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

June 2012

Canada

1 Introduction

The global trends in bird species survival indicator is a part of the Canadian Environmental Sustainability Indicators (CESI) (http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1) program, 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.[1]

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

2.1 Description

The RLI shows trends over time in aggregate extinction risk (i.e., overall improvement or deterioration in threat status) over time for species on the IUCN Red List. The index is derived from the proportion of species changing category due to genuine 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.[2]

2.1 Rationale

World biodiversity continues to decline in the face of increasing pressures.[3] 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 Threatened Species, recognized as the most objective and authoritative system for classifying species at risk of extinction.[1,4]

---

[1] BirdLife International (2011) Birds on the IUCN Red List. Available from: http://www.birdlife.org/action/science/species/global_species_programme/red_list.html.
[2] Butchart *et al*. (2005) Using Red List Indices to Measure Progress Toward the 2010 Target and Beyond. Available from: http://rstb.royalsocietypublishing.org/content/360/1454/255.short.
[3] Butchart *et al*. (2010) Global Biodiversity : Indicators of Recent Decline. *Science 328*(5982) p. 1164-1168. Available from: http://www.sciencemag.org/content/328/5982/1164.full.
[4] Butchart *et al*. (2004) Measuring Global Trends in the Status of Biodiversity: Red List Indices for Birds. Available from: http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0020383.

3 Data

3.1 Data source

Data for this indicator come from the 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.[1] Detailed definitions and guidance (http://www.iucnredlist.org/technical-documents/red-list-training#Red_List_Documents) on the IUCN Red List classification and criteria have been developed.

Most assessments included in the Red List are carried out by members of the IUCN Species Survival Commission (SSC) Specialist Groups, 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.[5] For more information on how assessments are conducted, see the IUCN Assessment Process (http://www.iucnredlist.org/technical-documents/assessment-process) website.

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 World Bird Database (http://www.birdlife.org/datazone/home), and makes its data sets available online at http://www.birdlife.org/datazone.

Terrestrial biogeographic realms are provided by the World Wildlife Federation (Olson et al., 2001), and are available at http://www.worldwildlife.org/science/ecoregions/item1267.html. A generalization that includes ocean areas was provided by the United Nations Environment Programme — World Conservation Monitoring Centre (UNEP-WCMC) for visualization purposes.

3.2 Spatial coverage

The IUCN Red List is a global-level assessment. The 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.[6]

3.3 Temporal coverage

The first global assessment of bird species was completed in 1988 with comprehensive assessments conducted in 1994, 2000, 2004 and 2008. The first RLI was conducted in 2004, using data on bird species for the period 1988 to 2004. The RLI for birds was recalculated following the 2008 assessment.

---

[5] IUCN Red List (2011) Assessment Process. Available from:
http://www.iucnredlist.org/technical-documents/assessment-process.
[6] Butchart *et al.* (2007) Improvements to the Red List Index. Available from:
http://www.plosone.org/article/info:doi/10.1371/journal.pone.0000140

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 highly representative, with the current RLI based on assessment of 9855 species, or 99.4% of the world's living bird species.[2] Sixty-two species classified as Data Deficient are excluded.

3.5 Data timeliness

The IUCN Red List is updated annually. Approximately 100—200 bird species are reassessed each year, with comprehensive assessments of all 10,000 bird species carried out every four years. The IUCN and BirdLife International recommend that a complete global reassessment and re-calculation of the RLI be conducted every four to five years. This is a sufficiently long interval to allow for the detection of status change while keeping the index timely enough to monitor the effects of conservation efforts and inform policy decisions.[2]

4 Methods

The RLI is calculated from the number of species in each Red List category, and the number moving between categories between assessments owing to genuine improvement or deterioration in status (i.e., re-categorizations resulting from improved knowledge or revised taxonomy are excluded). Based on evaluations of quantitative criteria such as population size and range, this assessment placed species into one of eight IUCN Red List extinction risk categories: Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild, Extinct, or Data Deficient. For calculation of the initial RLI value, species categorized as Extinct prior to the initial assessment or data deficient are excluded from analysis. Each of the remaining six categories is assigned a category weight to reflect the risk of extinction associated with that categorization. Using equal step weighting, categories from least concern to extinct are assigned integer values of 0 through 5, respectively. For more information on weighting methods and their implications for RLI values, see Butchart et al. (2004) and Butchart et al.(2007).

The RLI value for each year is derived from two values: the maximum threat score and the current threat score. The maximum threat score is calculated as the total number of species assessed (excluding those classified as data deficient or extinct prior to the initial 1988 assessment) multiplied by the maximum category weight of 5. The current threat score begins with a count of the number of species in each of the categories from least concern to critically endangered, and multiplying the count by the corresponding category weight. The sum of these products is the current threat score.

