Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

Indicator 15.1.2: Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

Institutional information

Organization(s):

UN Environment World Conservation Monitoring Centre (UNEP-WCMC)

BirdLife International (BLI)

International Union for Conservation of Nature (IUCN)

Concepts and definitions

Definition:

This indicator Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas shows temporal trends in the mean percentage of each important site for terrestrial and freshwater biodiversity (i.e., those that contribute significantly to the global persistence of biodiversity) that is covered by designated protected areas.

Concepts:

Protected areas, as defined by the International Union for Conservation of Nature (IUCN; Dudley 2008), are clearly defined geographical spaces, 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. Importantly, a variety of specific management objectives are recognised within this definition, spanning conservation, restoration, and sustainable use:

- Category Ia: Strict nature reserve
- Category Ib: Wilderness area
- Category II: National park
- Category III: Natural monument or feature
- Category IV: Habitat/species management area
- Category V: Protected landscape/seascape
- Category VI: Protected area with sustainable use of natural resources

The status "designated" is attributed to a protected area when the corresponding authority, according to national legislation or common practice (e.g., by means of an executive decree or the like), officially endorses a document of designation. The designation must be made for the purpose of biodiversity conservation, not de facto protection arising because of some other activity (e.g., military).

Sites contributing significantly to the global persistence of biodiversity are identified following globally criteria set out in *A Global Standard for the Identification of Key Biodiversity Areas* (IUCN 2016) applied at national levels. Key Biodiversity Areas encompass (a) Important Bird & Biodiversity Areas, that is, sites contributing significantly to the global persistence of biodiversity, identified using data on birds, of which >13,000 sites in total have been identified from all of the world's countries (BirdLife International 2014, Donald *et al.* 2018); (b) Alliance for Zero Extinction sites (Ricketts et al. 2005), that is, sites holding effectively the entire population of at least one species assessed as Critically Endangered or Endangered on The IUCN Red List of Threatened Species, of which 853 sites have been identified for 1,483 species of mammals, birds, amphibians, reptiles, freshwater crustaceans, reef-building corals, conifers, cycads and other taxa; (c) Key Biodiversity Areas identified under an earlier version of the Key Biodiversity Area criteria (Langhammer *et al.* 2007), including those identified in Ecosystem Hotspot Profiles developed with support of the Critical Ecosystem Partnership Fund. These three subsets are being reassessed using the Global Standard, which unifies these approaches along with other mechanisms for identification of important sites for other species and ecosystems (IUCN 2016).

Rationale:

The safeguard of important sites is vital for stemming the decline in biodiversity and ensuring long term and sustainable use of terrestrial and freshwater natural resources. The establishment of protected areas is an important mechanism for achieving this aim, and this indicator serves as a means of measuring progress toward the conservation, restoration and sustainable use of terrestrial and freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations

under international agreements. Importantly, while it can be disaggregated to report on any given single ecosystem of interest (e.g., forests), it is not restricted to any single ecosystem type, and so faithfully reflects the intent of SDG target 15.1.

Levels of access to protected areas vary among the protected area management categories. Some areas, such as scientific reserves, are maintained in their natural state and closed to any other use. Others are used for recreation or tourism, or even open for the sustainable extraction of natural resources. In addition to protecting biodiversity, protected areas have high social and economic value: supporting local livelihoods; protecting watersheds from erosion; harbouring an untold wealth of genetic resources; supporting thriving recreation and tourism industries; providing for science, research and education; and forming a basis for cultural and other non-material values.

This indicator adds meaningful information to, complements and builds from traditionally reported simple statistics of terrestrial and freshwater area covered by protected areas, computed by dividing the total protected area within a country by the total territorial area of the country and multiplying by 100 (e.g., Chape et al. 2005). Such percentage area coverage statistics do not recognise the extreme variation of biodiversity importance over space (Rodrigues et al. 2004), and so risk generating perverse outcomes through the protection of areas which are large at the expense of those which require protection.

