GEO BON

Global Biodiversity Change Indicators

Model-based integration of remote-sensing & in situ observations
that enables dynamic updates and transparency at low cost

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Towards a new generation of biodiversity indicators

GEO BON with its scientific partners introduces a new generation of global indicators integrating biodiversity observations, remote sensing data, and models for assessing progress towards the CBD Strategic Plan 2011-2020 and Aichi Targets 5, 11, 12, 14, 15 and 19.

A GEO BON (the Group on Earth Observations Biodiversity Observation Network) consortium involving researchers and organizations around the world has developed a novel set of global indicators to address important gaps in our understanding of biodiversity change across scales, from national to global. These indicators are embedded in open online analysis platforms following GEO data sharing principles and have the long-term commitment of established research institutions.

The new set of indicators is characterized by the rigorous use of open access large global datasets, state of the art remote-sensing based information, model-based integration of multiple data sources and types, including in situ (ground based) observations, and online infrastructure enabling inexpensive and dynamic updates, with full transparency. This has become possible through direct collaboration with technical and research support partners such as Google and NASA, the development of a dedicated infrastructure such as Map of Life, and the engagement of the larger GEO BON community.

The following pages describe five new indicators for assessing and reporting progress against Aichi Targets 5, 11, 12, 14, 15 and 19 and are derived by integrating data from three Essential Biodiversity Variables: species distributions, taxonomic diversity and ecosystem extent. By integrating the complementary strengths of different types of data, the resulting indicators offer some important benefits. For example, they help to fill geographical and taxonomic gaps in the coverage of measures based purely on in situ biological data and are able to translate measures based purely on remote sensing, for example of habitat loss and degradation, into biologically-scaled indicators of likely impacts on biodiversity.

One key advantage of these new indicators is that they cover the entire terrestrial surface of the planet at 1km grid resolution. By operating at this spatial resolution the indicators can effectively account for important relationships between species distributions and patterns of habitat loss and protection that play out at scales much finer than those typically addressed by previous global indicators. This fine resolution of analysis then underpins reporting of the indicators at any desired level of spatial aggregation, including the national level. Such automated national reporting is being integrated into the BON-in-a-Box toolkit of GEO BON.

Developing robust global indicators is a component of a larger GEO BON effort to improve our understanding of the biotic response to global change, by integrating previously disconnected dimensions of biodiversity and also by connecting local trends to regional and global trends, offering tests of the predictive capacity of models in response to global change, a critical step in making ecological forecast more rigorous.

Prof. Henrique M. Pereira
GEO BON Chair

SHI
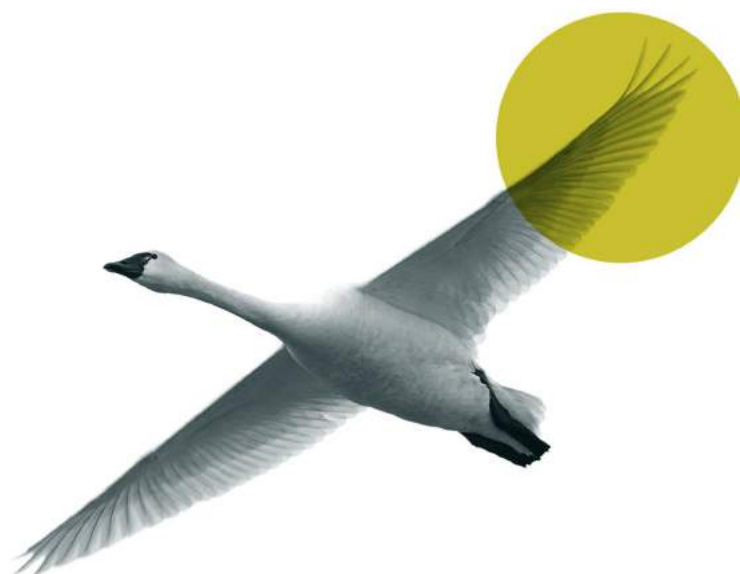
Species Habitat Indices

The Species Habitat Indices (SHIs) quantify changes in the suitable habitats of single species to provide aggregate estimates of potential population losses and extinction risk increases in a region or worldwide.

Purpose of the indices

To provide annually updated biodiversity change metrics that transparently build on single species data and that can be reported regionally and globally. The indices address trends in the sizes of species potential distributions and populations for habitat–dependent and threatened species.

The Species Habitat Indices use remote sensing data, local observations, and models in a web-based informatics infrastructure. They are designed to measure and report on progress in relation to CBD Aichi Targets 5 and 12.

Coverage

The indices use environmental and species data addressing all terrestrial areas of the world at 1 km spatial resolution. They can be aggregated at spatial levels ranging from 1 km to small regions, countries, biomes, and the whole planet. The indices build on land cover information available annually from Landsat and MODIS satellites since 2001 onwards. With continuation of these remote sensing products, this enables annual update of indices, including reporting Aichi Target 5 and 12 achievements, for ten data points from 2011 to 2020.

CBD Aichi Target 5
Habitat loss halved or reduced

CBD Aichi Target 12
Reducing risk of extinction
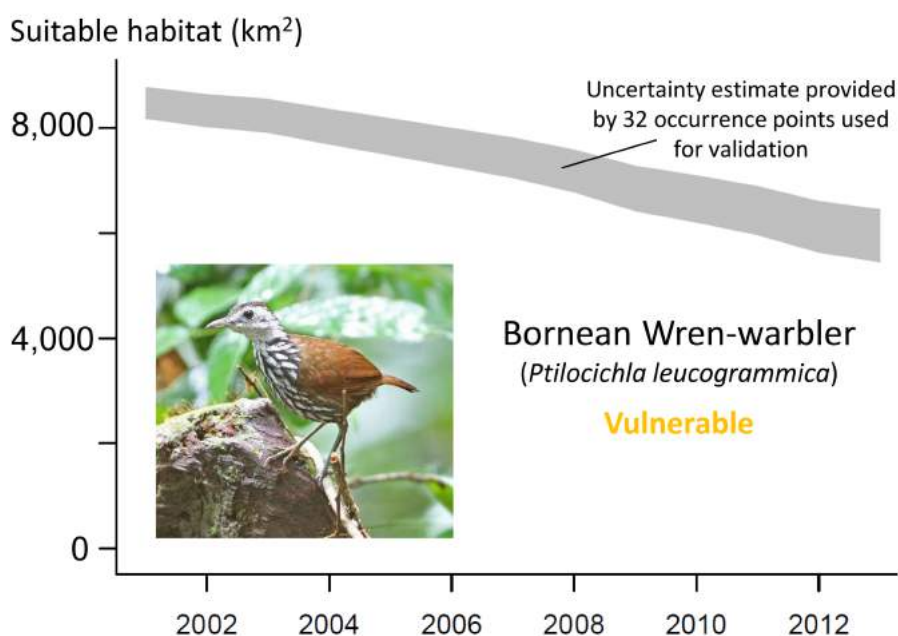
Example of a species-level trend informing the SHIs. Remotely sensed land-cover change indicates significant decrease in forest habitat suitable for the Bornean Wren-warbler in its range in Southeast Asia. The indices are derived from these single-species estimates and aggregated for all species occurring in a reporting region or country.

