Faculty of Environmental Sciences

MOBI Lab

Open-data resources

Citizen Science & Crowdsourcing

Florencia Grattarola

2026-11-02

Open-data resources

WHAT: concepts (20 minutes)

HOW: data sources and tools (60 minutes)

WHY: importance of open science (10 minutes)

WHAT

Concepts

What is open data?

Public does not mean open

Data are recorded observations, measurements, or facts that can be processed or analysed to produce information.

Examples: field notes, diaries, texts, illustrations, photographs, sound recordings, specimens, samples, spreadsheets, databases, etc.



By Kollibay, 1910 - Naturalis Biodiversity Center, CC0, https://commons.wikimedia.org/w/index.php?curid=46091909

	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	RegNumberFull	RegPrefix	RegNumber	RegSuffix	IdeQualifiedName	IdeTypeStatus	Family	Genus	Species	IdentifiedBy	CollectionEventSummaryData	Region	Country	Continent	EcoDistrict
2	SP106004	SP	106004	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	T Poupart; 15 Jul 2017; (46 34.18 S -	Stewart Isl	New Zealan	Oceania	79.05 Solander
3	SP106004	SP	106004	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	T Poupart; 15 Jul 2017; (46 34.18 S -	Stewart Isl	New Zealan	Oceania	79.05 Solander
4	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
5	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
6	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
7	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
8	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
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10	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
11	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
12	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
13	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
14	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
15	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
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17	SP105594	SP	105594	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs, J Barkla, MJ	South Islan	New Zealan	Oceania	70.02 Tahakop
18	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs & J Barkla; 1	Stewart Isl	New Zealan	Oceania	79.04 Mt Allen
19	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs & J Barkla; 1	Stewart Isl	New Zealan	Oceania	79.04 Mt Allen
20	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW K				Mt Allen
21	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW K				Mt Allen
22	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW K				Mt Allen
23	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW K				Mt Allen
24	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs & J Barkla; 1	Stewart Isl	New Zealan	Oceania	79.04 Mt Allen
25	SP105596	SP	105596	(blank)	Myosotis rakiura L.B.M	(blank)	Boraginac	Myosotis	rakiura	Meudt, Heidi	HM Meudt, AW Kusabs & J Barkla; 1	Stewart Isl	New Zealan	Oceania	79.04 Mt Allen

STRUCTURED

Avocadobabygirl, CC BY-SA 4.0 via Wikimedia Commons

What is open data?

Public does not mean open

The data we find online may be **public** but that doesn't make them open.

Open data and content can be freely **used**, **modified**, and **shared** by **anyone** for **any purpose**

https://opendefinition.org/od/2.1/en

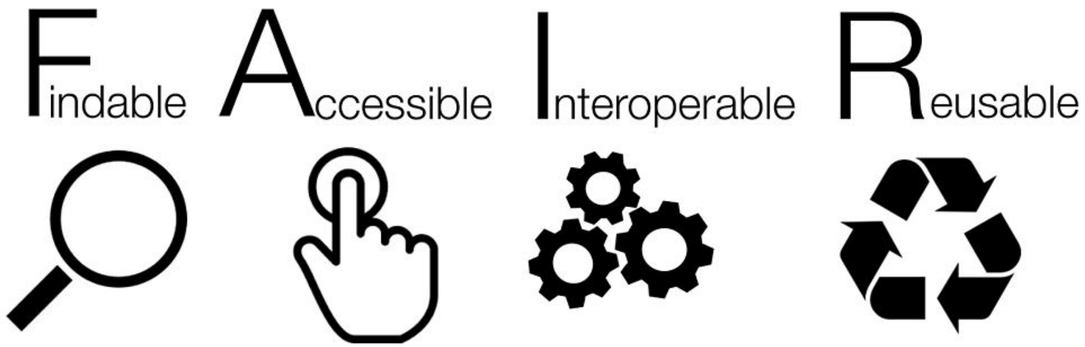
Open Definition

Requirements	
OPEN LICENSE	It must be in the public domain or provided under an open license
ACCESS	It must be provided as a whole and should be downloadable via the Internet without charge
MACHINE READABILITY	It must be provided in a form readily processable by a computer
OPEN FORMAT	It must be provided in an open format (which places no restrictions, monetary or otherwise)

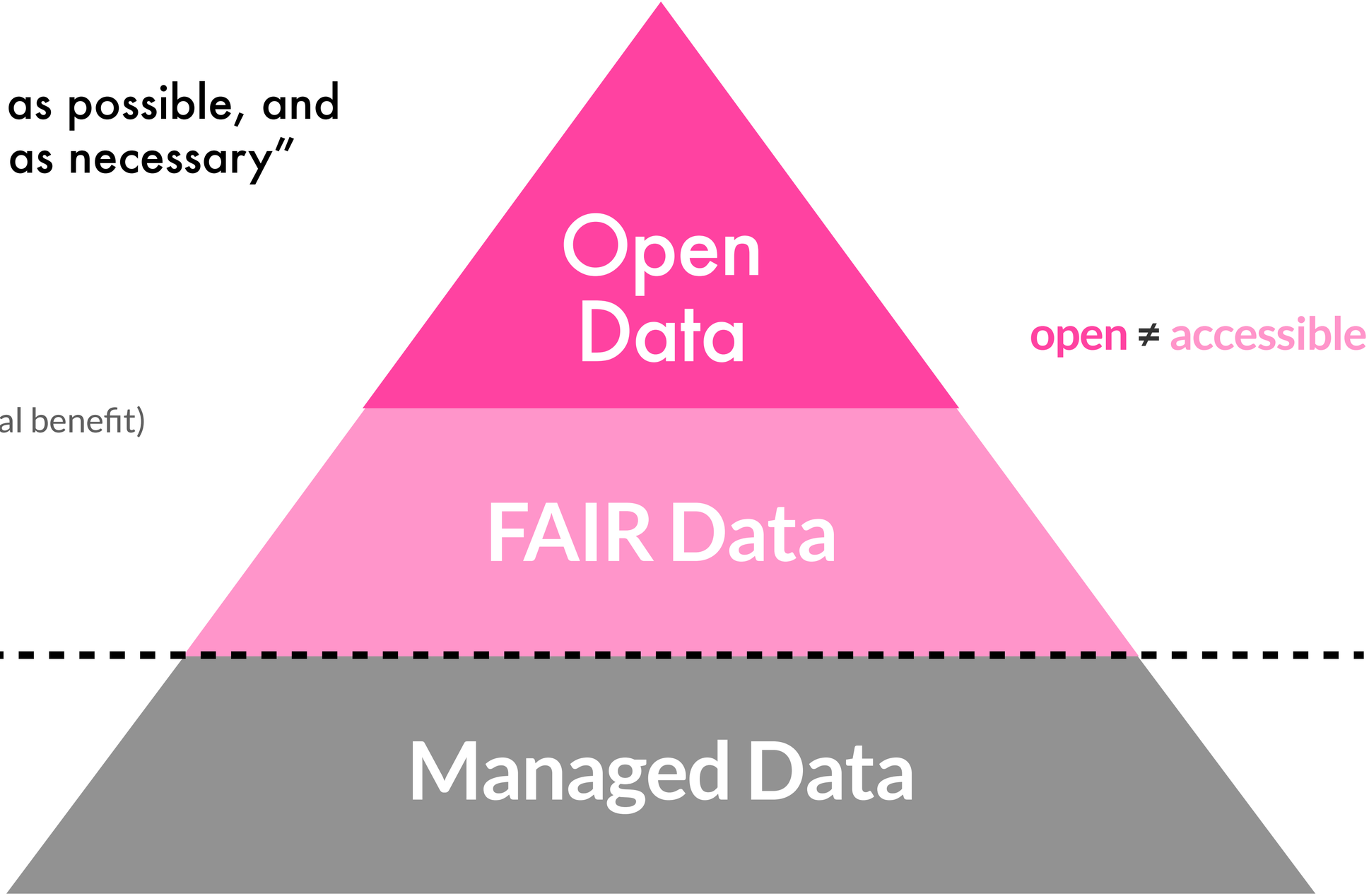
FAIR Principles

Guidelines for open science

- Making research data **easy to find** (because they have persistent unique identifiers), **accessible** (by people and machines), **interoperable** (because they can be integrated with other data), and **reusable** (because they have clear licenses for use, for example).