To scale the RLI between 0 and 1, the current threat score is subtracted from the maximum threat score and the difference is divided by the maximum threat score. The result is an RLI value between 0 and 1, where 0 indicates all species have gone extinct and 1 indicates all species are of least concern. That is, higher RLI values indicate a high rate of overall species survival, and as RLI values decline, the risk of extinction increases.

The methodology requires that the same set of species be included in each RLI calculation through time. As a result, the maximum threat score will not change over time. The current threat score 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 limits the influence of these external changes

through the use of a back-casting technique that adjusts earlier RLI values to reflect current information.

Once all RLI values have been calculated, the values are plotted over time. A downward trend in the RLI indicates that the set of species has moved to an overall higher level of extinction risk since the first assessment in 1988. 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. The RLI may be calculated for the entire set of bird species assessed or for subsets of species of interest. For a complete description of RLI calculation and its strengths and limitations, see Butchart et al. (2007).

5 Caveats and limitations

The RLI requires that the exact same set of species is 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 for the inclusion of new species or taxonomic changes by adjusting earlier RLI values based on current information.

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 and improvements in the RLI calculation 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.[6]

The RLI has low sensitivity, in that it is unable to detect species decline that occurs slowly as a result of general environmental degradation. 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), Vié et al. (2009), and Hoffman et al. (2010).

The RLI does not account for bird species extinctions occurring before 1988.

6 References and further reading

6.1 References

Biodiversity Indicators Partnership Red List Index Calculator. Retrieved on 6 July, 2011. Available from: http://www.bipindicators.net/rli.

BirdLife International (2011) Birds on the IUCN Red List. Retrieved on 7 July, 2011. Available from:
http://www.birdlife.org/action/science/species/global_species_programme/red_list.html.

Butchart SHM et al. (2004) Measuring Global Trends in the Status of Biodiversity: Red List Indices for Birds. Retrieved on 6 July, 2011. Available from:
http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0020383.

Butchart SHM et al., (2005) Using Red List Indices to Measure Progress Toward the 2010 Target and Beyond. Retrieved on 6 July, 2011. Available from:
http://rstb.royalsocietypublishing.org/content/360/1454/255.full.

Butchart SHM et al. (2007) Improvements to the Red List Index. Retrieved on 6 July, 2011. Available from: http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0000140.

Butchart et al. (2010). Global Biodiversity: Indicators of Recent Decline. Science 328(5982) p. 1164-1168. Retrieved on 6 July, 2011. Available from:
http://www.sciencemag.org/content/328/5982/1164.full.

Hoffmann M, Hilton-Taylor C, Angulo A, Böhm M, Brooks TM, Butchart SHM and 174 other authors (2010) The impact and shortfall of conservation on the status of the world's vertebrates. Science 330: 1503−1509. Retrieved on 6 July, 2011. Available from:
http://www.sciencemag.org/content/330/6010/1503.full.

IUCN (2011) Red List Assessment Process. Retrieved on 7 July, 2011. Available from:
http://www.iucnredlist.org/technical-documents/assessment-process.

Olson DM, Dinerstein E, Wikramanayake ED, Burgess ND, Powell GVN, Underwood EC, D'Amico JA, Strand HE, Morrison JC, Loucks CJ, Allnutt TF, Lamoreux JF, Ricketts TH, Itoua I, Wettengel WW, Kura Y, Hedao P, and Kassem K (2001) Terrestrial ecoregions of the world: A new map of life on Earth. BioScience 51(11):933−938. Retrieved on 6 July, 2011. Available from:
http://www.jstor.org/discover/10.1641/0006-3568%282001%29051%5B0933%3ATEOTWA%5D2.0.CO%3B2?uid=307952761&uid=3739464&uid=2129&uid=2&uid=70&uid=3737720&uid=3&uid=67&uid=16749816&uid=62&sid=47699009684107.

Vié JC, Hilton-Taylor C and Stuart SN (eds) (2009) Wildlife in a Changing World – An analysis of the 2008 IUCN Red List of Threatened Species™. IUCN, Gland, Switzerland. Retrieved on 6 July, 2011. Available from:
http://www.iucn.org/what/tpas/biodiversity/resources/publications/?3506/Wildlife-in-a-changing-world-An-analysis-of-the-2008-IUCN-Red-List-of-Threatened-Species.

6.2 Further reading

BirdLife International State of the World's Birds (http://www.birdlife.org/datazone/sowb)

BirdLife International World Bird Database (http://www.birdlife.org/datazone/home)

Convention on Biological Diversity (http://www.cbd.int/)

IUCN Red List of Threatened Species (http://www.iucnredlist.org/)

United Nations Millennium Development Goals (http://www.un.org/millenniumgoals/)

www.ec.gc.ca

Additional information can be obtained at:
Environment Canada
Inquiry Centre
10 Wellington Street, 23rd Floor
Gatineau, QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800
Fax: 819-994-1412
TTY: 819-994-0736
Email: Enviroinfo@ec.gc.ca