Methods

Indicators addressing Aichi Targets 5 and 12 are typically constrained in their adequate geographic representation, the level of disaggregation they allow, their temporal resolution, and their scientific underpinning and transparency. The Species Habitat Indices are part of a new generation of indicators that address these limitations by utilizing ongoing, spatially and temporally highly resolved remote sensing at near global-extent, together with biodiversity observations, and adequate and transparent modeling frameworks.

The indices build on detailed, remote-sensing informed maps of suitable habitat for single species. Maps are modeled using literature- and expert-based data on habitat restrictions and published land-cover products from MODIS and Landsat satellites available annually at 30 m and 1 km resolution. These detailed maps of habitat suitable for a species are validated with field data on species locations from surveys and citizen science.

Modifications in the area and fragmentation of individual species' remaining habitat are quantified annually and changes in extinction risk are estimated. The species-level metrics are then aggregated and reported over user-defined regions, such as countries. Separate indices can be calculated for species dependent on certain habitats types (e.g. natural forests), and for threatened species. The indices can also be subset to species with particularly rapid recent habitat changes, and they can account for countries' stewardship of species (their portion of a species' global range).

All underlying data and metrics are available through a dedicated dashboard in the Map of Life web interface that has been developed with Google Earth Engine as technology partner. Currently, the Species Habitat Indices are based on > 20,000 species of terrestrial vertebrate and invertebrate, and plant species, and validated with > 300 million location records, a growing number.
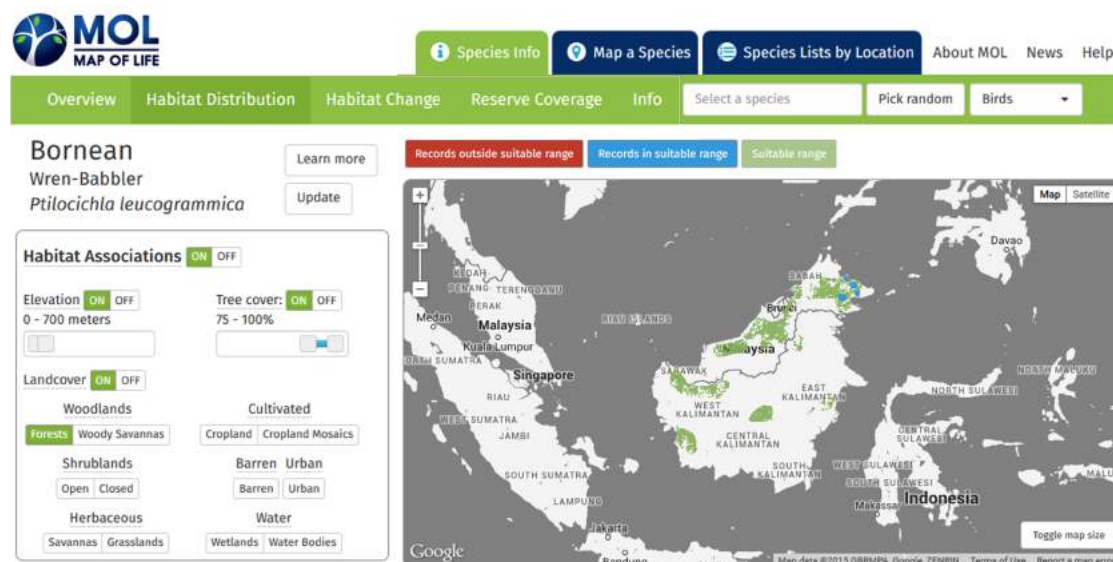
Essential Biodiversity Variables:

Species populations class
Species distribution

Ecosystem structure class
Ecosystem extent and fragmentation

Modeled prediction of 1 km pixels with habitat suitable for the Bornean Wren-warbler. Where data exists (blue circles), the accuracy of this estimate is validated with recent observations. The loss (or gain) of suitable pixels is then assessed over time. This information is accessible and updated for all species through this online dashboard developed in partnership with Google.

BHI Biodiversity Habitat Index

The Biodiversity Habitat Index uses biologically-scaled environmental mapping and modelling to estimate impacts of habitat loss, degradation and fragmentation on retention of terrestrial biodiversity globally, from remotely-sensed forest change and land-cover change datasets.

Purpose of the index

To provide a rigorous, yet cost-effective, approach to estimating impacts of habitat loss, degradation and fragmentation on biodiversity globally, by linking remotely-sensed forest change and land-cover change datasets to recent advances in biodiversity informatics, ecological meta-analysis, and macro-ecological modelling. The Biodiversity Habitat Index is designed specifically as an indicator for measuring and reporting progress in relation to the Convention on Biological Diversity's Aichi Target 5.

CBD Aichi Target 5
Habitat loss halved or reduced

Coverage

The approach uses data covering the entire terrestrial area of all countries of the world, at 1km grid resolution. This allows the Biodiversity Habitat Index to be calculated and reported at any desired level of spatial aggregation, ranging from individual 1km grid-cells up to whole ecoregions, countries, biomes and realms, or the entire planet.