"As open as possible, and as closed as necessary"



Externally
(for communal benefit)

Internally
(for own use)

open ≠ **accessible**

Data standards

The same language

- When we standardise data, we express it in a common language that others (including machines) can understand.
- A classic example is how to record **dates**:

  12-01-2020, is that 12th of January or 1st of December?

- The best-known standard for biodiversity data is **Darwin Core**

TDWG Darwin Core

https://dwc.tdwg.org/terms/

scientificName	
Identifier	http://rs.tdwg.org/dwc/terms/scientificName
Definition	The full scientific name, with authorship and date information if known. When forming part of a dwc:Identification, this should be the name in lowest level taxonomic rank that can be determined.
Notes	This term should not contain identification qualifications, which should instead be supplied in the IdentificationQualifier term. When applied to an Organism or Occurrence, this term should be used to represent the scientific name that was applied to the associated Organism in accordance with the Taxon to which it was or is currently identified. Names should be compliant to the most recent nomenclatural code. For example, names of hybrids for algae, fungi and plants should follow the rules of the International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code Articles H.1, H.2 and H.3). Thus, use the multiplication sign × (Unicode U+00D7, HTML ×) to identify a hybrid, not x or X, if possible.

Examples	`Coleoptera` (order)
	`Vespertilionidae` (family)
	`Manis` (genus)
	`Ctenomys sociabilis` (genus + specificEpithet)
	`Ambystoma tigrinum diaboli` (genus + specificEpithet + infraspecificEpithet)
	`Roptrocerus typographi (Györfi, 1952)` (genus + specificEpithet + scientificNameAuthorship)
	`Quercus agrifolia var. oxyadenia (Torr.) J.T. Howell` (genus + specificEpithet + taxonRank + infraspecificEpithet + scientificNameAuthorship)
	`×Agropogon littoralis (Sm.) C. E. Hubb.`
	`Mentha ×smithiana R. A. Graham`
	`Agrostis stolonifera L. × Polypogon monspeliensis (L.) Desf.`

Licenses

Terms and Conditions of Use

- Licences provide a simple, standardised way of granting the public permission to **share and use your creative work under the terms you choose**.

- They are not automatic. **You must specify the licence you have chosen** (opt in)**.**

DEFAULT IS COPYRIGHT!



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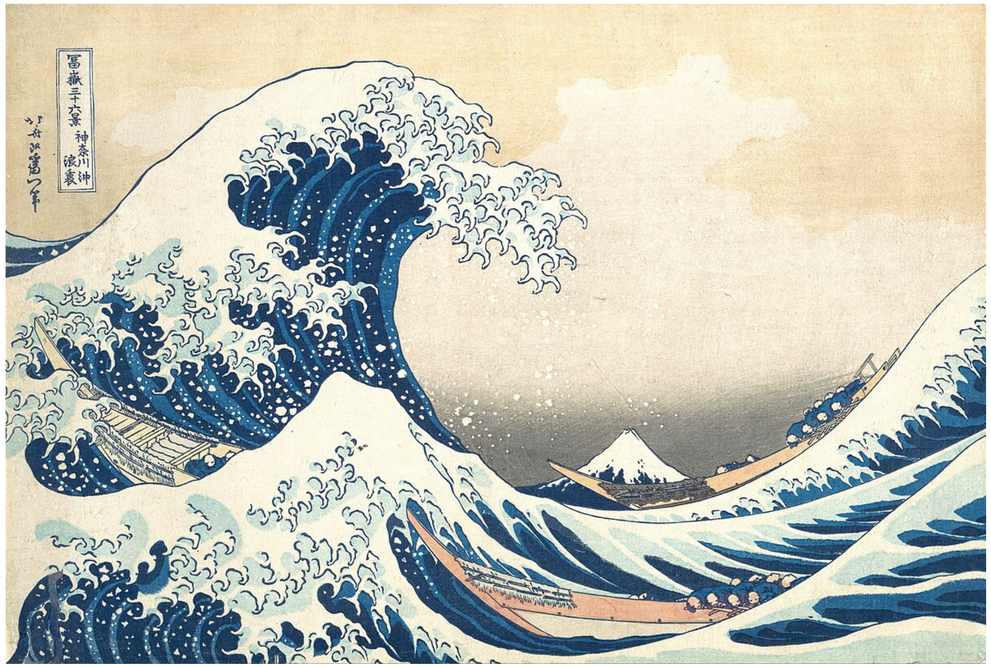
In public domain



The great wave of Kanagawa by Katsushika Hokusai

PUBLIC DOMAIN

But if it had another license?

BY SA



BY ND

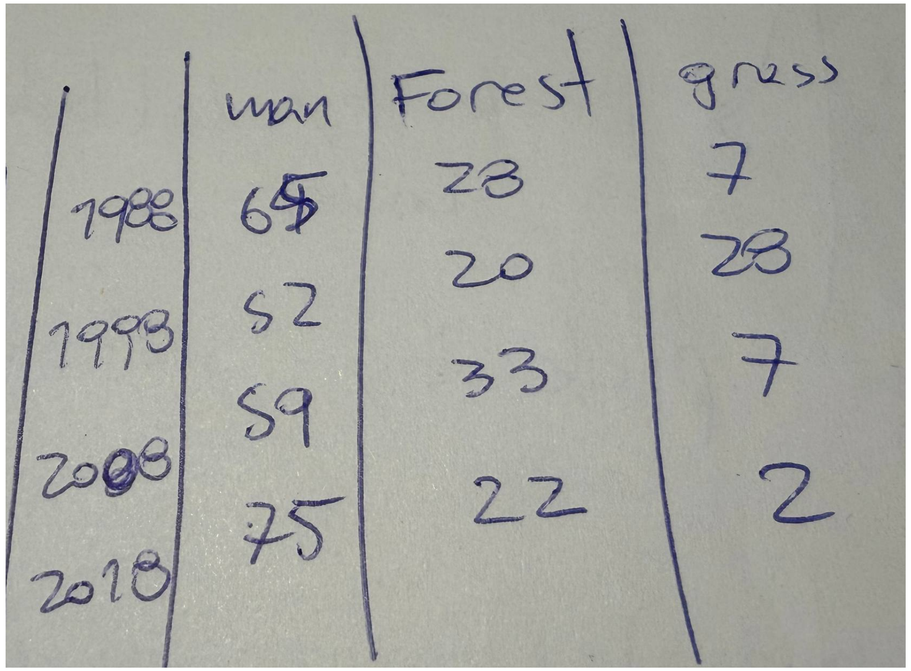


BY NC



What is open data?

