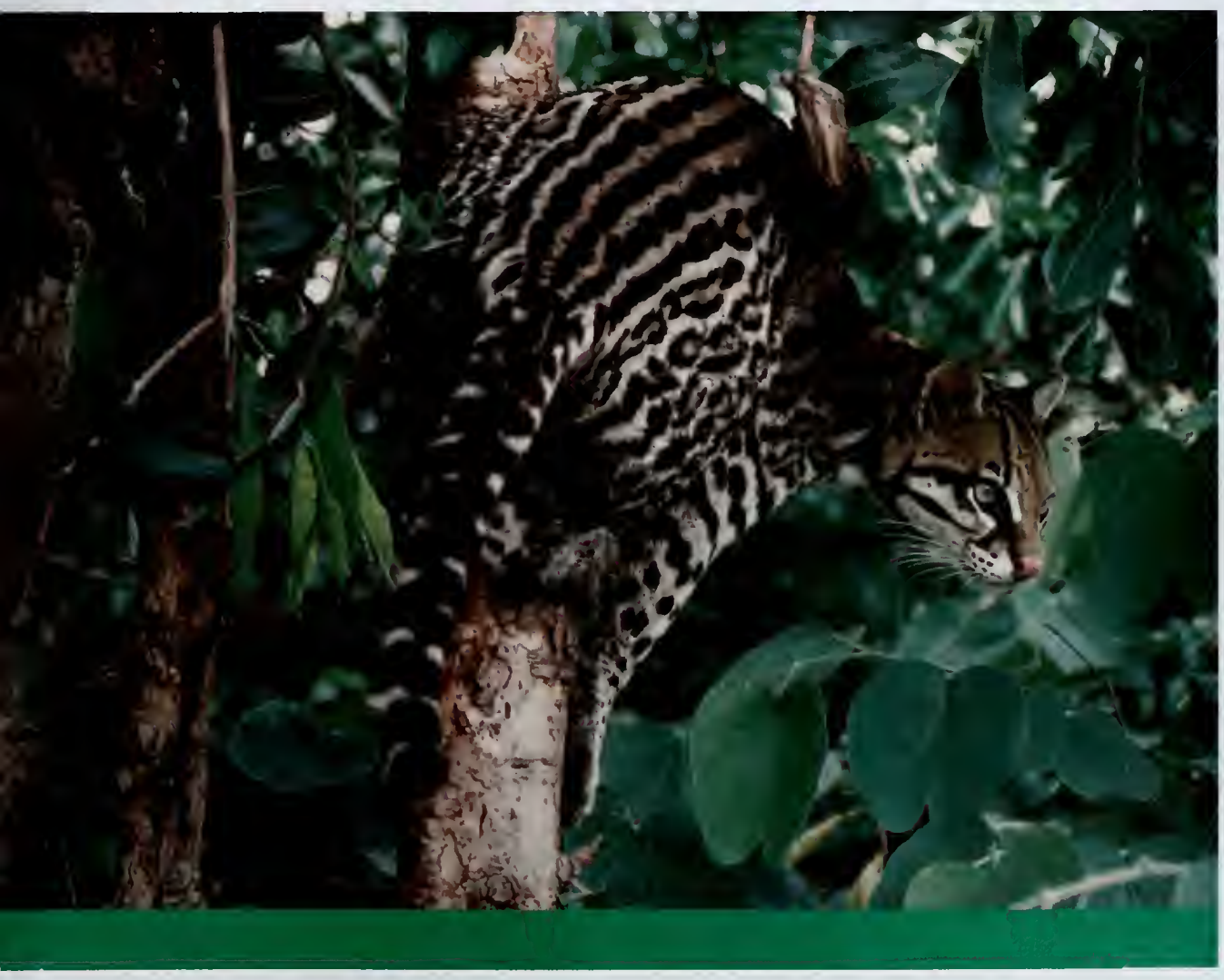
UNEP WCMC

Coverage of protected areas

Guidance for national and regional use

Version 1.2



This guidance document is one of a series produced with the support of the 2010 Biodiversity Indicators Partnership (2010 BIP) to assist Parties to the Convention on Biological Diversity (CBD) to track their progress towards the 2010 Biodiversity Target. Coverage of Protected Areas has been selected as one of the indicators suitable for assessing progress towards and communicating the 2010 Target at the global level. The aim of this document is to provide guidance to support the calculation and interpretation of the Coverage of Protected Areas indicator at the national and regional scales.