The approach utilises the full temporal coverage of Hansen *et al.'s* (2013, *Science* 342: 850-853) Global Forest Change dataset, i.e. 2000 onwards; and NASA's (Friedl *et al* 2010, *Remote Sensing of Environment* 114: 168-182) MODIS Land Cover Change dataset, i.e. 2001 onwards. Changes in the Biodiversity Habitat Index can therefore be reported annually, including reporting Aichi Target 5 achievement for ten annual data points from 2011 to 2020 (assuming ongoing annual updating of the above two remote-sensing products).
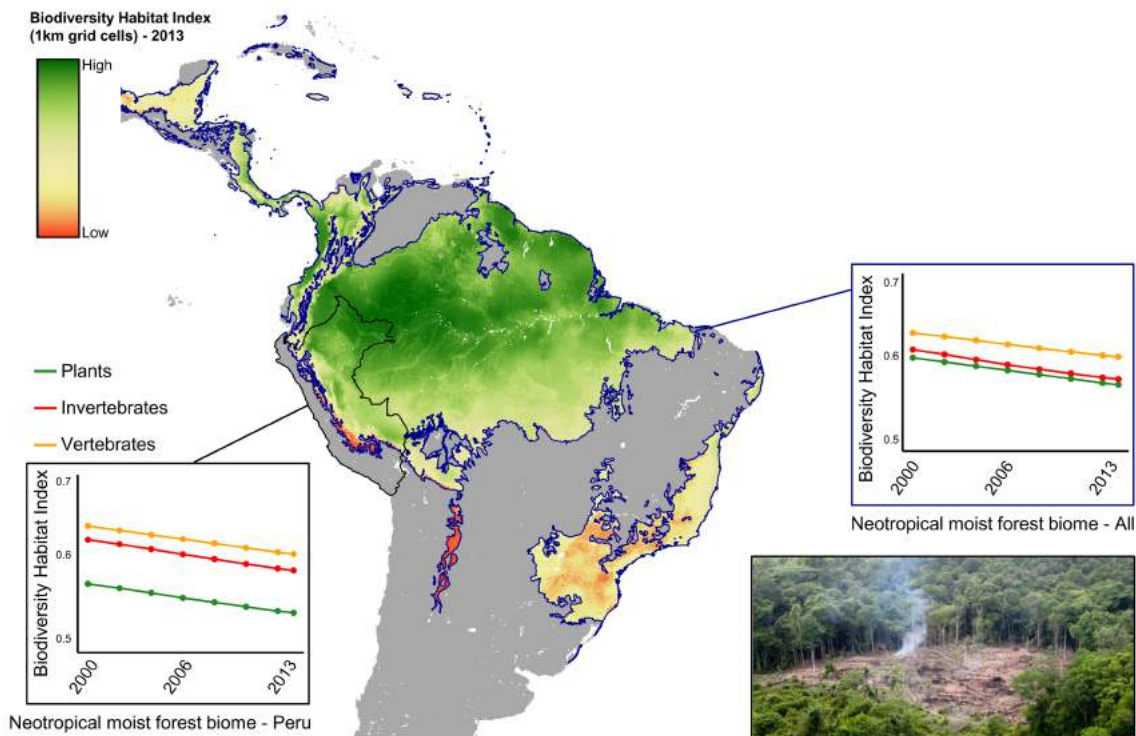
Reporting of the Biodiversity Habitat Index for an example combination of realm (Neotropics) and biome (moist tropical forest), based on analysis of Hansen et al's Global Forest Change dataset. The two charts depict changes in the index between 2000 and 2013, for the three major biological groups, aggregated across Peru alone, and across the entire biome, respectively. The map depicts values of the index for individual 1 km grid cells across the biome, in a single year (2013), averaged across all three biological groups.

Methods

Changes in habitat degradation and fragmentation are estimated across all terrestrial biomes by translating remotely-sensed land-cover change (NASA's MCD12Q1 dataset) into land-use change through statistical downscaling of coarse-scale land-use mapping to 1 km resolution, and using the PREDICTS meta-analysis (Newbold *et al* 2015, *Nature* 520: 45-50) to assign habitat-condition scores to resulting land-use classes. Mapping of habitat change in forest biomes is further refined by incorporating Hansen *et al.'s* 30m-resolution Global Forest Change dataset.

These habitat-change layers are then integrated with global modelling of fine-scaled spatial variation in biodiversity composition (beta diversity), derived by scaling environmental and geographical gradients using >300 million location records for >400,000 plant, invertebrate and vertebrate species.

The Biodiversity Habitat Index resulting from this integration estimates change in the proportion of collective biological (gamma) diversity retained within any specified spatial unit (e.g. an ecoregion, a country, or an entire biome) as a function of habitat loss, degradation and fragmentation across that unit.

Habitat condition, derived from remotely-sensed land cover and statistically-downscaled land use, being used to estimate the Biodiversity Habitat Index across all biomes

Essential Biodiversity Variables:

Community composition class
Taxonomic diversity

Ecosystem structure class
Ecosystem extent and fragmentation
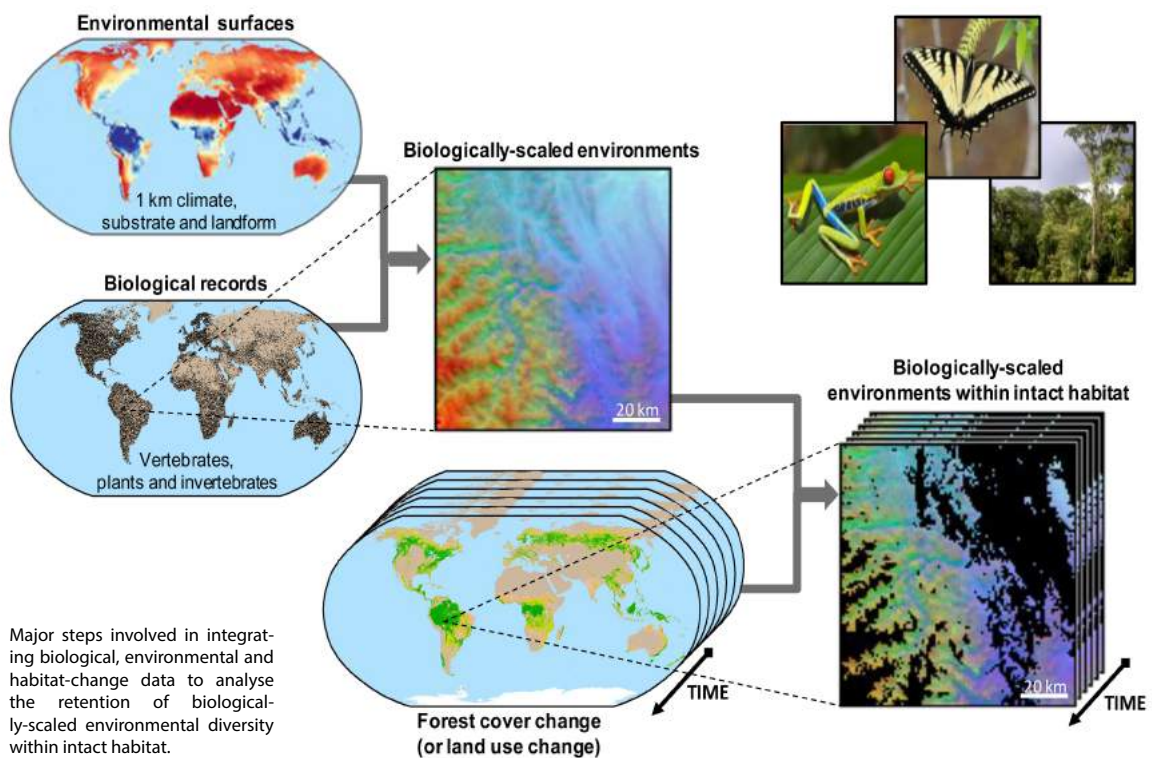
Major steps involved in integrating biological, environmental and habitat-change data to analyse the retention of biologically-scaled environmental diversity within intact habitat.