Exercise: make the data open



FIELD NOTES

MAKE THEM DIGITAL

year	man	forest	grass
1988	65	28	7
1998	52	20	28
2008	59	33	7
2018	75	22	2

STORE THEM IN AN OPEN FORMAT

CSV

CREATE METADATA

README

Column	Definition
man	Percentage of land that is managed
forest	Percentage of land that is forested with trees
grass	Percentage of land that is grassland
year	Year in which the measure was extracted

DECLARE A LICENSE

CC BY

PUBLISH DATA + METADATA IN A TRUSTED REPOSITORY

iDdoi

WHAT

Concepts

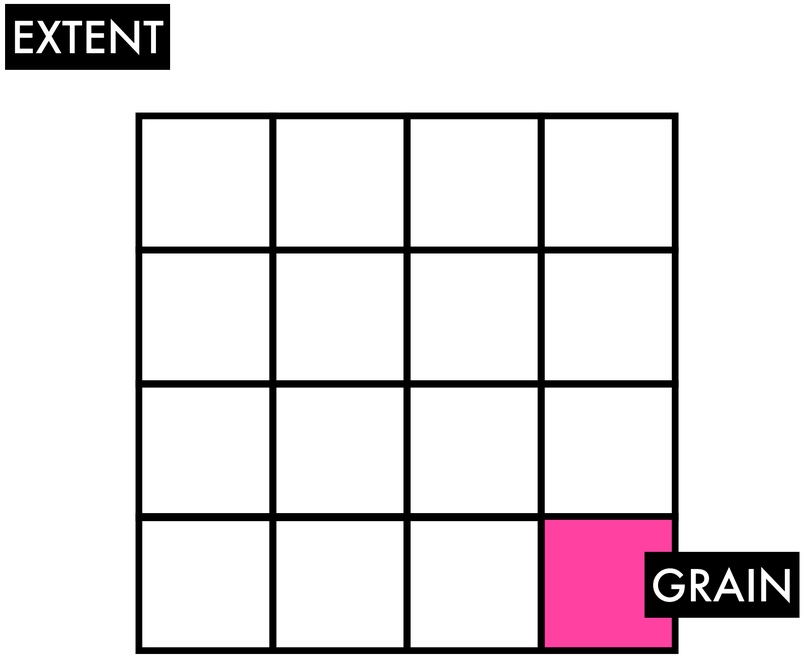
1. What is open data?
2. FAIR Principles
3. Data standards
4. Licenses
5. Exercise

HOW

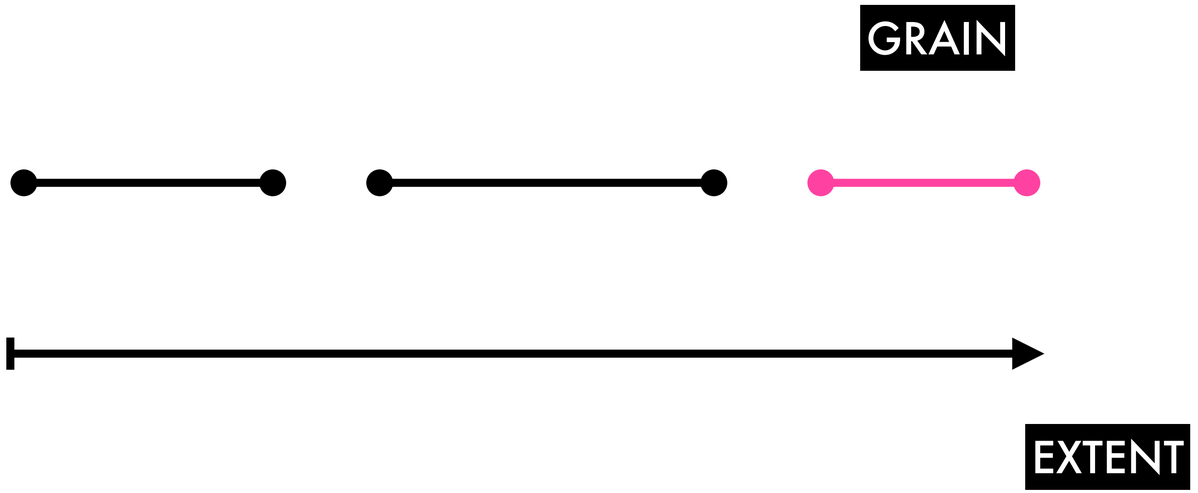
Data sources

Data types

Spatial and temporal grain (resolution) and extent



area



time

Data types

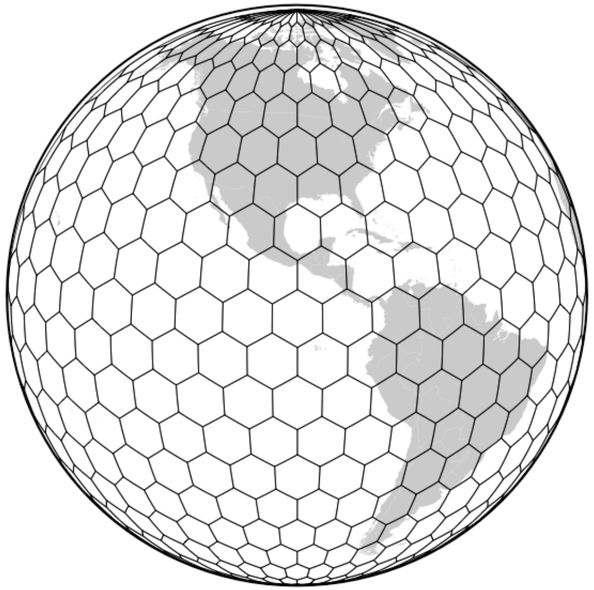
Spatial and temporal grain and extent

1 degree ≈ 111 km



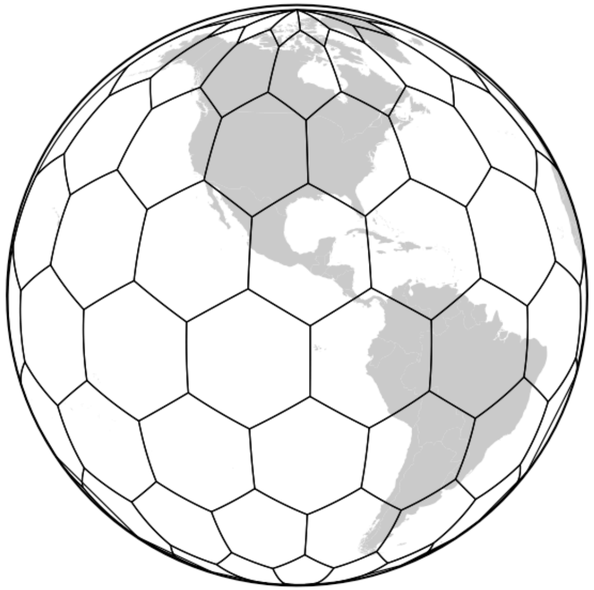
EXTENT global

GRAIN 1°



EXTENT global

GRAIN 10°



EXTENT global

GRAIN 25°



EXTENT global

GRAIN global

Data sources

Typology

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

1. **Drivers**: factors that alter the makeup of ecosystems by applying direct pressure on biodiversity (*indirect drivers*)
2. **Pressures**: natural and anthropogenic drivers of biodiversity loss, such as climate change (*direct drivers*)
3. **State**: the present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level
4. **Responses**: recommendations on how to respond to drivers of biodiversity loss
5. **Benefits**: data on the benefits biodiversity and ecosystem services provide for people

Data sources

1. Drivers (indirect drivers)

Factors that alter the makeup of ecosystems by applying direct pressure on biodiversity