The indicator is used to track progress towards the 2011–2020 Strategic Plan for Biodiversity (CBD 2014, Tittensor et al. 2014), and was used as an indicator towards the Convention on Biological Diversity's 2010 Target (Butchart et al. 2010).

Comments and limitations:

Quality control criteria are applied to ensure consistency and comparability of the data in the World Database on Protected Areas. New data are validated at UNEP-WCMC through a number of tools and translated into the standard data structure of the World Database on Protected Areas. Discrepancies between the data in the World Database on Protected Areas and new data are minimised by provision of a manual (UNEP-WCMC 2019) and resolved in communication with data providers. Similar processes apply for the incorporation of data into the *World Database of Key Biodiversity Areas* (BirdLife International 2019).

The indicator does not measure the effectiveness of protected areas in reducing biodiversity loss, which ultimately depends on a range of management and enforcement factors not covered by the indicator. A number of initiatives are underway to address this limitation. Most notably, numerous mechanisms have been developed for assessment of protected area management, which can be synthesised into an indicator (Leverington et al. 2010). This is used by the Biodiversity Indicators Partnership as a complementary indicator of progress towards Aichi Biodiversity Target 11

(http://www.bipindicators.net/pamanagement). However, there may be little relationship between these measures and protected area outcomes (Nolte & Agrawal 2013). More recently, approaches to "green listing" have started to be developed, to incorporate both management effectiveness and the outcomes of protected areas, and these are likely to become progressively important as they are tested and applied more broadly.

Data and knowledge gaps can arise due to difficulties in determining whether a site conforms to the IUCN definition of a protected area, and some protected areas are not assigned management categories. Moreover, "other effective area-based conservation measures", as specified by Aichi Biodiversity Target

11 of the Strategic Plan for Biodiversity 2011–2020, recognise that some sites beyond the formal protected area network, while not managed primarily for nature conservation, may nevertheless be managed in ways which are consistent with the persistence of the biodiversity for which they are important (Jonas et al. 2014). However, the formally agreed definition of an OECM ("A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and, where applicable, cultural, spiritual, socioeconomic, and other locally relevant values") were only agreed in November 2018 and measures are only recently in place for countries to submit OECM data to UNEP-WCMC. OECMs are now collated by UNEP-WCMC in a separate database, the WD-OECM.

Regarding important sites, the biggest limitation is that site identification to date has focused mainly on specific subsets of biodiversity, for example birds (for Important Bird and Biodiversity Areas) and highly threatened species (for Alliance for Zero Extinction sites). While Important Bird and Biodiversity Areas have been documented to be good surrogates for biodiversity more generally (Brooks et al. 2001, Pain et al. 2005), the application of the unified standard for identification of Key Biodiversity Areas (IUCN 2016) sites across different levels of biodiversity (genes, species, ecosystems) and different taxonomic groups remains a high priority, building from efforts to date (Eken et al. 2004, Knight et al. 2007, Langhammer et al. 2007, Foster et al. 2012). Birds now comprise <50% of the species for which Key Biodiversity Areas have been identified, and as Key Biodiversity Area identification for other taxa and elements of biodiversity proceeds, such bias will become a less important consideration in the future.

Key Biodiversity Area identification has been validated for a number of countries and regions where comprehensive biodiversity data allow formal calculation of the site importance (or "irreplaceability") using systematic conservation planning techniques (Di Marco et al. 2016, Montesino Pouzols et al. 2014).

Future developments of the indicator will include: a) expansion of the taxonomic coverage of terrestrial and freshwater Key Biodiversity Areas through application of the Key Biodiversity Areas standard (IUCN 2016) to a wide variety of terrestrial and freshwater vertebrates, invertebrates, plants and ecosystem type; b) improvements in the data on protected areas by continuing to increase the proportion of sites with documented dates of designation and with digitised boundary polygons (rather than coordinates).