SPI

Species Protection Index

The Species Protection Index (SPI) measures how much suitable habitat for single species is under protection and estimates the regional or global biodiversity representativeness of terrestrial protected areas.

Purpose of the index

To provide an annually updated, remote-sensing informated, spatially explicit, and global metric of how well terrestrial species are represented in terrestrial protected areas. The Species Protection Index capitalizes on detailed remote sensing data, a global biodiversity informatics infrastructure and integrative models. It is designed to measure and report progress in relation to CBD Aichi Target 11.

CBD Aichi Target 11
Protected Areas

Coverage

The index uses environmental and species data addressing all terrestrial areas of the world at 1km spatial resolution. It can be aggregated at spatial levels ranging from 1km to small regions, countries, biomes, and the whole planet. The index uses land cover information available annually from Landsat and MODIS satellites since 2001 onwards. With continuation of these remote sensing products, this enables annual index updates, including reporting Aichi Target 11 achievements, for ten data points from 2011 to 2020.

Information supporting the SPI calculations for the Vejar's Fir in Mexico. The 1 km pixels modeled as suitable for a species in a given year (see SHI) are overlaid with the protected areas existing in a region at that time. This informs to which degree the areal conservation target for that species is achieved. This information is then aggregated for all species occurring in an reporting region or country. This dashboard and underlying data are available online for all species included in the indicator (see http://species.mol.org/pa for examples).

MOL
MAP OF LIFE

Methods

Indicators addressing Aichi Target 11 are typically constrained in their adequate geographic representation, the level of disaggregation they allow, their temporal resolution, and their scientific underpinning and transparency. The Species Protection Index is part of a new generation of indicators that utilize ongoing, spatially and temporally highly resolved remote sensing at near global-extent, together with biodiversity observations and adequate modeling frameworks, to help address these limitations.

The Species Protection Index builds on detailed, remote-sensing informed species distributions and their overlap with protected areas. These species maps are modeled using literature- and expert-based data on habitat restrictions and published land-cover products from MODIS and Landsat satellites available annually at 30m and 1km resolution and validated with field data on species locations from surveys and citizen science. Modifications in the area of individual species' overall distribution and the proportion under protection are quantified and updated annually based on changes in protected areas and available suitable habitat. The index represents the aggregate of species-level metrics over any specified spatial unit such as countries or biomes. It can be calculated for different minimum sizes or categories of protected areas and be separated by biological group. A version of the index can also account for countries' stewardship of species (their portion of a species' global range, according to the best-available estimate).

All underlying data and metrics are available through a dedicated dashboard in the Map of Life web interface that has been developed with Google Earth Engine as technology partner. Currently, the Species Protection Index is addressing all protected areas of the World Database on Protected Areas and is calculated for >30,000 species of terrestrial vertebrates and invertebrates, and plant species, and validated with > 350 million location records. This list is growing rapidly as more species and data are entering the database.

Essential Biodiversity Variable:

Species populations class
Species distribution

Protected Area Representativeness & Connectedness (PARC) Indices

PARC

The Protected Area Representativeness & Connectedness Indices use biologically-scaled environmental mapping and modelling globally to assess the extent to which terrestrial protected areas are ecologically representative and well connected.

Purpose of the indices

To provide a rigorous, yet cost-effective, approach to assessing global terrestrial protected-area representativeness and connectedness at an unprecedentedly fine spatial resolution. This is achieved by harnessing the power of recent advances in remote environmental mapping, biodiversity informatics, and macroecological modelling. The PARC Indices are designed specifically as indicators for measuring and reporting progress in relation to the Convention on Biological Diversity's Aichi Target 11.