EXAMPLES

1. Socioeconomics
2. Human demographics

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

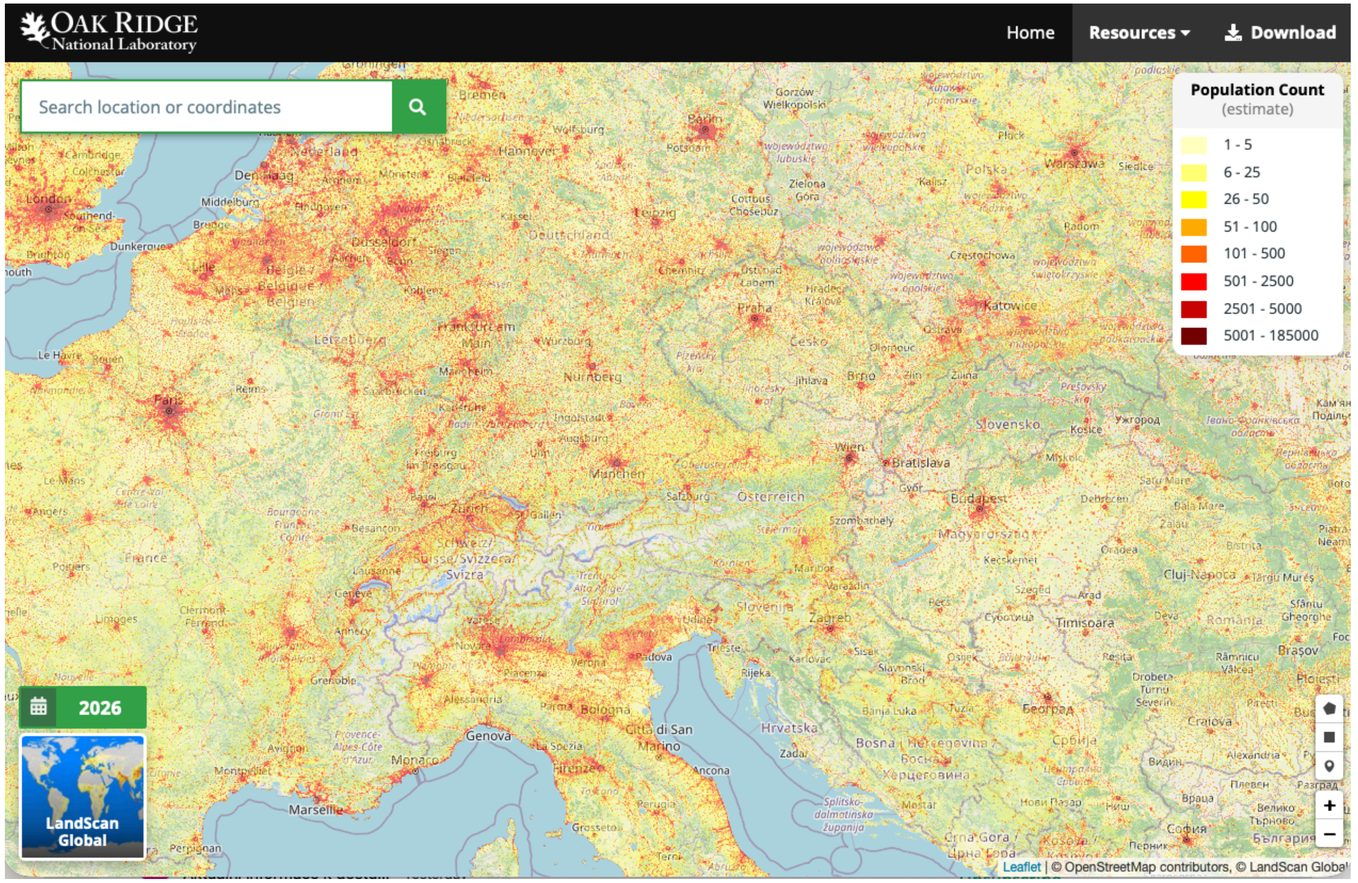
Data sources

1. Drivers (indirect drivers)

Factors that alter the makeup of ecosystems by applying direct pressure on biodiversity

Data portal on human population density

https://www.ornl.gov/news/public-release-ornl-global-population-distribution-data-aids-humanitarian-support/



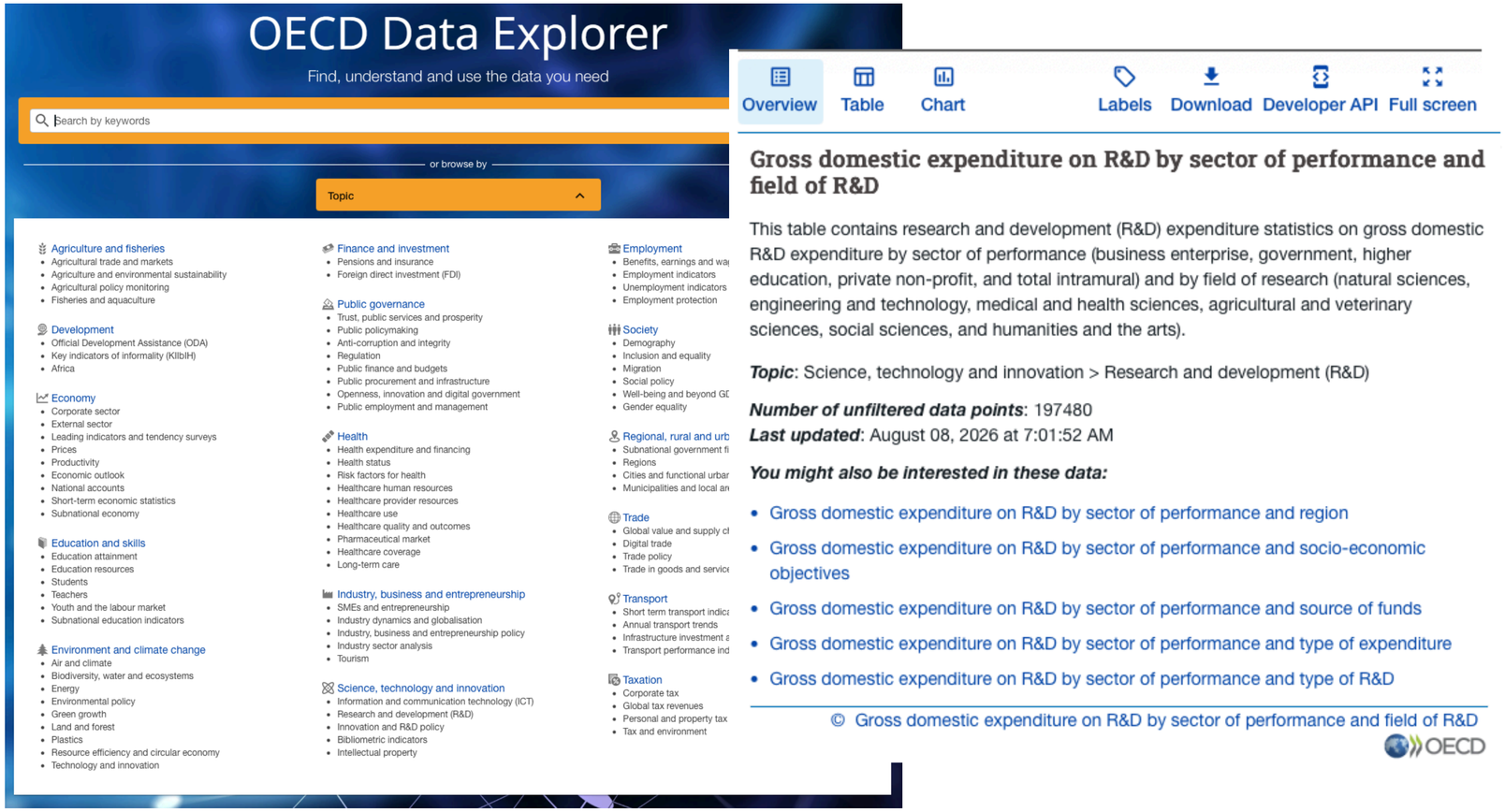
Data sources

1. Drivers (indirect drivers)

Factors that alter the makeup of ecosystems by applying direct pressure on biodiversity