The 2010 Biodiversity Indicators Partnership (2010 BIP) intends this guidance to be a 'living document'. Updated versions will be produced based on users' feedback, and will include lessons learned and new examples of the indicators in use. Please send requests for advice and feedback on this guidance to: protectedareas@unep-wcmc.org

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For information on other indicator guidance documents and the 2010 BIP please see www.twentyten.net or contact info@twentyten.net

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Coverage of protected areas

PURPOSE

The Coverage of Protected Areas indicator represents the degree to which components of biodiversity are formally protected. It can show the changes in extent of protected areas, including marine protected areas, in relation to geographical and political units and to different measures of distribution of the components of biodiversity, such as priority areas, ecosystem or habitat maps and species distributions.

Overall, depending on the data, technical skills and equipment available, and the approach taken, this indicator can be used to:

- assess overall progress of total area protected as a measure of political will to protect biodiversity
- track changes in protection of key ecosystems and habitats;
- help assess the adequacy of protection of particular species or taxonomic groups of interest;
- track changes in the degree to which areas of key importance for biodiversity around the world are protected;
- help identify ecologically distinct priority areas for conservation.

However it cannot be used to:

- indicate how well managed these protected areas are;
- act as confirmation that the biodiversity within them is effectively protected;
- provide an indication of areas that are not formally protected but still may be important for conserving biodiversity.

PLACE IN THE 2010 BIODIVERSITY TARGET FRAMEWORK

Coverage of protected areas is both a headline indicator and an indicator adopted by the CBD for immediate testing, under the 2010 Target focal area *Status and trends of the components of biological diversity*. As a headline indicator it includes both the coverage of areas of key importance for biodiversity and management effectiveness of protected areas. These two indicators are complementary because formal designation of protected area status is not in itself sufficient to ensure conservation of that biodiversity contained within it.

Coverage of protected areas also directly complements several other headline indicators within this focal area:

1 trends in extent of selected biomes, ecosystems, and habitats;
2 trends in abundance and distribution of selected species;
3 change in the status of threatened species.

Protected areas may play a key role in retaining habitat cover and therefore in helping to maintain species populations. Protection also plays a role in the conservation status of species and is therefore closely linked to assessment of changes in that status.

In addition to the 2010 Target, Coverage of Protected Areas is relevant to a number of other CBD targets under specific programmes of work. These include the *Programme of Work on Protected Areas* and thematic programmes of work on: Marine and coastal biodiversity; Inland waters; Forest biodiversity; Mountains; Dry and sub-humid lands and Island biodiversity. It also addresses targets within the Global Strategy for Plant Conservation (GSPC).

Specific variants of protected areas coverage can be used to track progress under the Ramsar Convention and the Convention on Migratory Species (and its subsidiary agreements). At a regional scale it has also been adopted as an indicator within Europe under the SEBI-2010 process.

'Proportion of terrestrial and marine areas protected' is also Indicator 7.6 for reporting on progress towards the UN Millennium Development Goal 7 on environmental sustainability and its Target 7.B: 'Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss'.

KEY TERMS USED IN THIS DOCUMENT

Geographical Information System (GIS): a system of computer hardware and software used for storage, retrieval, mapping, and analysis of geographic data that is referenced to a map projection in an earth coordinate system.

Projection: a method of representing the surface of a sphere (globe) on a flat plane. All projections distort the surface in some fashion; therefore selection of the appropriate projection depends on the purpose of the map.

Equal area projection: quadrilaterals formed by meridians and parallels have an area on the map proportional to their area on the globe (real-world).

Attribute: a specification that defines a property of an object, feature or file. It usually consists of a name and a value.

Polygon: a feature used to represent areas. It is defined by lines that make up its boundary and have attributes that describe the feature they represent.

Point: GIS data that has no dimensions. A point represents the location of a feature but not its area and has attributes that describe the feature represented.

Protected Area: A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Designated: protected area site that is recognized, supported and declared by a national legislation and/or authority.

Establishment year: year that a protected area was formally established/designated.