Methodology

Computation method:

This indicator is calculated from data derived from a spatial overlap between digital polygons for protected areas from the World Database on Protected Areas (UNEP-WCMC & IUCN 2020) and digital polygons for terrestrial and freshwater Key Biodiversity Areas (from the World Database of Key

Biodiversity Areas, including Important Bird and Biodiversity Areas, Alliance for Zero Extinction sites, and other Key Biodiversity Areas). Sites were classified as terrestrial Key Biodiversity Areas by undertaking a spatial overlap between the Key Biodiversity Area polygons and an ocean raster layer (produced from the 'adm0' layer from the database of Global Administrative Areas (GADM 2019)), classifying any Key Biodiversity Area as a terrestrial Key Biodiversity Area where it had ≤95% overlap with the ocean layer (hence some sites were classified as both terrestrial and marine). Sites were classified as freshwater Key Biodiversity Areas if the resident species for which they were identified were documented in the IUCN Red List as dependent on 'Inland Water' systems. For non-resident or migrant species, or species that shift habitats during the annual cycle, the site was tagged as freshwater if the species occurred at the site in the appropriate season of water-dependence (e.g. some species are only dependent on water during the breeding season). Sites were then screened (using the satellite imagery base layer within ArcGIS) as to whether they lay wholly in the Coastal Zone (defined here as within 10 km of the coast), and these sites were then untagged as Freshwater and instead tagged as Marine if the wetland habitats present at the site fell purely within the IUCN Habitat Classification Scheme class 'Marine Supratidal' (i.e. estuaries, lagoons, etc.). If the site was within the Coastal Zone, but contained a mixture of Marine Supratidal and Inland Water classes, then it was tagged as both Freshwater and Marine. Each site was then manually cross-checked against other (less comprehensively available) site attributes, such as the habitat preferences of its trigger species, the site's name (Delta, River, Humedal, etc.), its areal coverage by different habitat types, its overlap with Ramsar Sites, and its 'shadow' Ramsar status, so as to confirm or remove the Freshwater tag appropriately. The value of the indicator at a given point in time, based on data on the year of protected area establishment recorded in the World Database on Protected Areas, is computed as the mean percentage of each Key Biodiversity Area currently recognised that it covered by protected areas.

Year of protected area establishment is unknown for ~12% of protected areas in the World Database on Protected Areas, generating uncertainty around changing protected area coverage over time. To reflect this uncertainty, a year was randomly assigned from another protected area within the same country, and then this procedure repeated 1,000 times, with the median plotted.

Prior to 2017, the indicator was presented as the percentage of Key Biodiversity Areas completely covered by protected areas. However, it is now presented as the mean % of each Key Biodiversity Area that is covered by protected areas in order to better reflect trends in protected area coverage for countries or regions with few or no Key Biodiversity Areas that are completely covered.

Treatment of missing values:

- ***At country level:***

Data are available for protected areas and Key Biodiversity Areas in all of the world's countries, and so no imputation or estimation of national level data is necessary.

- ***At regional and global levels:***

Global indicators of protected area coverage of important sites for biodiversity are calculated as the mean percentage of each Key Biodiversity Area that is covered by protected areas. The data are generated from all countries, and so while there is uncertainty around the data, there are no missing values as such and so no need for imputation or estimation.

Regional aggregates:

UNEP-WCMC is the agency in charge of calculating and reporting global and regional figures for this indicator, working with BirdLife International and IUCN to combine data on protected areas with those for sites of importance for biodiversity. UNEP-WCMC aggregates the global and regional figures on protected areas from the national figures that are calculated from the World Database on Protected Areas and disseminated through Protected Planet. The World Database on Protected Areas and Protected Planet are jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas. The World Database on Protected Areas is held within a Geographic Information System that stores information about protected areas such as their name, size, type, date of establishment, geographic location (point) and/or boundary (polygon). Protected area coverage is calculated using all the protected areas recorded in World Database on Protected Areas whose location and extent is known apart from protected areas without digital boundaries and those sites who have a status of 'proposed' or 'not reported'.

