicator

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# 1 Introduction

The Global Trends in Bird Species Survival indicator (<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=78A7AE2B-1>) is part of the Canadian Environmental Sustainability Indicators (CESI) program (<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1>), which provides data and information to track performance on key environmental sustainability issues.

The Red List Index (RLI) measures the projected overall extinction risk of species by examining changes over time in species' classification on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. The steady and continuing deterioration in the threat status for many species since the first global assessment was carried out in 1988 indicates that birds are facing increasing threats and risk of extinction, threatening bird biodiversity worldwide.<sup>1</sup>

## 2 Description and rationale of the Global Trends in Bird Species Survival indicator

### 2.1 Description

The Red List Index (RLI) shows trends in aggregate extinction risk over time (i.e., overall improvement or deterioration in threat status), for bird species on the International Union for Conservation of Nature (IUCN) Red List. The index is derived from the proportion of species changing category due to genuine biological status changes from one assessment to the next, and acts as an indicator of the changing status of global biodiversity. A downward trend in the RLI indicates that the set of species assessed has moved to a higher level of extinction risk.<sup>2</sup>

### 2.2 Rationale

World biodiversity continues to decline in the face of increasing pressures.<sup>3</sup> In 2002, parties to the Convention on Biological Diversity (CBD) committed to significantly reduce the rate of biodiversity loss by 2010 and this target was included in the United Nations Millennium Development Goals. The IUCN RLI was developed in 2004 to serve as an indicator of progress toward achieving the 2010 goal and monitor the changing status of the world's biodiversity. In 2010, the CBD parties adopted a new suite of targets for 2020, including the aim by 2020 of preventing the extinction of known threatened species and improving their conservation status, for which the RLI will be used to measure progress. The RLI is based on the IUCN Red List of

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<sup>1</sup> BirdLife International (2008) The status of the world's birds has deteriorated over the last 20 years. Retrieved on 16 August, 2013. Available from: <http://www.birdlife.org/datazone/sowb/casestudy/72>.

<sup>2</sup> Butchart *et al.* (2005) Using Red List Indices to measure progress toward the 2010 target and beyond. *Philosophical Transactions of the Royal Society B* 360(1454):255-268. Retrieved on 16 August, 2013. Available from: <http://rstb.royalsocietypublishing.org/content/360/1454/255.short>.

<sup>3</sup> Butchart *et al.* (2010) Global Biodiversity: Indicators of Recent Decline. *Science* 328(5982):1164-1168. Retrieved on 16 August, 2013. Available from: <http://www.sciencemag.org/content/328/5982/1164.full>.

Threatened Species, recognized as the most objective and authoritative system for classifying species at risk of extinction.<sup>4,5</sup>

### 2.3 Recent changes to this indicator

This report reflects new knowledge, revisions to status assessments and changes in taxonomic status since 2008. BirdLife International provides detailed explanations of rank changes (<http://www.birdlife.org/datazone/species/search>).

## 3 Data

### 3.1 Data source

Data for this indicator come from the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. The Red List categorizes species in terms of their risk of extinction, as determined by assessment against a set of standardized, quantitative criteria. Information on species' population size, population trends and geographic range are applied against these criteria to categorize species into one of nine Red List Categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient or Not Evaluated. Detailed definitions and guidance on the IUCN Red List classification and criteria have been developed (<http://www.iucnredlist.org/technical-documents/categories-and-criteria>).

Most assessments included in the Red List are carried out by members of the IUCN Species Survival Commission (SSC) Specialist Groups, IUCN Red List Partner organizations, appointed Red List Authorities or participants of Global Biodiversity Assessment workshops, a joint initiative of the IUCN/SSC and the Center for Applied Biodiversity Science at Conservation International. For more information on how assessments are conducted, see the IUCN Assessment Process website (<http://www.iucnredlist.org/technical-documents/assessment-process>).

BirdLife International is the Red List Authority for birds and hence provides all the assessments for birds on the IUCN Red List. BirdLife International maintains all assessments and associated documentation in the Species Information System, which is co-managed with IUCN.

Terrestrial biogeographic realms are provided by the World Wildlife Federation (Olson et al. 2001). A generalization that includes ocean areas was provided by the United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC) for visualization purposes.

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<sup>4</sup> Butchart *et al.* (2004) Measuring Global Trends in the Status of Biodiversity: Red List Indices for Birds. *Public Library of Science Biology* 2(12):e383. Retrieved on 16 August, 2013. Available from: <http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0020383>.

<sup>5</sup> BirdLife International (2013) Spotlight on birds as indicators. Retrieved on 16 August, 2013. Available from: <http://www.birdlife.org/datazone/sowb/indicators>.

### 3.2 Spatial coverage

The IUCN Red List is a global-level assessment. The Red List Index (RLI) is calculated for all bird species, and can also be disaggregated to show trends for species in different biogeographic realms, ecosystems and taxonomic groups.<sup>6</sup>

### 3.3 Temporal coverage

The first global assessment of bird species was completed in 1988 with comprehensive assessments conducted in 1994, 2000, 2004, 2008 and 2012. The first RLI was calculated in 2004 using data on bird species for the period 1988 to 2004. The RLI has been periodically updated since then, most recently in 2012.

### 3.4 Data completeness

All bird species assigned to threat categories on the Red List are included in the calculation of the RLI. As a result, the RLI is geographically highly representative, with the current RLI based on assessment of 9870 species, or 99.4% of the world's living bird species. Sixty species classified as Data Deficient are excluded.

### 3.5 Data timeliness

The indicator is current to December 2012.