Spatial coverage: total extent of protection referenced in geographical space and containing no overlaps in protection of sites. This is managed and analysed within a GIS.

Statistical coverage: total area of protection generated from tabular data. No spatial relationship is maintained between features, and is therefore unable to account for overlaps in protection of sites.

National and regional use

NATIONAL RELEVANCE

At national scale, coverage of protected areas is highly relevant for reporting progress towards international policy targets under the CBD, Ramsar, CMS and other relevant Conventions and processes. It also has been shown to support national policy and decision making in conservation and many other sectors affecting use of land and other natural resources. Furthermore CBD guidance suggests that a national gap analysis of protected areas coverage should form part of the NBSAP process, and national coverage analyses are also called for under the Programme of Work on Protected Areas. Most decisions with respect to protected area designation are taken at national level, and these decisions need to be informed by relevant information and analysis.

National implementation of a protected areas coverage indicator can take several approaches, depending on the components of biodiversity that are of interest and the data that are available. Measures of protected area coverage that might be of interest at this scale are:

- proportion protected nationally and by sub-national administrative unit of terrestrial or marine area or territorial area (terrestrial and marine combined);
- protected areas coverage of climatic zones or potential vegetation types;
- protected areas coverage of current vegetation, habitat or ecosystem cover;
- protected areas coverage of distributions and/or concentrations of key species (e.g. threatened species or endemics);
- protected areas coverage of priority areas.

Ideally, national coverage assessment should be developed from country-specific data sets but can potentially be disaggregated from a global assessment depending on the data quality.

IMPLEMENTATION

There are two main approaches to calculate the coverage of protected areas indicator, depending on the analysis required and the type of data, technical skills and equipment available. This section of the guidance document explains and illustrates these two approaches with examples from the global scale, as they have been developed by UNEP-WCMC. Subsequent sections discuss potential data sources suitable for national use and detail the methods for calculating the indicator.

The two main approaches to measurement of the coverage or extent of land and/or sea under formal protection are: (Table 1)

1 statistical, using tabular data of the cumulative number and area of protected sites per year;
2 spatial, using analysis of protected area site data in a GIS within a current year.

It is likely that at a minimum the statistical approach can be undertaken by the majority of national users, with the spatial approach being desirable if there is suitable technical capacity and spatial data. The spatial approach requires an IT/computer system capable of running GIS software (e.g. ESRI ArcGIS[1]) and a user with the technical understanding to run the analysis processes. The success of the spatial approach is also dependent on the availability of spatial (GIS) protected area boundary data (polygons). The main advantage of using spatial analysis is that you can remove any overlaps in protection of sites. This allows the production of an overall figure of 'spatial coverage protected' and a spatial GIS layer that can be used to calculate the level of protection of other biodiversity components, such as ecosystems, habitats, species or priority areas.

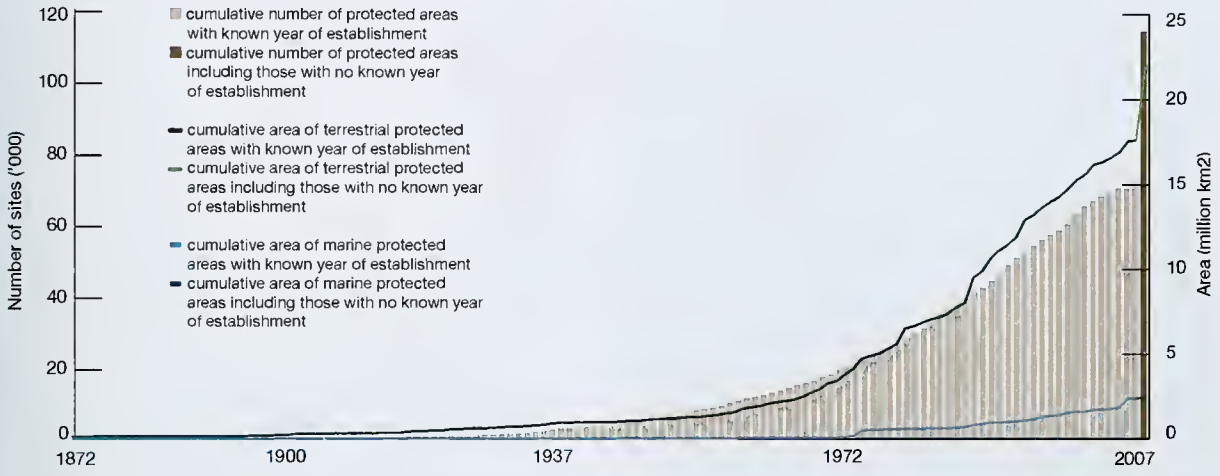
	Statistical	Spatial
Measurement	Trends in protection over time.	Spatially resolved coverage in current year.
Data	Tabular data of the cumulative number and area of protected sites per year (including overlaps in protection of sites).	Spatial layer of protected coverage in current year (with overlaps in protection of sites accounted for).
Definition	Total area of protection generated from tabular data. No spatial relationship is maintained between features, and is therefore unable to account for overlaps in protection of sites.	Total extent of protection referenced in geographical space and containing no overlaps in protection. This is managed and analysed within a GIS.
Analysis	Further analysis with other biodiversity components is not possible.	Further analysis with other spatial biodiversity components is possible.