Sources of discrepancies:

National processes provide the great bulk of the data that are subsequently aggregated into both the World Database on Protected Areas and the World Database of Key Biodiversity Areas, and so there are very few differences between national indicators and the global one. One minor source of difference is that the World Database on Protected Areas incorporates internationally-designated protected areas (e.g., UNESCO World Heritage sites, Ramsar sites, etc), a few of which are not considered by their sovereign nations to be protected areas.

Note that because countries do not submit comprehensive data on degazetted protected areas to the WDPA, earlier values of the indictor may marginally underestimate coverage. Furthermore, there is also a lag between the point at which a protected area is

designated on the ground and the point at which it is reported to the WDPA. As such, current or recent coverage may also be underestimated.

Methods and guidance available to countries for the compilation of the data at the national level:

The WDPA has its origins in a 1959 UN mandate when the United Nations Economic and Social Council called for a list of national parks and equivalent reserves Resolution 713 (XXVIII). More details are available here: https://www.protectedplanet.net/c/world-database-on-protected-areas. The UN List of Protected Areas has been published in 1961/62, 1966/71, 1972 (addendum to the 1966/71 edition), 1973, 1974, 1975, 1980, 1982, 1985, 1990, 1993, 1997, 2003, 2014 and 2018 which have resulted in a global network of national data providers for the WDPA. For example, in 2014 all Convention on Biological Diversity (CBD) National Focal points and all National Focal points for the CBD Protected Areas Programme of Work (PoWPA) to request data for the 2014 Un List of Protected Areas (https://www.protectedplanet.net/c/united-nations-list-of-protected-areas/united-nations-list-of-protected-areas-2014). Protected areas data is therefore compiled directly from government agencies, regional hubs and other authoritative sources in the absence of a government source. All records have a unique metadata identifier (MetadataID) which links the spatial database to the Source table where all sources are described. The data is collated and standardised following the WDPA Data Standards and validated with the source. The process of collation, validation and publication of data as well as protocols and the WDPA data standards are regularly updated in the WDPA User Manual (https://www.protectedplanet.net/c/wdpa-manual) made available through www.protectedplanet.net where all spatial data and the Source table are also published every month and can be downloaded.

The process for compilation of data on sites contributing significantly to the global persistence of biodiversity (Key Biodiversity Areas) is documented online (http://www.keybiodiversityareas.org/home). Specifically, (http://www.keybiodiversityareas.org/what-are-kbas), the Key Biodiversity Area identification process is a highly inclusive, consultative and bottom-up exercise. Although anyone with appropriate scientific data may propose a site to qualify as a Key Biodiversity Area, wide consultation with stakeholders at the national level (both non-governmental and governmental organizations) is required during the proposal process. Key Biodiversity Area identification builds off the existing network of Key Biodiversity Areas, including those identified as Important Bird & Biodiversity Areas through the BirdLife Partnership of 120 national organisations (http://www.birdlife.org/worldwide/partnership/birdlife-partners), for the Alliance for Zero Extinction by 93 national and international organisations (http://www.zeroextinction.org/partners.html), and as other Key Biodiversity Areas by civil society organisations supported by the Critical Ecosystem Partnership Fund in developing ecosystem profiles, named in each of the profiles listed here (http://www.cepf.net/resources/publications/Pages/ecosystem_profiles.aspx), with new data strengthening and expanding expand the network of these sites. Any site proposal undergoes independent scientific review. This is followed by the official site nomination with full documentation meeting the Documentation Standards for Key Biodiversity Areas. Sites confirmed by the Key Biodiversity Areas Secretariat to qualify as Key Biodiversity Areas then appear on the Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home).