## 4 Methods

The Red List Index (RLI) is calculated from the Red List categories of the species under consideration. Species categorized as Extinct prior to the 1988 assessment and those classified as Data Deficient are excluded from the analysis; all remaining species are included. No bird species are in the Not Evaluated category. Migratory species and other species with large geographical ranges are included in all biogeographical realms in which they regularly occur.

To calculate the current RLI for each biogeographical realm, each species that occurs in the realm is assigned a score based on its extinction risk category. Species of Least Concern are assigned a score of 0, for Near Threatened a score of 1 is assigned, for Vulnerable a score of 2, for Endangered a score of 3, for Critically Endangered a score of 4, and for Extinct a score of 5. These scores are summed across all species and compared to the maximum possible sum (5 × number of species):

$$\text{RLI} = (\text{maximum possible sum} - \text{sum of species scores}) / \text{maximum possible sum}$$

This creates an index that ranges from zero (all species are Extinct) to one (all species are Least Concern). That is, higher RLI values indicate a higher expected rate of species survival, and as RLI values decline, the risk of extinction increases.

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<sup>6</sup> Butchart *et al.* (2007) Improvements to the Red List Index. Retrieved on 15 August, 2013. Available from: <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0000140>.

Back-casting is used to calculate the RLI for previous assessment years while taking into account new information and changes in taxonomic status. Back-casting determines what category would have been assigned to a species had current knowledge been available. For species that occur in more than one realm and that have undergone a category change, the change is assigned to the realm in which the threat has occurred (or where the conservation intervention has been successful). For example, a Canadian neotropical migrant that was threatened by development occurring in its breeding area would have a constant status in the Neotropical realm and a declining status in the Nearctic realm. One that was threatened by logging in its wintering area would have a constant status in the Nearctic realm and a declining status in the Neotropical realm. With these adjustments, the RLI for previous years is calculated in the same way as for the current year.

The methodology only captures changes if any species have been moved from one extinction risk category to another as a result of genuine status changes. Genuine changes are those resulting from an improvement or deterioration in quantitative assessment criteria rather than improved knowledge or changes in taxonomy.

The RLI shows both the level of extinction risk, represented by the RLI value, and the rate at which extinction risk changes over time, represented by the slope of the line connecting two RLI values. For a complete description of RLI calculation and its strengths and limitations, see Butchart et al. (2007)

(<http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0000140>).

## 5 Caveats and limitations

- The Red List Index (RLI) requires that the exact same set of species be included in the calculation at each stage in a time series and that the only reason for a species to change from one category to another is a genuine status change. That is, category changes occur solely as a result of improvements or deterioration in the quantitative assessment criteria and not as a result of improvements in knowledge or changes in taxonomy. Both of these conditions are met through the use of a back-casting formula that accommodates the inclusion of new species or taxonomic changes by adjusting earlier RLI values based on current information. Back-casting may be uncertain in some cases.
- The RLI values depend on sufficient knowledge of a species being available to evaluators and consistent application of the Red List categories and criteria by all evaluators. Poor knowledge, incorrect categorization, and inconsistency in the application of criteria are all sources of uncertainty in the RLI values. Annual revisions of the guidelines for the application of Red List categories and criteria, improvements in the RLI calculation, and the existence of an overarching Red List Authority ensure consistency across the assessments for all birds help to reduce some of this uncertainty.
- The RLI value is an index of the proportion of bird species expected to survive in the near future if no conservation measures are undertaken. However, "near future" cannot be precisely quantified because different species in the index have different generation times. It can generally be assumed to be between 10 and 50 years.
- The RLI has moderately low sensitivity. Large changes in population size or distribution may be required to move a species from one Red List category to another. As a result, lack of change in species categorization from one assessment to the next does not necessarily mean the species has no change in risk of extinction over that time period.

- The RLI shows net trends in an aggregated form and, in the RLI calculation, extinction of a species may be offset by conservation efforts directed toward another species. The RLI does not measure the extinction rate as such, nor does it completely capture changes in overall genetic diversity.
- The RLI presented here is representative of trends for the world's birds; it does not include other taxonomic groups, which may be at higher risk of extinction or deteriorating faster. For more information on index development for other taxonomic groups, see Butchart et al. (2005) (<http://rstb.royalsocietypublishing.org/content/360/1454/255.full>), Vié et al. (2009) ([http://www.iucn.org/about/work/programmes/species/publications/analysis\\_of\\_the\\_2008\\_red\\_list/](http://www.iucn.org/about/work/programmes/species/publications/analysis_of_the_2008_red_list/)), Hoffman et al. (2010) (<http://www.sciencemag.org/content/330/6010/1503.abstract>) and Butchart et al. (2010) (<http://www.sciencemag.org/content/328/5982/1164.full>).
- The RLI does not account for bird species extinctions occurring before 1988.

## 6 References and further reading

### 6.1 References

BirdLife International (2008) The status of the world's birds has deteriorated over the last 20 years. Retrieved on 16 August, 2013. Available from: <http://www.birdlife.org/datazone/sowb/casestudy/72>.

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## 6.2 Further reading

BirdLife International: State of the World's Birds. Available from: <http://www.birdlife.org/datazone/sowb>.

BirdLife International: World Bird Database. Available from: <http://www.birdlife.org/datazone/home>.

Convention on Biological Diversity. Available from: <http://www.cbd.int/>.

IUCN Red List of Threatened Species. Available from: <http://www.iucnredlist.org/>.

United Nations Millennium Development Goals. Available from: <http://www.un.org/millenniumgoals/>.

Wildlife in a Changing World: An analysis of the 2008 IUCN Red List of Threatened Species. Available from: [http://www.iucn.org/about/work/programmes/species/our\\_work/the\\_iucn\\_red\\_list/review\\_11012012\\_1607/](http://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/review_11012012_1607/).

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