Table 1: Two main approaches to producing the coverage of protected areas indicator

A basic requirement for both approaches is the availability of protected areas data with suitable attributes (information). The minimum attributes for the statistical approach are name of protected area, designation, legal status, total area, and year of establishment. The availability of geographic location (latitude/longitude), spatial boundary data, IUCN Protected Area Management category, and marine area, increases the likelihood of the user being able to carry out more advanced analysis, including possible breakdowns such as by IUCN management category.

1 ESRI ArcGIS software was used by UNEP-WCMC in developing and applying this method.

Figure 1: Growth of nationally designated protected areas, 1872-2007 (number and area)



Global application of the statistical approach

The statistical approach is used for reporting the growth in protected areas for the UN Millennium Development Goal Indicator 7.6, 'Proportion of terrestrial and marine areas protected'. As this approach is solely based on tabular data its success is dependent on good quality attribute data, especially total/marine area and establishment year. The UN MDG indicator requires summary tables to be produced of the cumulative number and area protected per establishment year at global, national, and MDG region level. An example of an output from this process is show in Figure 1: a graphical representation of the global growth in number and area of designated protected areas from 1872 – 2008. It is important to note that if an establishment year is unavailable for a designated protected area it cannot be included within the time series, but if it is known that a protected area had been designated by a certain year, it may be possible to include it within the time series (with qualification and caveats as necessary).

The UN MDG Goal 7 also calls for indicator 7.6 to be expressed as the proportion of surface area protected. This requires tabular data of protected areas, with an indication of whether the site is within the marine and/or terrestrial environment along with the equivalent area protected. In addition tabular data on the total land area and territorial waters (out to 12 nautical miles) per country are also required. Using the tabular information a simple statistic of the proportion protected (e.g. total terrestrial area protected divided by total terrestrial land) can be produced. By using the available tabular data it is possible to produce a time series analysis of proportion protected. However this is unable to account for overlaps in protection, such as multiple protection categories for the same site or overlaps in boundaries of neighbouring sites. Therefore, the proportion protected will always be inherently overestimated and is directly affected by the availability of up-to-date information.

Another significant limitation of the statistical approach is that it does not show how much biological diversity is protected, for which a spatial approach is required.

Global application of the spatial approach

The uneven distribution of biological diversity means there is not a straightforward relationship between the proportion of a territory that is protected and the proportion of biological diversity in that area. Therefore, it is more meaningful to consider area protected in relation to the distribution of components of biological diversity. An example of such a spatial approach is the work of UNEP-WCMC to analyse the proportion of biodiversity protected as represented by terrestrial ecoregions. This spatial approach can also be repeated with other spatial biodiversity datasets such as species, key biodiversity areas, habitats, etc. This approach accounts for overlaps in protection, but it is difficult to perform the analysis as a time series. This is due to the large amount of data processing required along with the limited availability of boundary data and establishment year or date of change information for protected areas. Consequently this type of spatial analysis is usually performed with a spatial layer of designated protected areas from the current year and displayed in mapped form, as shown in Figure 2.