The WDPA User Manual (https://www.protectedplanet.net/c/wdpa-manual) published in English, Spanish, and French provides guidance to countries on how to submit protected areas data to the WDPA, what are the benefits of providing such data, which are the data standards and which quality checks are performed. We also provide a summary of our methods to calculate protected areas coverage to all WDPA users: https://www.protectedplanet.net/c/calculating-protected-area-coverage. The “Global Standard for the Identification of Key Biodiversity Areas” (https://portals.iucn.org/library/node/46259) comprises the standard recommendations available to countries in the identification of Key Biodiversity Areas, with further guidelines available on the Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home). Specifically, (http://www.keybiodiversityareas.org/get-involved), the main steps of the Key Biodiversity Area identification process are the following:

1. submission of Expressions of Intent to identify a Key Biodiversity Area to Regional Focal Points;
2. proposal Development process, in which proposers compile relevant data and documentation and consult national experts, including organizations that have already identified Key Biodiversity Areas in the country, either through national Key Biodiversity Area Coordination Groups or independently;
3. review of proposed Key Biodiversity Areas by Independent Expert Reviewers, verifying the accuracy of information within their area of expertise; and
4. a Site Nomination phase comprising the submission of all the relevant documentation for verification by the Key Biodiversity Areas Secretariat (see section 3.3 below).

Once a Key Biodiversity Area is identified, monitoring of its qualifying features and its conservation status is important. Proposers, reviewers and those undertaking monitoring can join the Key Biodiversity Areas Community to exchange their experiences, case studies and best practice examples.

Quality assurance:

The process on how the data is collected, standardised and published is available in the WDPA User Manual at: https://www.protectedplanet.net/c/wdpa-manual which is available in English, French and Spanish. Specific guidance is provided at https://www.protectedplanet.net/c/world-database-on-protected-areas on, for example, predefined fields or look up tables in the WDPA: https://www.protectedplanet.net/c/wdpa-lookup-tables, how WDPA records are coded how international designations and regional designations data is collected, how regularly is the database updated, and how to perform protected areas coverage statistics.

The process of identification of Key Biodiversity Areas is supported by the Key Biodiversity Areas Partnership (http://www.keybiodiversityareas.org/kba-partners). Among the roles of the partnership is establishment of the Key Biodiversity Areas Secretariat, which checks information submitted in the Site Nomination phase for the correct application of the Key Biodiversity Areas Standard ((https://portals.iucn.org/library/node/46259), and the adequacy of site documentation and then verifies the site, which is then published on the Key Biodiversity Areas Website (http://www.keybiodiversityareas.org/get-

involved). In addition, the Chairs of the IUCN Species Survival Commission and World Commission on Protected Areas (both of whom are elected by the IUCN Membership of governments and non-governmental organisations), appoint the Chair of an independent Key Biodiversity Areas Standards and Appeals Committee, which ensures the correct application of the Global Standard for the identification of Key Biodiversity Areas. The R code for calculating protected area coverage of Key Biodiversity Areas is documented as Dias, M. (2017) "R code for calculating protected area coverage of KBAs" (http://www.keybiodiversityareas.org/userfiles/files/R_code_for_calculating_protected_area_coverage_of_KBAs_March_2017.pdf).

In addition to dissemination via the Protected Planet website (https://www.protectedplanet.net/), the UN List process described in 3.1 the fact that protected areas data is collected from national agencies acknowledged in the WDPA metadata, and Key Biodiversity Areas website (http://www.keybiodiversityareas.org/home), Protected Planet and Key Biodiversity Areas data are disseminated through the Integrated Biodiversity Assessment Tool, available for research and conservation online (https://www.ibat-alliance.org/ibat-conservation/). This incorporates Country Profile documents for all of the world's countries, which includes documentation of the indicator of protected area coverage of Key Biodiversity Areas. Each annual update to these Country Profiles are sent for consultation to National Focal Points of the Convention on Biological Diversity (https://www.cbd.int/information/nfp.shtml), National Statistics Offices SDG Representatives and UN Permanent Missions (Geneva) representatives.

Data sources

Description:

Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. Protected Areas data for sites designated under the Ramsar Convention and the UNESCO World Heritage Convention are collected through the relevant convention international secretariats. Protected area data are aggregated globally into the World Database on Protected Areas by the UN Environment World Conservation Monitoring Centre, according to the mandate for production of the United Nations List of Protected Areas (Deguignet et al. 2014). They are disseminated through Protected Planet, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (Juffe-Bignoli et al. 2014).

