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Data Sources and Methods for the Protected Areas Indicators

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1 Introduction

The Protected Areas indicators are part of the Canadian Environmental Sustainability Indicators (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues.

2 Description and rationale of the Protected Areas indicator

2.1 Description

The Protected Areas indicators report the amount and proportion of Canada's land and freshwater and marine area that is recognized as protected under the international definition of a protected area as "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (www.iucn.org/dbtw-wpd/edocs/PAPS-016-Fr.pdf).¹ Land and/or water access, use and activities are restricted, permanently or temporarily, primarily for the purpose of conserving biodiversity and ecosystem function, regardless of proprietary designation (e.g., park, conservation area, wildlife reserve). Geographic breakdowns by jurisdiction and by ecological region are also provided.

2.2 Rationale

The area of land and water that is protected is a measure of human response to the loss of biodiversity and natural habitat. As the amount of protected area in Canada increases, more natural landscapes are withdrawn from direct human development stresses, thereby preserving ecosystem services and contributing to biodiversity conservation. Although the results can be linked to International Union for the Conservation of Nature (IUCN) standards for management goals, the degree to which the areas are ecologically intact and protected from the impact of human activities is not known (but see Ecological Integrity of National Parks (<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=CDE1612B-1>)). Many countries use protected areas as the core of their programs to preserve biodiversity, ecosystems, and ecological services.

The Parties to the Convention on Biological Diversity, which includes Canada, set an aspirational target to set aside at least 17% of terrestrial areas and inland waters and at least 10% of marine areas, by 2020 (<http://www.cbd.int/>). This is one of 20 targets collectively known as the Aichi Targets, established in October 2010. The protected area target supersedes the previous Convention target, set in 2004, of having 10% of each ecological region protected by 2010.

2.3 Changes since last report

The quality and completeness of protected areas data have continued to improve.

Areas managed by the National Capital Commission and recognized as protected areas are now included as federal protected areas.

Management of areas in the Community Pastures Program (Agriculture and Agri-Food Canada) will be transferred to provinces; at present, these continue to be managed federally and are

¹ Dudley N (2008) Guidelines for Applying Protected Area Management Categories, IUCN: Gland, Switzerland, page 6. Retrieved on 16 April, 2012 (<http://www.iucn.org/dbtw-wpd/edocs/paps-016.pdf>).

included in federal protected areas. Among the provincial jurisdictions affected, only Saskatchewan has committed to continuing to protect these areas.

The geographic breakdown of marine ecological regions has been updated to use the more recent marine bioregion framework, replacing the marine Ecozones⁺ framework.

3 Data

3.1 Data source

Protected areas:

For Canada except Quebec: Canadian Council on Ecological Areas (CCEA) (2013) Conservation Areas Reporting and Tracking System (CARTS) (http://www.ccea.org/en_carts.html). Data current as of 31 December, 2012.

For Quebec: Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP) (2013) Base de données du Registre des aires protégées au Québec (in French only). Data current as of 31 December, 2012 (http://www.mddep.gouv.qc.ca/biodiversite/aires_protegees/registre/index.htm#synthese).

Provincial and territorial areas:

For Canada except Quebec: Natural Resources Canada (2009), Canada Centre for Remote Sensing. Areas are estimated using the Atlas of Canada 1,000,000 National Frameworks Data, Administrative Boundaries. For Quebec: Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (<http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/0d2b6f01-fe48-521f-aa7c-a177613c56dd.html>).

Marine areas:

Fisheries and Oceans Canada (2010) Canada's Ocean Estate: A description of Canada's maritime zones. Retrieved on 22 February, 2013 (<http://www.dfo-mpo.gc.ca/oceans/canadasoceans-oceansducanda/marinezones-zonesmarines-eng.htm>).

Ecozones⁺:

Federal, Provincial and Territorial Governments of Canada (2010) Canadian Biodiversity: Ecosystem Status and Trends 2010 (<http://www.biodivcanada.ca/ecosystems>).

Marine bioregions:

Fisheries and Oceans Canada (2011) National Framework for Canada's Network of Marine Protected Areas. Note: boundaries are not yet finalized (<http://www.dfo-mpo.gc.ca/oceans/publications/dmpaf-eczpm/framework-cadre2011-eng.asp>).

National boundaries:

Natural Resources Canada (2009) Atlas of Canada 1,000,000 National Frameworks Data, Administrative Boundaries (<http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/0d2b6f01-fe48-521f-aa7c-a177613c56dd.html>).

3.2 Spatial coverage

National.

3.3 Temporal coverage

Both the CCEA and MDDEFP datasets are current to 31 December, 2012. Temporal coverage is 1876 to 2012.