OECD Data Explorer

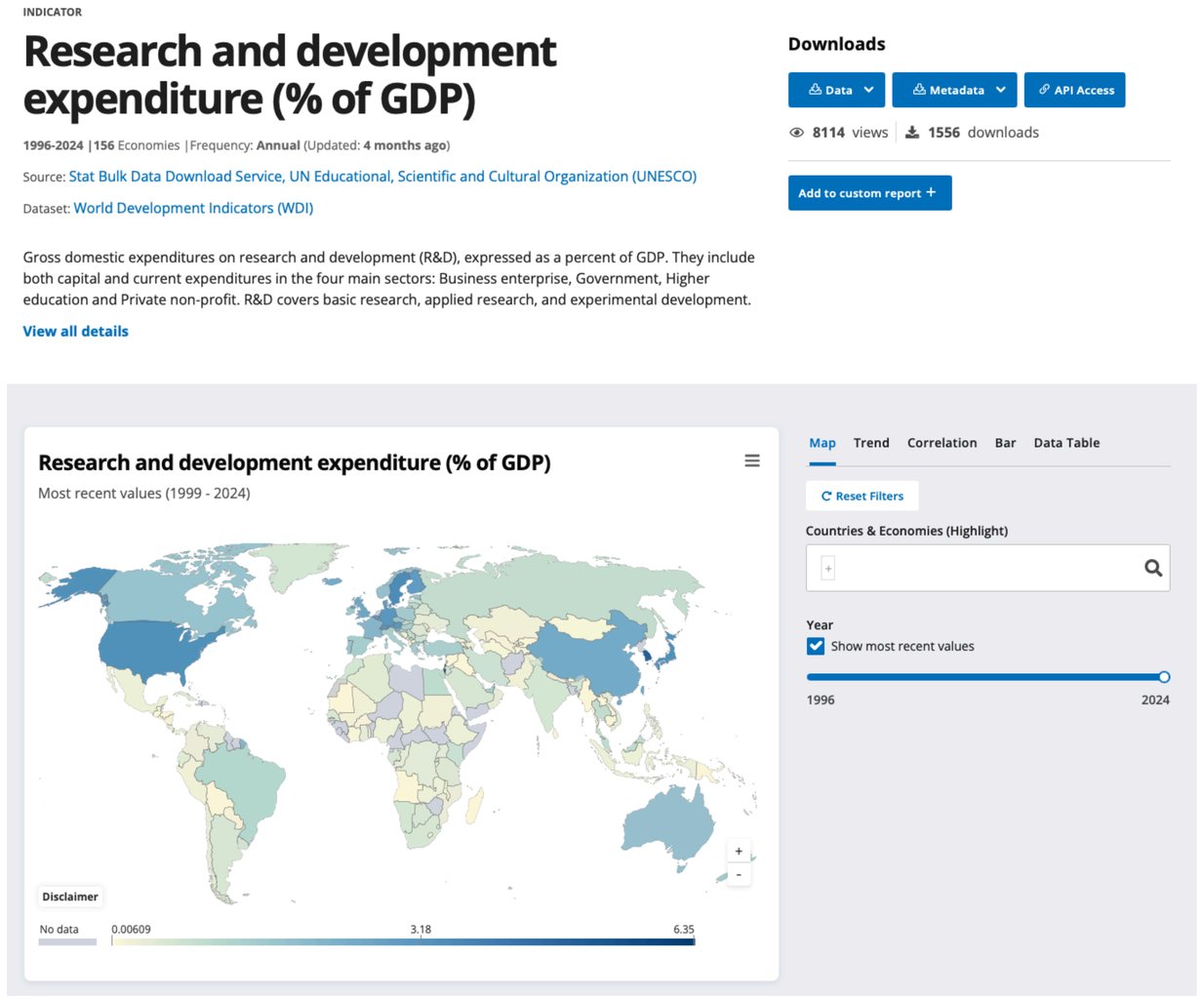
https://data-explorer.oecd.org/



Data sources

1. Drivers (indirect drivers)

Factors that alter the makeup of ecosystems by applying direct pressure on biodiversity