In a few cases, it may be possible to draw meaningful conclusions

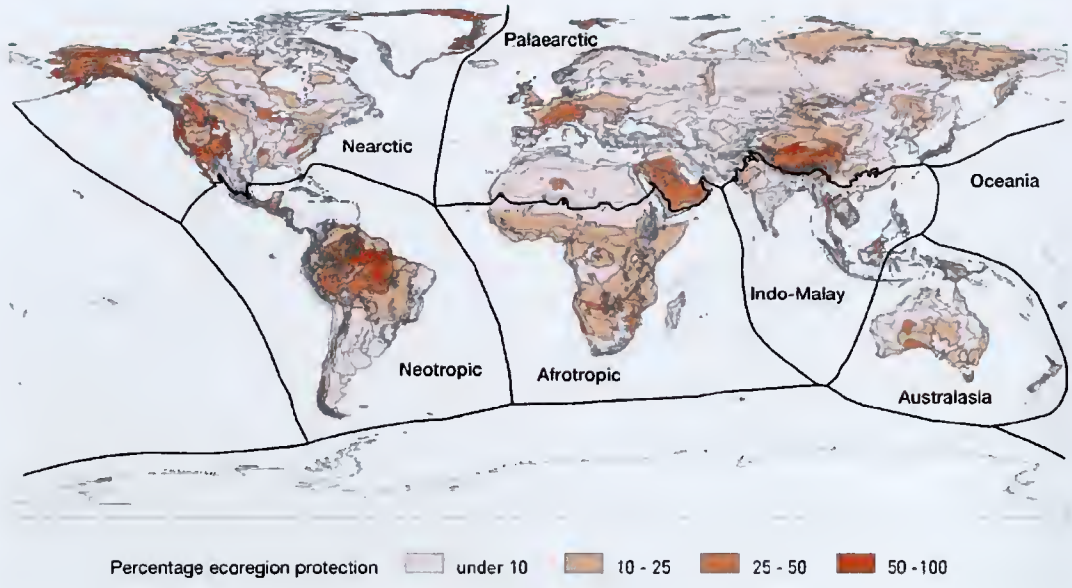


Figure 2: Percentage protection within terrestrial ecoregions. 2008.

about this protected areas coverage based purely on statistical data of the occurrence of key biodiversity elements within protected areas. However a further complication is that not all protected areas afford equal protection to the biodiversity within them. This variation is due both to differences in the type of management for which the area is designated, and the effectiveness with which the designated management is applied.

Protected areas are established under a huge range of legislative regimes and with many different purposes in mind. There may be no legislative or management requirement to maintain all the components of biological diversity that they hold and in some cases, particularly in IUCN management categories V and VI, maintenance of biological diversity may not be a major function of the protected area. For this reason, it may be useful to incorporate a breakdown of the indicator by IUCN category, where such data are available. In addition, a separate and complementary indicator under development within the 2010 Target framework is protected area management effectiveness.

Data sources

This section outlines potential sources of global spatial data on protected areas and biodiversity components that can be used with this indicator.

PROTECTED AREAS

In the majority of cases the most accurate and current data for determining protected areas coverage for a country will be available from the relevant protected areas agency or national equivalent. In some cases international non-governmental organizations may also have suitable data of value, including improved spatial (GIS) data on protected area boundaries.

In some circumstances the data available internationally may be the best source, as held by the World Database on Protected Areas (WDPA). The WDPA is a joint project of UNEP and IUCN, hosted and managed by UNEP-WCMC, with support from the IUCN World Commission on Protected Areas (IUCN-WCPA), and working with governments and collaborating NGOs.

The WDPA uses the IUCN definition of a Protected Area, which following its revision in October 2008 now closely reflects the CBD definition:

> *"A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"* (Dudley, 2008).

The Convention on Biological Diversity defines protected areas as:

> *"A geographically defined area which is designated or regulated and managed to achieve specific conservation objectives".*

Information in the database is provided principally by ministries of the environment and other government agencies that are responsible for the designation and maintenance of protected areas. However information from NGOs and academic institutions, international environmental conventions, and others may also be included. Data are currently available for over 120,000 protected areas worldwide. The WDPA is updated as new information is made available. The WDPA, including spatial (GIS) and other attribute data on all the world's protected areas, is freely available for non-commercial use and is accessible via the internet at www.wdpa.org.