CBD Aichi Target 11
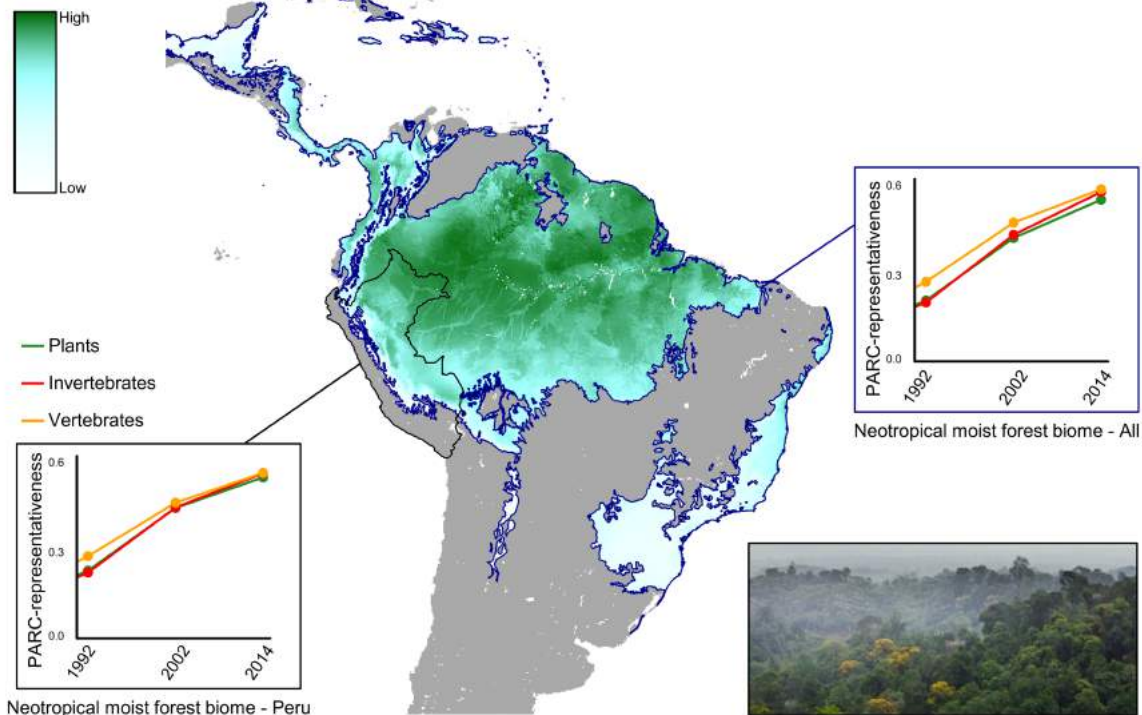Protected Areas

Coverage

The approach uses data covering the entire terrestrial area of all countries of the world, at 1km grid resolution. This allows the PARC Indices to be calculated and reported at any desired level of spatial aggregation, ranging from individual 1km grid-cells up to whole ecoregions, countries, biomes and realms, or the entire planet.

The approach utilises the full temporal coverage of the World Database on Protected Areas (WDPA) and of NASA's (Friedl *et al* 2010, *Remote Sensing of Environment* 114: 168-182) MODIS Land Cover Change dataset (2001 onwards). The PARC Indices can therefore report changes in the representativeness and connectedness of protected areas annually, including reporting Aichi Target 11 achievement for ten annual data points from 2011 to 2020.

Reporting of the PARC index of representativeness (proportion of biologically-scaled environmental diversity included in protected areas) for an example combination of realm (Neotropics) and biome (moist tropical forest). The two charts depict changes in the index between 1992 and 2014, for the three major biological groups, aggregated across Peru alone, and across the entire biome, respectively. The map depicts values of the index for individual 1km grid cells across the biome, in a single year (2014), averaged across all three biological groups.
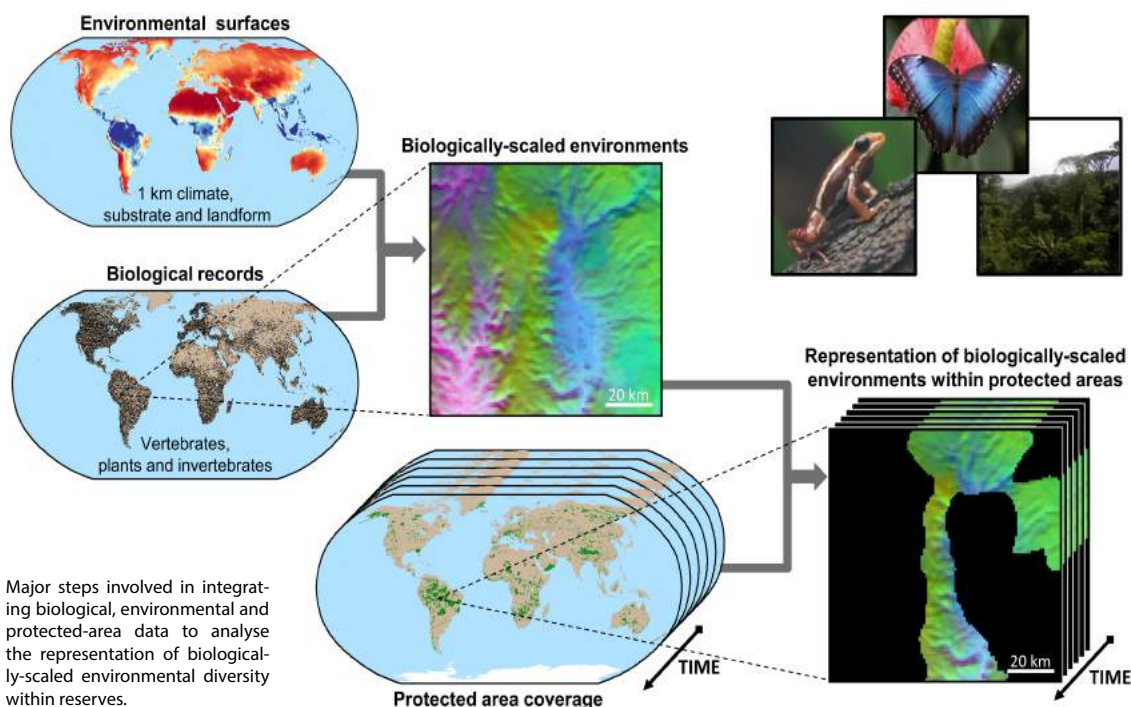
Major steps involved in integrating biological, environmental and protected-area data to analyse the representation of biologically-scaled environmental diversity within reserves.

Methods

The PARC Indices are underpinned by global modelling of fine-scaled spatial variation in biodiversity composition (beta diversity) derived by scaling environmental and geographical gradients using >300 million location records for >400,000 plant, invertebrate and vertebrate species. This modelling is then integrated with data on protected-area boundaries (from the WDPA) and land use in surrounding landscapes, derived by translating remotely-sensed land-cover change (NASA's MCD12Q1 dataset) into land-use change through statistical downscaling of coarse-scale land-use mapping to 1 km resolution.