World Bank's Open Data portal

https://data360.worldbank.org/en/search

Data sources

2. Pressures (direct drivers)

Natural and anthropogenic drivers of biodiversity loss, such as climate change

EXAMPLES

1. Changing use of sea and land
2. Direct exploitation of organisms
3. Climate change
4. Invasive nonnative species

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

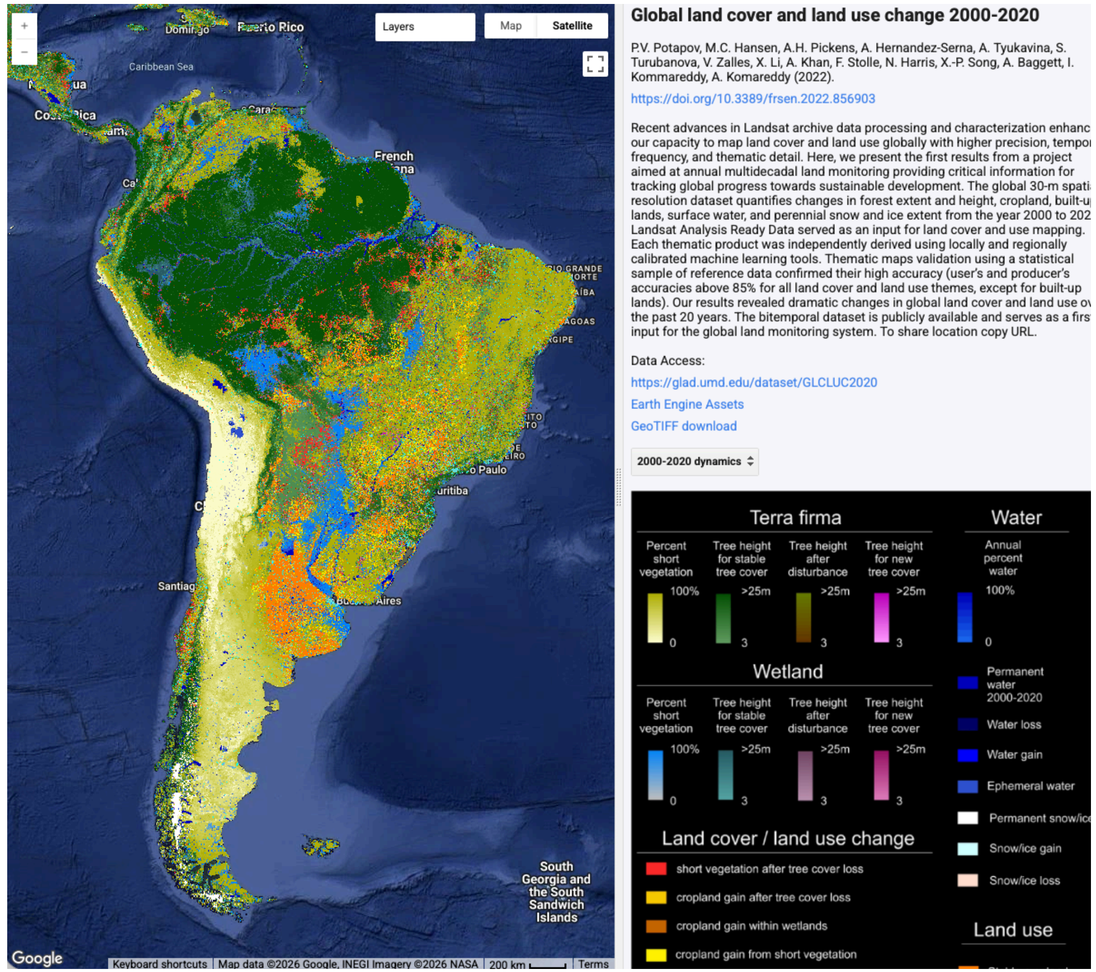
Data sources

2. Pressures (direct drivers)

Natural and anthropogenic drivers of biodiversity loss, such as climate change

Global Land Cover and Land Use Change, 2000-2020

https://glad.umd.edu/dataset/GLCLUC2020/

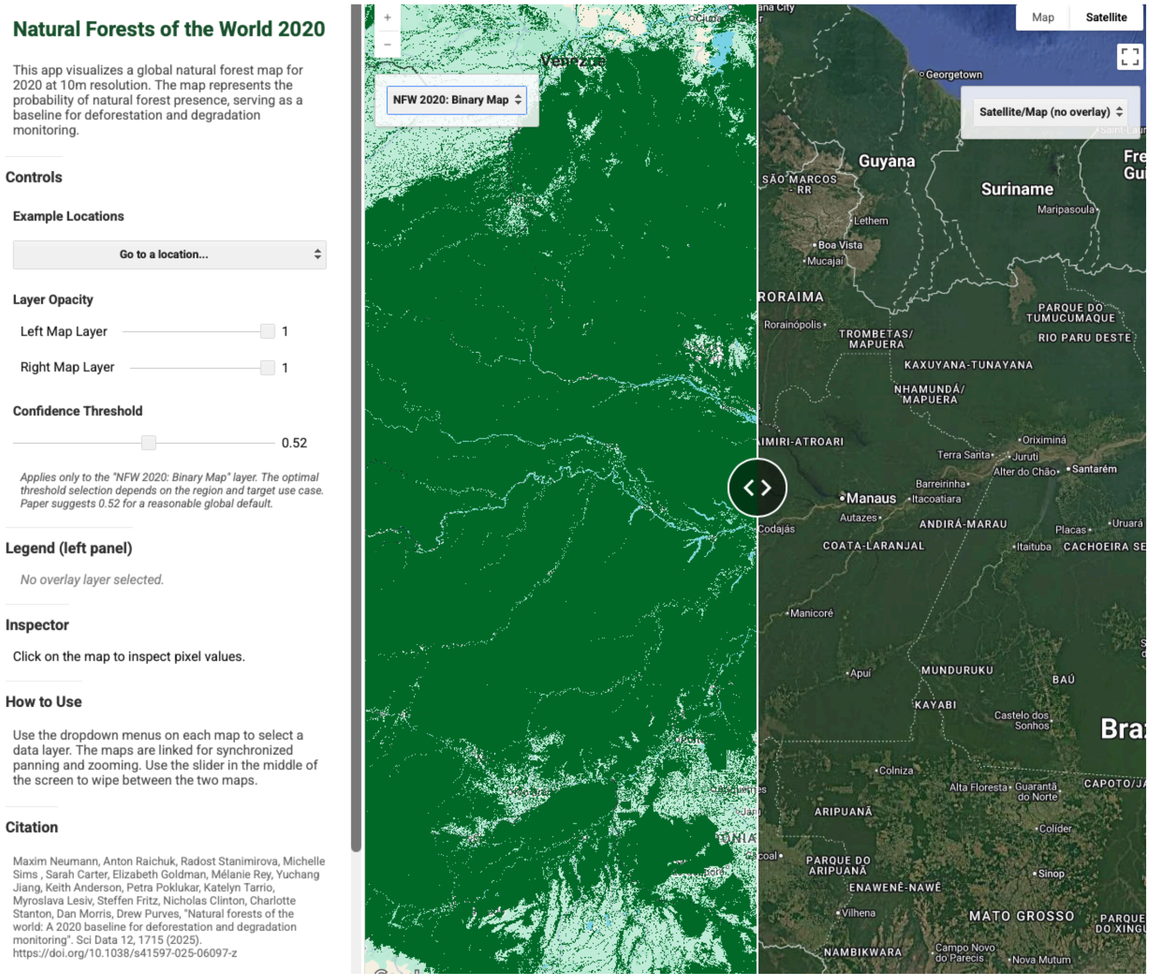


Data sources

2. Pressures (direct drivers)

Natural forests of the world 2020

Natural and anthropogenic drivers of biodiversity loss, such as climate change



Natural Forests of the World

https://nature-trace.projects.earthengine.app/view/natural-forests-2020

Data sources

2. Pressures (direct drivers)

Natural and anthropogenic drivers of biodiversity loss, such as climate change

CHELSA

https://www.chelsa-climate.org

Key Figures

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File Format
COG

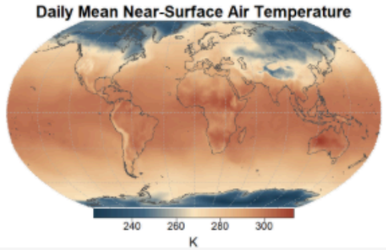
Publication Date
6.2021

Model Citation
Karger, D. N.; Conrad, O.; Böhner, J.; Kawohl, T.; Kreft, H.; Soria-Auza, R. W.; Zimmermann, N. E.; Linder, H. P.; Kessler, M. Climatologies at high resolution for the earth's land surface areas. Sci. Data 2017, 4, 170122 (20 pp.). https://doi.org/10.1038/sdata.2017.122

Data Citation
Karger, D. N., Conrad, O., Böhner, J., Kawohl, T., Kreft, H., Soria-Auza, R. W., Zimmermann, N. E., Linder, H. P., Kessler, M. (2021). Climatologies at high resolution for the earth's land surface areas. EnviDat. https://www.doi.org/10.16904/envidat.228.

CHELSA-climatologies

Overview | Variables | Related Datasets



CHELSA-climatologies is a global, kilometer-scale climate dataset generated with the CHELSA downscaling model. It consists of long term climatological means.

Start Time	1981-2010
End Time	2071-2100
Status	active
Version	2.1

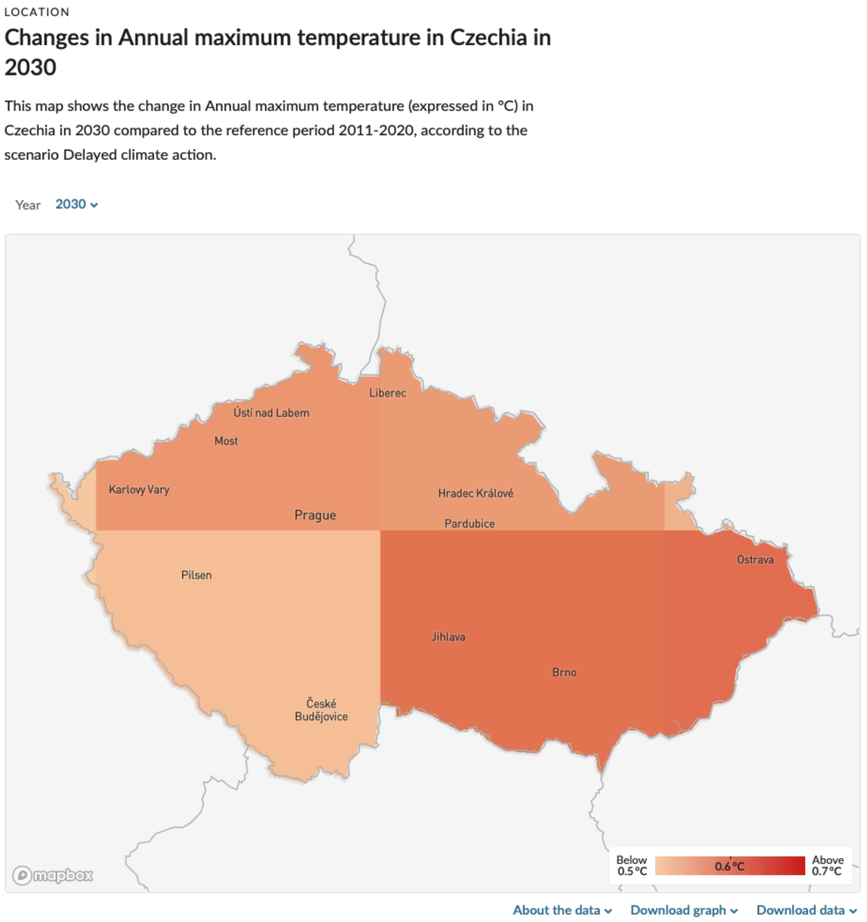
Data sources

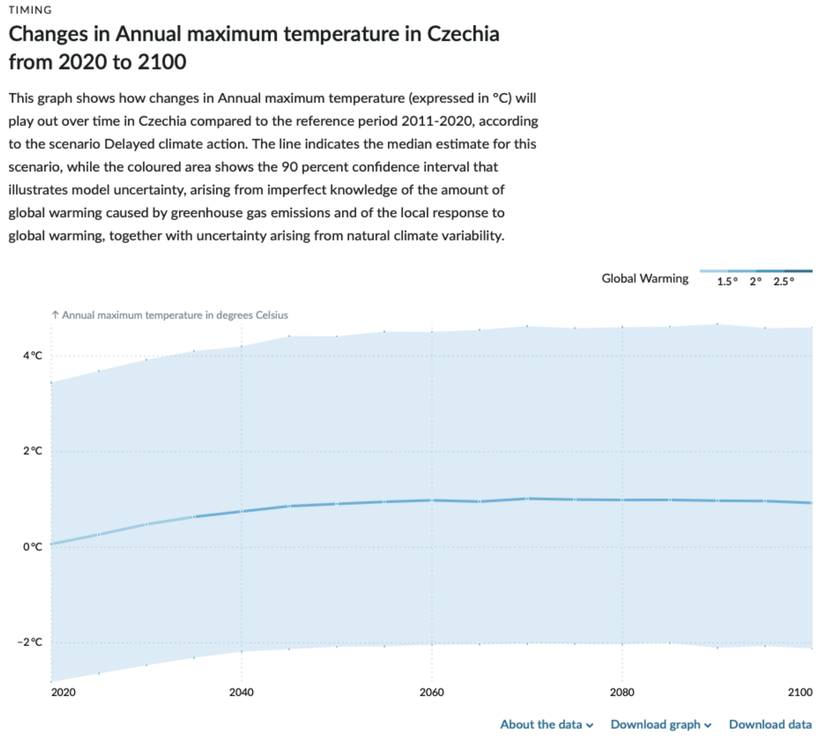
2. Pressures (direct drivers)