Ideally the areas included in the WDPA are assigned to one of the six protected area management categories defined by IUCN, opposite (Dudley, 2008).

In practice a substantial number of areas listed in the WDPA database have not as yet been assigned a specific category. In October 2008 new guidelines for applying IUCN Protected Areas Management Categories were published – see http://data.iucn.org/dbtw-wpd/edocs/PAPS-016.pdf.

IUCN MANAGEMENT CATEGORIES AND DEFINITIONS

Ia Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areasfor scientific research and monitoring (i.e. Strict Nature Reserve)

Ib Protected areas that are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition (i.e. Wilderness Area)

II Protected areas that are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities (i.e. National Park).

III Protected areas that are set aside to protect a specific natural monument, which can be a landform, seamount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value (i.e. Natural Monument or Feature).

IV Protected areas that aim to protect particular species or habitats and management reflects this priority. Many category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category (i.e. Habitat/ Species Management Area)A protected area where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values (i.e. Protected Landscape/Seascape).

VI Protected areas that conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area (i.e. Protected area with sustainable use of natural resources).

DATA ON BIODIVERSITY DISTRIBUTION – ECOSYSTEMS AND ECOREGIONS

Data on biodiversity distribution may be drawn from internationally accepted ecoregional classifications as a useful first approximation, but many countries may have their own ecoregional classification systems or other measures of biodiversity distribution and priority that are more meaningful at national scale.

For global and regional scale reporting, the terrestrial ecoregions defined by World Wide Fund for Nature (WWF) are frequently employed. In this context an ecoregion is defined as a large area of land or water that contains a geographically distinct assemblage of natural communities that:

a share a large majority of their species and ecological dynamics;
b share similar environmental conditions, and;
c interact ecologically in ways that are critical for their long-term persistence.

The boundaries of an ecoregion approximate the original extent of natural communities prior to major land-use change. The database currently delineates 825 terrestrial ecoregions; in May 2008 WWF and TNC published a map of freshwater ecoregions of the world, with 426 units (FEOW, 2008). The ecological regions described in the recent Marine Ecoregionalization of the World (MEOW; Spalding, M. *et al,* 2006) or Large Marine Ecosystems (NOAA 2001) can be used to address marine systems.

The World Wide Fund for Nature (WWF) recognizes three caveats to its definition of ecoregions, which are appropriate for all bio-geographic mapping approaches:

- No single biogeographic framework is optimal for all taxonomic groups. Ecoregions reflect the best compromise for as many taxonomic groups as possible.
- Ecoregion boundaries rarely form abrupt edges; rather, ecotones and mosaic habitats form gradual transitions between habitat types.

ecological or vegetation classifications that can form the basis for protected area coverage analysis. These will often be far more detailed at country scale than the global ecoregion classifications. Examples of such national analyses include:

- an analysis of the protection of vegetation zones in Brazilian Amazonia by state based on a national vegetation map (Fearnside & Ferraz 1995);
- a protected areas coverage analysis of the Cape Floristic region in South Africa, which assessed protection of 88 broad habitat units defined based on topography, geology and vegetation (Rouget et al. 2003);
- national level ecoregional assessment in Mexico, which assessed 56 marine and 75 terrestrial ecoregions (CCA, In Press and CONABIO, 2006).

Increasingly it is becoming possible to base assessments of protection on remotely sensed data on current vegetation cover within ecoregions or other (bio)geographical units. This approach has the advantage of addressing the vegetation that is actually present within protected areas, rather than simply the zone in which they occur. However, results from these types of assessment need to be presented very carefully, so that protection is not falsely represented as increasing as a result of decreasing area of natural vegetation (see below on calculation and presentation). It also presents a number of challenges, including how to deal with the crude vegetation classifications usually produced by remote sensing and frequent changes in methods between remote sensing assessments, which reduce their comparability through time. Strand et al. (2007) cover many of the issues in using remote sensing data for biodiversity indicators, including protected area coverage.

DATA ON SPECIES DISTRIBUTION

Protected areas coverage of species can be assessed from detailed inventories of the protected areas themselves or from data on species distributions. The former approach is feasible only for some groups and gives information about representation of species within protected areas, but not about what fraction of their total extent of