Separate indices can be calculated and reported for ecological representativeness (the proportion of biologically-scaled environmental diversity included in protected areas) and for connectedness (a relative index between 0 and 1), or these can be combined into a single composite measure of representativeness and connectedness of protected areas within any specified spatial unit (e.g. an ecoregion, a country, or an entire biome). Likewise, separate indices can be reported for the three major biological groups (plants, invertebrates and vertebrates) or these can be combined into a single measure across all groups.
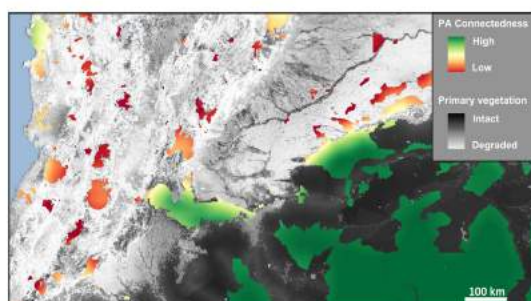
PARC-connectedness - assessing how well protected areas are connected within the broader landscape

Essential Biodiversity Variables:

Community composition class
Taxonomic diversity

Ecosystem structure class
Ecosystem extent and fragmentation

LBII

Local Biodiversity Intactness Index

The Local Biodiversity Intactness Index (LBII) is based on a purpose-built global database of local biodiversity surveys combined with highresolution global land-use data. The index provides estimates of human impacts on the intactness of local biodiversity worldwide, and how this may change over time.

Purpose of the index

The Local Biodiversity Intactness Index (LBII) estimates how much of a terrestrial site's original biodiversity remains in the face of human land use and related pressures. Because LBII relates to site-level biodiversity, it can be averaged and reported for any larger spatial scale (e.g., countries, biodiversity hotspots or biomes as well as globally) without additional assumptions. Building on research published recently in Nature, and repurposing existing biodiversity survey data, it combines scientific rigour with affordability. The LBII is particularly relevant for Aichi Targets 12 (Preventing Extinctions) and 14 (Essential Ecosystem Services). Existing indicators for these targets lack a broad biodiversity perspective; in particular, they are heavily biased towards vertebrates, which make up only 0.5% of the world's species and relate to only simple biodiversity measures. The LBII can report on both species-richness and mean abundance, and is being developed further to also report on geographic range rarity (endemism) and phylogenetic diversity. LBII is strongly complementary to the proposed Biodiversity Habitat Index (BHI). LBII's focus is on average local biotic intactness, which reflects species' persistence within the landscape and the local ecosystem's ability to provide many ecosystem services; BHI, by contrast, focuses on how the overall diversity of a larger region is hit by habitat loss and degradation (Target 5). LBII was first proposed in 2005 but the data needed to make it operational have only now been brought together.
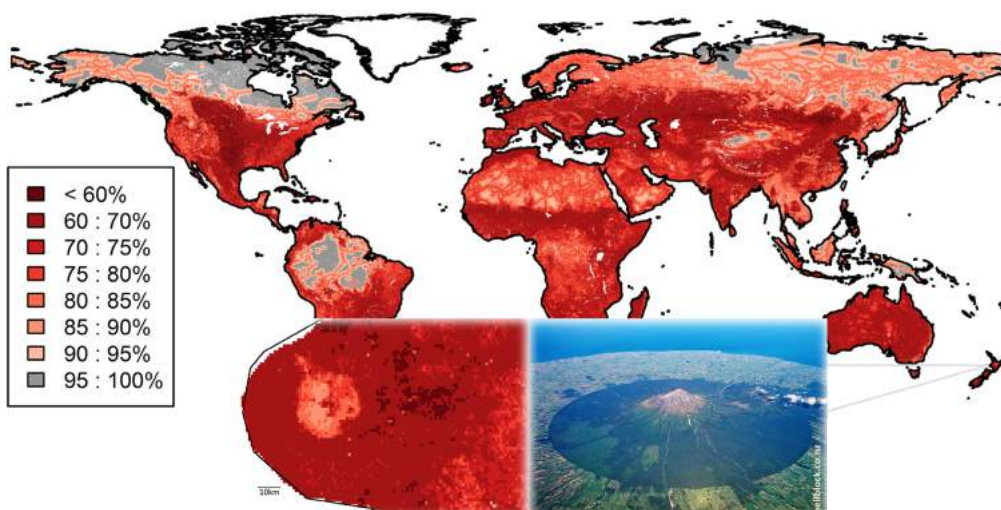
CBD Aichi Target 12
Reducing risk of extinction
CBD Aichi Target 14
Essential ecosystems services

Preliminary global map of LBII for species richness, expressed as a percentage, with inset showing how LBII picks out Egmont National Park from the dairy pasture that surrounds it. (From Newbold et al. in prep.)
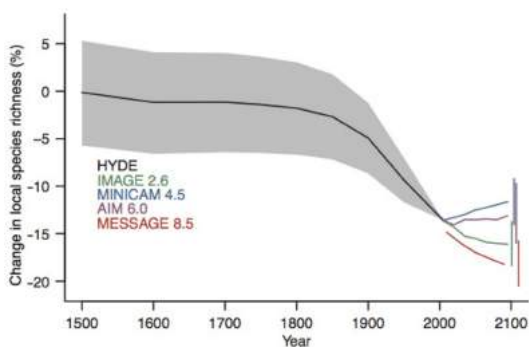
Predicts

Coverage

The LBII covers the world's entire terrestrial realm, and can report both globally and at any smaller scale relevant for global policy. Although published analyses have so far had coarse spatial and temporal grain1, CSIRO's development of annual, global, fine-scale land-use maps allows LBII to report annually at 1km resolution from 2001 to 2020.
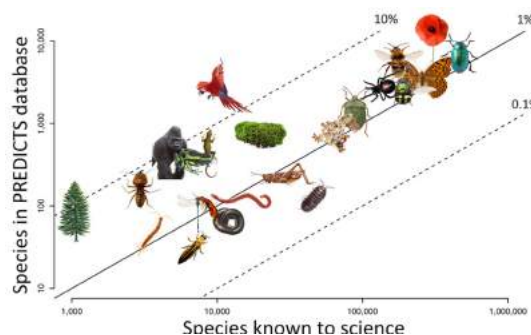
Methods

The underpinning science

The LBII is based on rigorously peer-reviewed and transparent science. The global statistical models were published recently in Nature, along with global maps of net changes in local biodiversity by 2005, a hindcast of change from 1500-2005, and global and national projections of future changes under the Representative Concentration Pathway scenarios.