Natural and anthropogenic drivers of biodiversity loss, such as climate change

PROVIDE Climate Risk Dashboard

https://climate-risk-dashboard.iiasa.ac.at/





Data sources

2. Pressures (direct drivers)

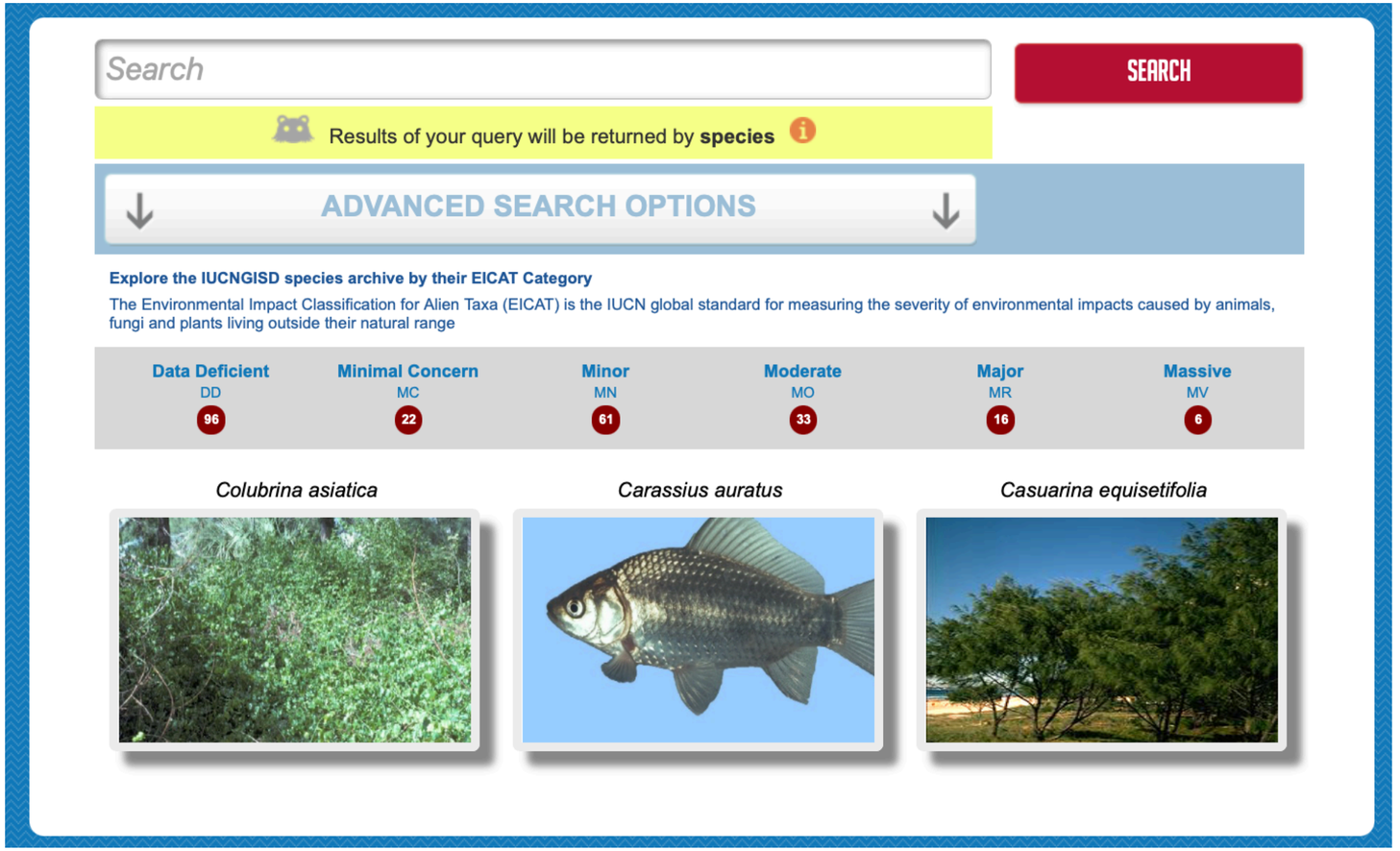
Natural and anthropogenic drivers of biodiversity loss, such as climate change

GENERAL IMPACTS

Carpobrotus edulis can form impenetrable mats up to 20cm wide and over 50cm deep, and will sometimes compete aggressively with native species (D'Antonio and Mahall 1991, D'Antonio, 1993; PIER, 2005). Once it becomes established, it shows a high vegetative reproductive rate, and its growth does not appear to be affected by herbivory or competition (D'Antonio 1993; Campelo *et al.* 1999). *C. edulis* can also decrease species diversity by preventing sand movement, which hinders the natural processes of disturbance and change in dune environments (Kim, undated). *C. edulis* reduces soil pH and influences nutrient dynamics (D'Antonio 1990a, D'Antonio and Mahall, 1991). *C. edulis* has been observed to invade new areas following fire events in California (Zedler and Scheid 1988; D'Antonio *et al.* 1993). *C. edulis* hybridises with its related species (native, naturalised and alien) in many parts of its introduced range (Chinnock, 1972; Vila and D'Antonio, 1998; Albert *et al.* 1997; Suehs *et al.* 2004a; Gallagher *et al.* 1997), which may intensify the invasion process (Suehs *et al.* 2004a) or impact on the integrity of native species.