A few protected areas do not currently have a recorded date of protection. Sites with an unknown protection date are treated as pre-1990 when reporting total areas, or removed from

consideration when reporting change over time. Protection dates continue to be incorporated into the database.

3.4 Data completeness

The data include all areas under the direct administrative control of each jurisdiction and recognized as protected with an IUCN designation. Some private lands, areas preserved by environmental non-governmental organizations (ENGOS) or indigenous communities, municipal parks, and other conservation areas are included. Data on additional non-governmental areas will be included in the future as jurisdictions assume the responsibility of providing data to the CCEA.

4 Methods

Federal, provincial and territorial departments and agencies have submitted, to the Canadian Council on Ecological Areas (CCEA), geospatial and ancillary data for protected areas under their administrative control. These data contributors will be referred to here as jurisdictions. Data on areas controlled by non-governmental organizations, such as the Nature Conservancy of Canada and Ducks Unlimited Canada, are included in cases where a jurisdiction has recognized and categorized those areas. Work is underway to capture and incorporate data on additional privately held protected areas.

These data are housed in the Conservation Areas Reporting and Tracking System (CARTS) and used to compile the protected areas indicator for all of Canada except Quebec. Data for Quebec are taken from the Registry of Protected Areas² database at the Ministère du Développement Durable, de l'Environnement, de la Faune et des Parcs (MDDEFP) and were acquired directly from the ministry for this analysis. MDDEFP also provided an area total corrected for overlaps.

Data submitted include the name of the protected area, its geospatial location, boundaries (when available), official area in hectares (ha), biome (terrestrial/marine), IUCN category, managing jurisdiction, and protection date, among other information. In cases where the same attribute information does not apply to the entire protected area, the protected area is divided into zones for reporting. For example, a single protected area that crosses a provincial border is divided into zones corresponding to the different provinces. Similarly, a protected area that is later expanded will be treated as several zones, each with its own protection dates. Terrestrial and marine sections are treated as separate zones. Ancillary data are maintained independently for each zone. Protected areas that are undivided are treated as a single zone.

Canada's Protected Areas indicator

The official areas of all land and freshwater zones (outside Quebec) in the CCEA CARTS database were summed, and the total (overlap-corrected) land and freshwater protected area of Quebec was added. One additional protected area in Yukon (Herschel Island-Qikiqtaruk Territorial Park), not included in CARTS, was added. The grand total was divided by the total land and freshwater area of Canada to determine the proportion protected. Other reports consider different divisions of land, freshwater and marine areas, and consequently will report somewhat different figures.

² Quebec's *Natural Heritage Conservation Act* (R.S.Q., c. C-61.01), articles 5 and 6, governs the registry (http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/C_61_01/C_61_01_A.htm).

The official areas of all marine zones in the CARTS database were summed and the total (overlap-corrected) marine protected area of Quebec was added. The grand total was divided by the total area of Canada's ocean estate (includes the territorial sea, exclusive economic zone, and the continental shelf if more than 200 nautical miles from the seaward edge of the territorial sea), to determine the proportion protected.

The area protected under federal jurisdiction is the sum of areas protected by Parks Canada, Environment Canada, Fisheries and Oceans Canada, Agriculture and Agri-Food Canada, Aboriginal Affairs and Northern Development Canada and the National Capital Commission. To generate trend information, an estimate was made of the total protected area in each year since 1990. For each biome, and using the reported protection date, the official area was summed for all zones with a protection date in the year of interest or earlier (i.e., for 1990, this is the total official area of all zones with a protection date of 1990 or earlier). The same procedure was followed for the CCEA and MDDEFP databases; no correction is made for overlaps. Zones with an unknown protection date (0.3% of total protected area) were assigned to pre-1990.

Rates of change were calculated by dividing the difference in area (later minus earlier) by the total area protected in the earlier year. Areas with an unknown protection date were excluded from this calculation.

In keeping with general practice, protected areas assigned to IUCN categories IA, IB, II, III or IV were considered to be "strictly protected". See the Canadian Guidebook for the Application of IUCN Protected Areas Categories, 2008, for details on the application of international standards in Canada. Note: these categories are based on management objectives (http://www.ccea.org/en_order.html).

Protected Areas, by province and territory

CARTS contains information on the province or territory into which a protected area falls. For each province except Quebec, the official areas of all protected land and freshwater zones in that province were summed and divided by the total land and freshwater area of the province. Territories were treated in the same way. A correction to the Yukon total was made (as described for the national total).

For Quebec, the total land and freshwater protected area was provided by MDDEFP and divided by the official land and freshwater area of Quebec, also provided by MDDEFP. Note that MDDEFP undertakes an analysis that corrects for overlaps (e.g., areas managed by multiple jurisdictions that would otherwise be counted twice).