Models of how land use affects the similarity of an ecological community to that of intact sites are now in review; a paper combining these with our earlier models to map LBII is in preparation. These models all use the PREDICTS database, which has collated data from studies that compared terrestrial biodiversity at sites facing different intensities of human pressures; it currently holds over 3 million records for over 26,000 sites (in 94 countries) and a taxonomically representative set of over 45,000 plant, invertebrate and vertebrate species. These data, contributed by a network of over 500 researchers worldwide, will be made freely available in the coming months (some metadata are already available). The database will continue to grow, enabling more precise modeling. Annual land-use data since 2001 are produced by using remotely-sensed land cover change data to statistically downscale global land-use maps to 1km resolution; a paper is in preparation.

Projected net change in local species richness worldwide from 1500 to 2095; LBII additionally discounts species not in the original assemblage. Future projections are based on the four Representative Concentration Pathway scenarios6. Grey shading and error bars show 95% confidence intervals. (From Newbold et al. 2015 Nature 520:45-50.)

Taxonomic representativeness of the PREDICTS database; lines indicate (from bottom to top) 0.1%, 1% and 10% representation of the groups depicted. Note logarithmic scales.
(From Hudson et al. in prep.).

Essential Biodiversity Variables:

Species populations class
Species distribution
Population abundance

Community composition class
Taxonomic diversity

GERI

Global Ecosystem Restoration Index

The Global ecosystem restoration index (GERI) is a composite index that integrates structural and functional aspects of the ecosystem restoration process. These elements are evaluated through a window that looks into a baseline for degraded ecosystems with the objective to assess restoration improvements or declines in a more integrated manner.

Purpose of the index

There is still a lack of global indicators to assess Target 15 of the Convention on Biological Diversity. One of the main problems rests in the actual definition of restoration. Many ecosystem changes may lead to restoration of ecosystem functioning; however, not all these changes are caused by the same process. Land restoration is a composite term that describes different processes acting at different times, scales, and extents. We build upon recent advances on biodiversity science, remote sensing, and ecosystem mapping to design a composite index tailored to three key and complementary elements of ecosystem restoration: (1) change in ecosystem productivity (2) change in the ecosystem energy balance and (3) changes in land cover. Degraded areas defined in a baseline are the window into the world upon which we monitor these three aspects relative to the goals of Target 15.

Coverage

This composite index is produced for near the entire terrestrial surface of the planet at a spatial resolution of 1 km2. This allows for the GERI index to be aggregated to small regions, states, countries, continents and the planet. This index uses well vetted products derived from MODIS sensor, in orbit since 2001. These products are continuously being outputted and the expected data availability and planned mission continuity is an assurance of the temporal sustainability of the proposed index.

CBD Aichi Target 15
Restoration of 15 per cent of degraded ecosystems
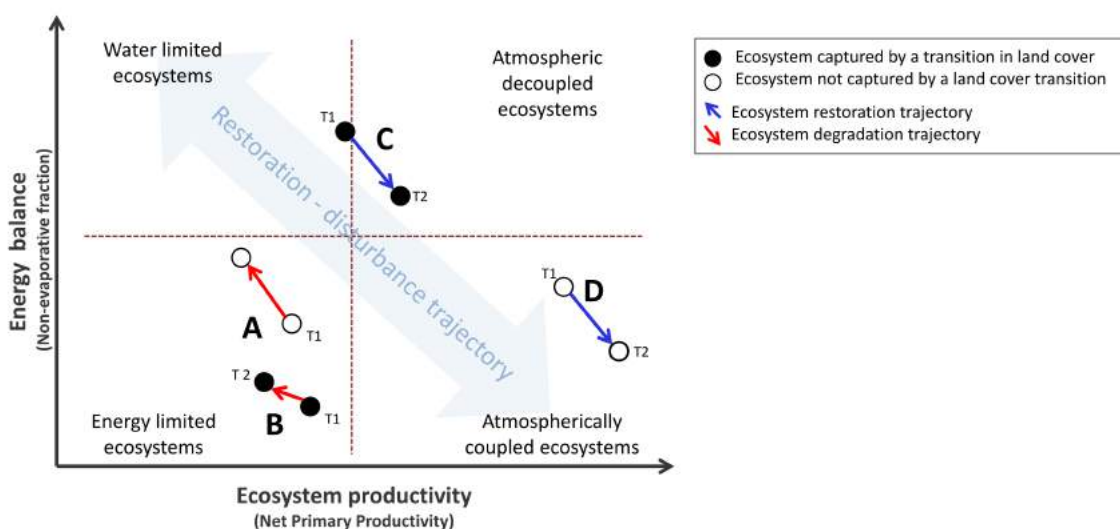
Modified after Nemani & Running (1997), in Ecological Applications
Hypothetical restoration trajectories in the two-dimensional space defined by net primary productivity and energy balance. Where A & B portray degradation trajectories; C & D portray restoration trajectories. Filled (empty) circles represent an ecosystem where a transition in land cover was detected (not detected).

Methods

The Global Ecosystem Restoration Index (GERI) addresses Target 15 goals by integrating three datasets derived from remote sensing and produced at global extent. These datasets were carefully selected because they address three different but related aspects of the land restoration process.

The first functional aspect is based on changes in land productivity, the second aspect is also functional and it is related to changes in the energy balance of the ecosystem, the third and final aspect is related to the structural changes and it is measured using identity transitions in land cover. These datasets are evaluated together though a window (i.e., mask) defined by a baseline of land degradation that aims to capture and discriminate very highly degraded ecosystems from degraded ecosystems.

1) Change in land productivity

This first component of the index addresses land degradation from a functional perspective. For this we use primary productivity indicators derived from vegetation indices. To correct for the effect of precipitation we calculate the Rain Use Efficiency (RUE), which is originally defined as the ratio between net primary productivity (NPP) and precipitation, and represents the capacity of vegetation to use water; the larger the capacity, the better the condition of the system.

For the precipitation time series we use the Climate Research Unit gridded precipitation dataset (CRU TS v. 3.23). Because restoration assessments require the definition of ecologically meaningful boundary conditions, we use the USGS Ecological Land Units dataset to rescale RUE in relation to climatic, geological and biotic conditions.

2) Change in the energy balance

The second component of the index evaluates land degradation from an energy balance perspective. Functional ecosystems should optimize the fraction of dissipated energy in the land surface in the form of latent heat flux (evapotrasnpiration). Therefore the partition of the available energy reaching the land surface into latent heat and sensitive heat provides key information on the restoration process.