Key Biodiversity Areas are identified at national scales through multi-stakeholder processes, following standard criteria and thresholds. Key Biodiversity Areas data are aggregated into the World Database on Key Biodiversity Areas, managed by BirdLife International. Specifically, data on Important Bird and Biodiversity Areas are available online at http://datazone.birdlife.org/site/search and data on Alliance for Zero Extinction sites are available online at https://zeroextinction.org. Both datasets, along with Key Biodiversity Areas identified through other processes, are available through the World Database on Key Biodiversity Areas, and, along with the World Database on Protected Areas, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning.

Collection process:

See information under other sections.

Data availability

Description:

This indicator has been classified by the IAEG-SDGs as Tier 1. Current data are available for all countries in the world, and these are updated on an ongoing basis.

Time series:

~150 years

Disaggregation:

Given that data for the global indicator are compiled at national levels, it is straightforward to disaggregate to national and regional levels (e.g., Han et al. 2014), or conversely to aggregate to the global level. Key Biodiversity Areas span all ecosystem types, including marine (Edgar et al. 2008), freshwater (Holland et al. 2012), and mountains (Rodríguez-Rodríguez et al. 2011). The indicator can therefore be reported in combination across terrestrial and freshwater (and indeed marine) systems, or disaggregated among them. However, individual Key Biodiversity Areas can encompass terrestrial, freshwater, and marine systems simultaneously, and so determining the results is not simply additive. Finally, the indicator can be disaggregated according to different protected area management categories (categories I–VI) to reflect differing specific management objectives of protected areas.

In addition to the aggregation of the coverage of protected areas across important sites for terrestrial and freshwater biodiversity as an indicator towards SDG 15.1, other disaggregations of coverage of protected areas of particular relevance as indicators towards SDG targets (Brooks et al. 2016) include:

SDG 14.5.1 Coverage of protected areas in relation to marine areas.

SDG 15.4.1 Coverage by protected areas of important sites for mountain biodiversity.

Protected area coverage data can be combined with other data sources to yield further, complementary, indicators. For example, protected area overlay with ecoregional maps can be used to provide information on protected area coverage of different broad biogeographical regions. Protected area coverage of the distributions of different groups of species (e.g., mammals, birds, amphibians) can similarly provide indicators of trends in coverage of biodiversity at the species level. Protected area coverage can be combined with the Red List Index to generate indicators of the impacts of protected areas in reducing biodiversity loss (Butchart et al. 2012). Finally, indicators derived from protected area overlay can also inform sustainable urban development; for example, the overlay of protected areas onto urban maps could provide an indicator of public space as a proportion of overall city space.

Calendar

Data collection:

UNEP-WCMC produces the UN List of Protected Areas every 5–10 years, based on information provided by national ministries/agencies. In the intervening period between compilations of UN Lists, UNEP-WCMC works closely with national ministries/agencies and NGOs responsible for the designation and maintenance of protected areas, continually updating the WDPA as new data become available. The World Database of Key Biodiversity Areas is also updated on an ongoing basis, as new national data are submitted.

Data release:

The indicator of protected area coverage of important sites for biodiversity is anticipated to be released annually.

Data providers

Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. Key Biodiversity Areas are identified at national scales through multi-stakeholder processes, following standard criteria and thresholds.

Data compilers

Name:

UNEP-WCMC and IUCN

Description:

Protected area data are aggregated globally into the World Database on Protected Areas by the UN Environment World Conservation Monitoring Centre, according to the mandate for production of the United Nations List of Protected Areas (Deguignet et al. 2014). They are disseminated through Protected Planet, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (UNEP-WCMC 2016). Key Biodiversity Areas data are aggregated into the World Database on Key Biodiversity Areas, managed by BirdLife International (2019). Specifically, data on Important Bird and Biodiversity Areas are available online at http://datazone.birdlife.org/site/search and data on Alliance for Zero Extinction sites are available online at https://zeroextinction.org. Both datasets, along with the World Database on Protected Areas, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning.

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http://www.unep-wcmc.org/

http://www.birdlife.org/

http://www.iucn.org/

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