Because overlaps can be accounted for in Quebec but not elsewhere, the national indicator for 2012 varies from the sum of the regions by less than 0.2%.

Protected Areas, by ecological region

CESI has used the Ecozones⁺ framework developed for the Ecosystem Status and Trends 2010 report because it updates the *Ecological Framework of Canada's* ecozones to reflect new information and includes the Great Lakes. This modified classification system is referred to as "Ecozones⁺" in order to avoid confusion with the more familiar "ecozones" of the original framework.

For marine areas, CESI has used the marine bioregions framework, under development to support the Marine Protected Areas Network.

The CCEA CARTS and MDDEFP databases do not contain information on ecological regions. To generate an estimate of protected area (with a reported IUCN management category) within each terrestrial region, a geospatial analysis with the Ecozones⁺ framework was made:

1. For each database, the polygon area of each zone was calculated (this is distinct from the official area, as polygon boundaries are approximate).
2. Zones were intersected with ecozone⁺ boundaries in such a way as to divide protected area zones into subzones based on the ecozones⁺.
3. The proportional areas of the subzones relative the original polygon were calculated (i.e., each zone was divided into subzones such that the sum of the subzone proportional areas was 1).
4. The official area of each zone was allocated to its subzones based on the proportional area.
5. The allocated official area was summed for each ecozone⁺.
6. Totals for each ecozone⁺ were summed across the two databases.

In other words, a hypothetical protected area with an official area of 100 ha and a polygon boundary that fell 60% into the Taiga Shield and 40% into the Boreal Shield would be divided into subzones of 60 ha and 40 ha in the respective zones.

A correction was made to the Arctic totals for Herschel Island-Qikiqtaruk Territorial Park, as described for the national total.

With the exception of the Great Lakes Ecozone⁺, the total area of each ecozone⁺ was calculated from its geospatial boundaries. For the Great Lakes, the area bounded by terrestrial ecozones⁺ to the north and the Canadian-American border to the south was calculated. The total area protected per ecozone⁺ was divided by the total area of the ecozone⁺ to generate a percentage protected.

For marine bioregions, a similar procedure was followed. However, because a high proportion of marine protected areas are coastal, the analysis is sensitive to imprecision in the representation of coastal boundaries: national coastlines are appropriately mapped to a different degree of detail than the local boundaries of individual protected areas. To avoid this difficulty, 1) a version of the bioregions framework that included inland areas adjacent to each marine bioregion was used, and 2) the analysis was limited to marine protected areas or zones. Marine zones were intersected with the bioregion boundaries, and areas within each bioregion were summed, as described for the terrestrial analysis.

5 Caveats and limitations

Responsibility for source data accuracy and completeness lies with the jurisdictions. The CCEA provides data standards and guidance, including a procedures manual. The reported official area is generally more reliable than the geospatial boundary data, and has therefore been used for analysis whenever possible. No account has been taken of overlaps, with the exception of the Quebec protected area analysis.

Data quality and completeness continue to improve as additional information is collected, mapping is updated, and additional protected areas are recognized and captured in the databases. The indicator represents the best estimate available but revisions are to be expected.

Areas that are no longer recognized as protected are not captured in the trend analysis, as these areas are not included in the database. An exception is the calculation of the trend in area protected by the federal government, which accounts for the Community Pastures currently being transferred from the jurisdiction of Agriculture and Agri-Food Canada to the jurisdiction of provinces in which they are located.

Complex boundaries such as coastlines and ecological regions must be generalized for mapping purposes. All geographical analysis is approximate to some degree.

The CCEA reports a summary from CARTS, which differs slightly from that reported here (http://www.ccea.org/en_cartsreports.html). The CCEA uses official territorial extent from each province and territory; CESI uses official territorial extent from the Atlas of Canada (with the exception of Quebec). The CCEA defines Canada's marine territory as areas within and including Canada's Exclusive Economic Zone; CESI uses Canada's ocean estate. If comparing these websites, care should be taken to note any differences in the date-stamp of the underlying data and the methods of analysis.

6 References and further reading

6.1 References

CCEA Secretariat (2008) Canadian Guidebook for the Application of IUCN Protected Area Categories 2008. CCEA Occasional Paper No. 18. Canadian Council on Ecological Areas, Ottawa, ON. 66 pp.

Dudley N (2008) Guidelines for Applying Protected Area Management Categories, IUCN: Gland, Switzerland. Retrieved on 16 April, 2012. Available from: www.iucn.org/dbtw-wpd/edocs/PAPS-016-Fr.pdf

6.2 Further reading

Canadian Council on Ecological Areas. Available from: <http://www.ccea.org/>

Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP), Quebec - Protected Areas (some pages in French only). Available from : http://www.mddep.gouv.qc.ca/biodiversite/aires_protegees/index-en.htm

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