We will use MODIS data on radiometric temperature, vegetation, and albedo to calculate the energy partition. Once the relationship between latent and sensible heat is calculated for every month of the full time series, we use a standard statistical technique to estimate pixel-based significant trends.

This pixel based metrics can then be aggregated and reported at any scale depending on the user requirements.

3) Identity transitions in land cover

To be able to correctly interpret trends derived from the previous two components we need to place them in the context of a land cover classification dataset that addresses the structural aspect of the restoration process. For this we use the Global Forest Change time series based on Landsat. We identify pixel based identity transitions from and to forest. This pixel based metric can then be aggregated and reported at any scale depending on the user requirements.

Although these three components are calculated independently they should be interpreted together because they provide insights into different but complementary aspects of the ecosystem restoration process.

All the data and metrics are available via the a dedicated web interface that will be developed by the German Centre for Integrative Biodiversity Research (iDiv) computational infrastructure

Essential Biodiversity Variables:

Ecosystem function class
Net primary productivity

Ecosystem structure class
Ecosystem extent and fragmentation

SSII

Species Status Information Index

The Species Status Information Index (SSII) measures the adequacy of data on the distribution of single species and on the make-up of species assemblages in a location or region.
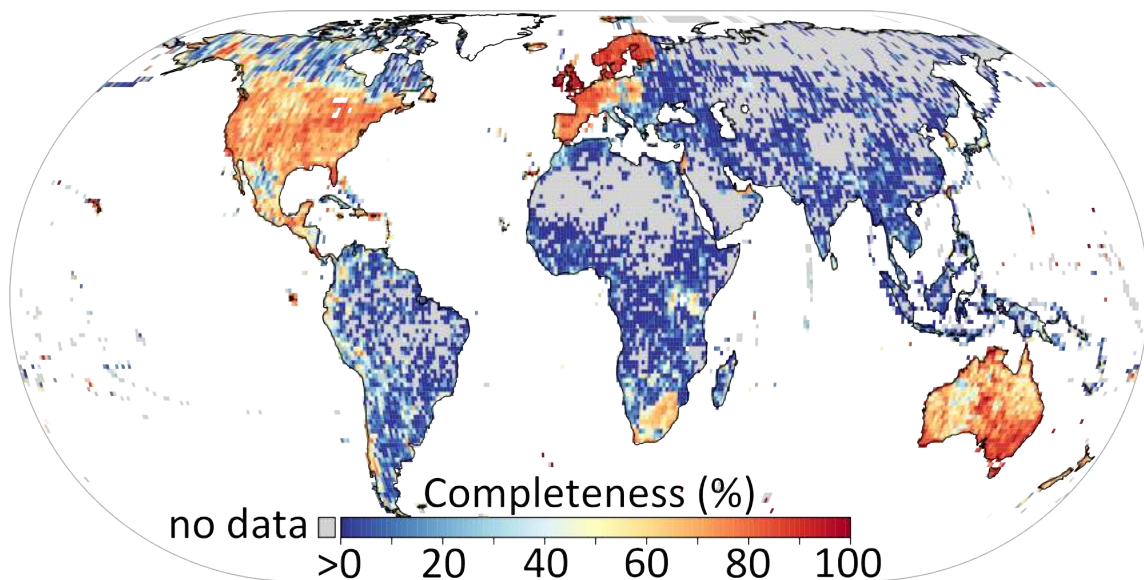
Purpose of the index

To provide an annually updated metric of how growth in the amount and detail of digitally accessible information on species occurrences in space and time is addressing regional and global information gaps. The Species Status Information Index benefits from a large stack of species distribution data, a continuously updated informatics infrastructure, and interactive reporting tools. It is designed to measure and report progress in relation to CBD Aichi Target 19.

CBD Aichi Target 19
Sharing information and knowledge

Coverage

The index uses species data addressing all terrestrial areas of the world from 100km down to, for some groups, 1km spatial resolution. It can be aggregated at spatial levels ranging from small regions, countries, biomes, to the whole planet. It will be updated continuously with latest mobilized records from GBIF and many other location data sources. This enables at least twice-annual formal index updates and a reporting on Aichi Target 19 achievements for twenty time points between 2011 and 2020.

Completeness of distribution records
Spatial variation in the adequacy of digital accessible point information (<150 M records)to represent the make-up of species assemblages (%). Based on information on the distribution and occurrence of 21,170 terrestrial vertebrate species and reported for 110 km grid cells. For details see Meyer, Kreft, Guralnick & Jetz, Nature Communications 2015 (online Sep 7).

Methods

Indicators addressing Aichi Target 19 have limits in their ability to relate knowledge improvements and sharing to the knowledge needs. The data needs to adequately represent biodiversity status and trends increase with the number of species and the spatial extent of their populations. The Species Status Information Index combines data availability and data needs into a single metric that enables a standardized, transparent, and quantitative tracking of how well information gaps are getting filled.

The index builds on model- and expert-based information about the geographic distribution of species, available through Map of Life. It then assesses how well currently accessible digital point occurrence locations for each species are able to spatially represent and ultimately track this distribution over time. In doing this, the index draws on a variety of sources, including GBIF, and takes into account the varying spatial and temporal accuracy of species location records. The index represents the aggregate of species-level metrics over any specified spatial unit such as countries or biomes. It can be calculated for different cut-offs of spatial or temporal detail and be reported separately by biological group. A version of the index can also account for countries' stewardship of species (the proportion of the range that, according to the best estimate, is restricted to them).

All underlying data and metrics are available through a dedicated dashboard in the Map of Life web interface (see example below). Currently, the Species Status Information Index is available for > 35,000 terrestrial species and validated with > 350 million location records. Extensions to increase species coverage and include freshwater and marine groups are underway.

Essential Biodiversity Variables:

Species populations class
Species distribution

Community composition class
Taxonomic diversity

Screenshot of the online tool for country level reporting on species status information, soon available through Map of Life.

Organisations involved

The Species Protection Index (SP), the Species Status Information Index (SSII) and the Species Habitat Index (SHIs) have been developed within a partnership of the Group on Earth Observations Biodiversity Observation Network (GEO BON) lead by Map of Life (Yale University with University of Florida) in collaboration with NASA, the National Science Foundation, the Global Biodiversity Information Facility (GBIF), and Google Earth Engine as well as many data contributing organisations.
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