Global Invasive Species Database

https://www.iucngisd.org/gisd/



Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level

1. Genes
2. Species
3. Ecosystems

EXAMPLES

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level

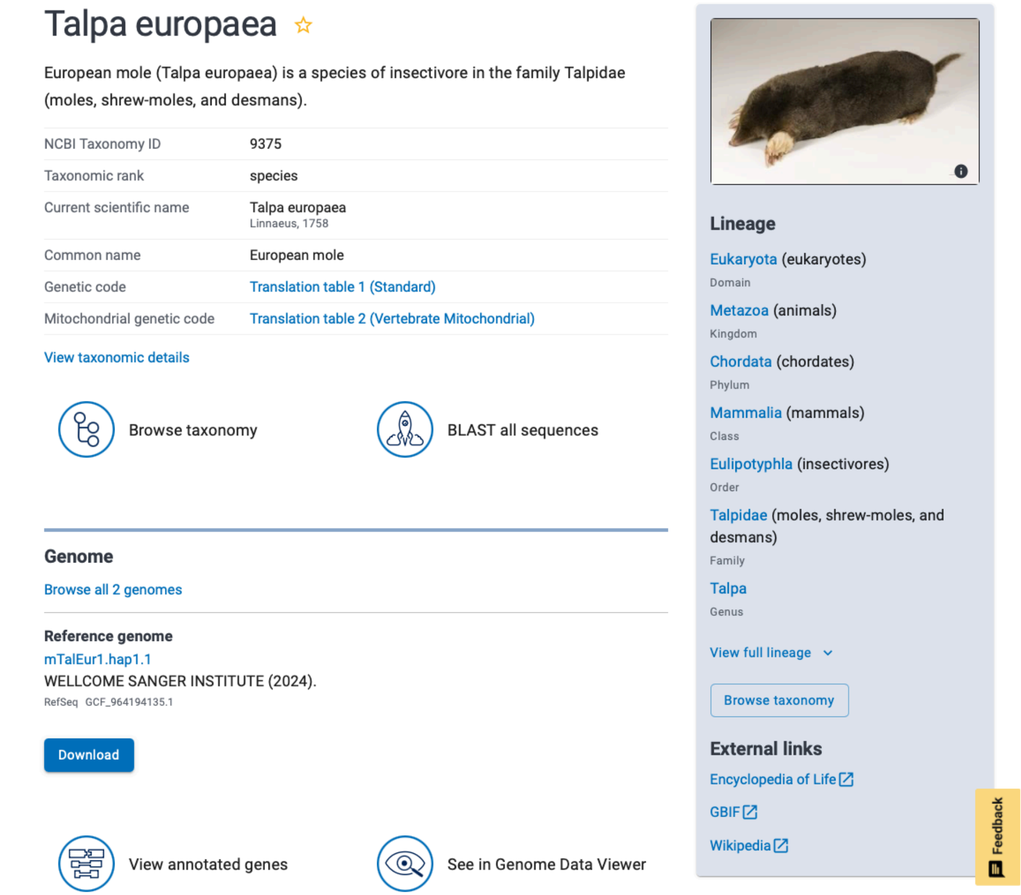
DDBJ DNA Data Bank of Japan

ENA European Nucleotide Archive

NLM-NCBI

International Nucleotide Sequence Database Collaboration

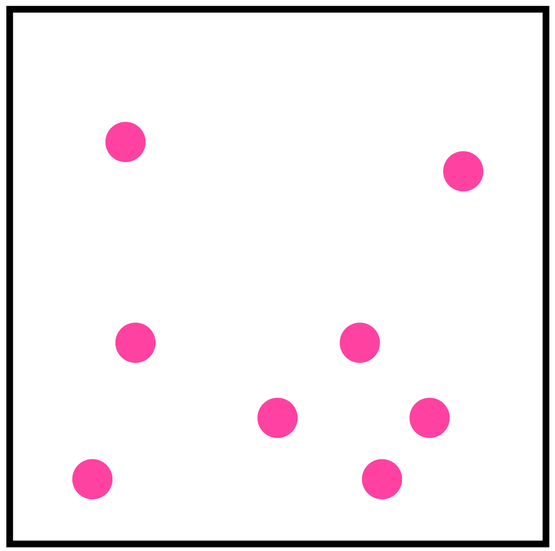
https://www.insdc.org/



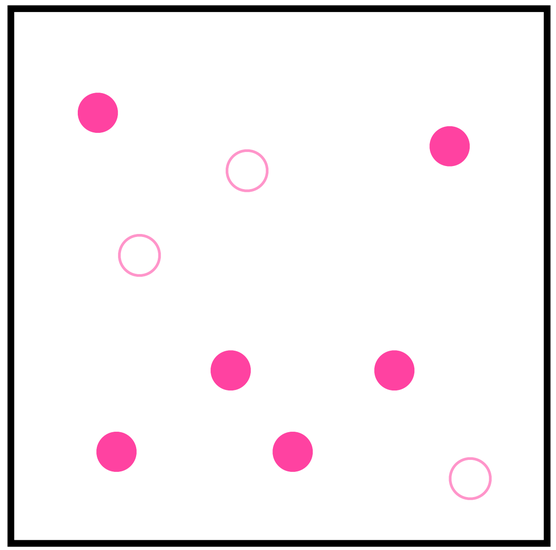
https://www.ncbi.nlm.nih.gov/datasets/genome

Data types

Different types records



PRESENCE-ONLY



PRESENCE-ABSENCE

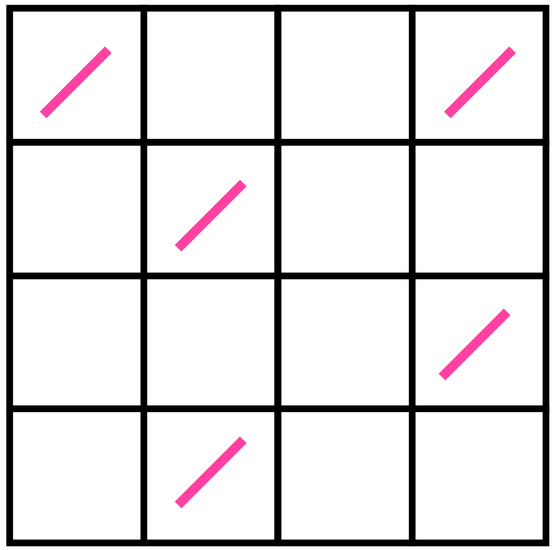
DETECTION NON-DETECTION



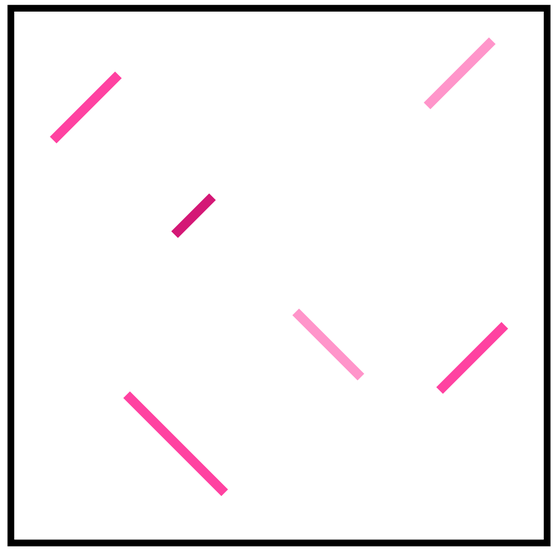
RANGE MAP

Data types

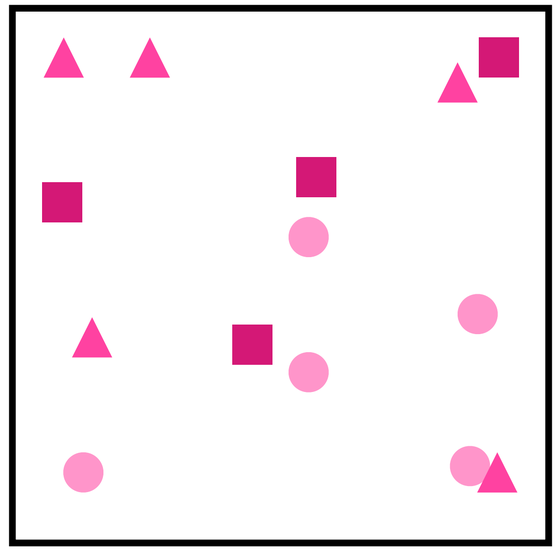
Different types of sampling strategies



STRUCTURED



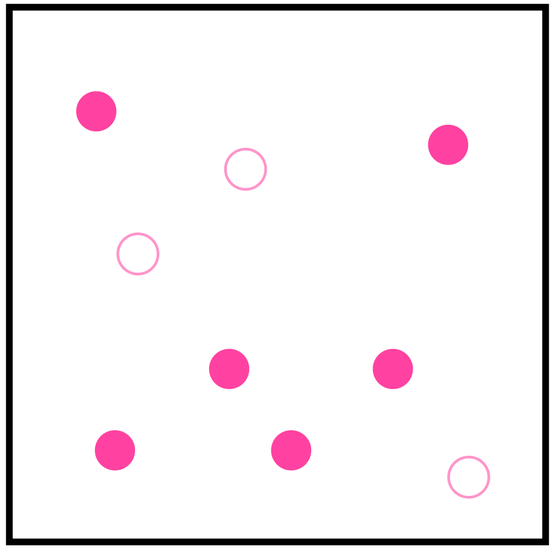
SEMI-STRUCTURED



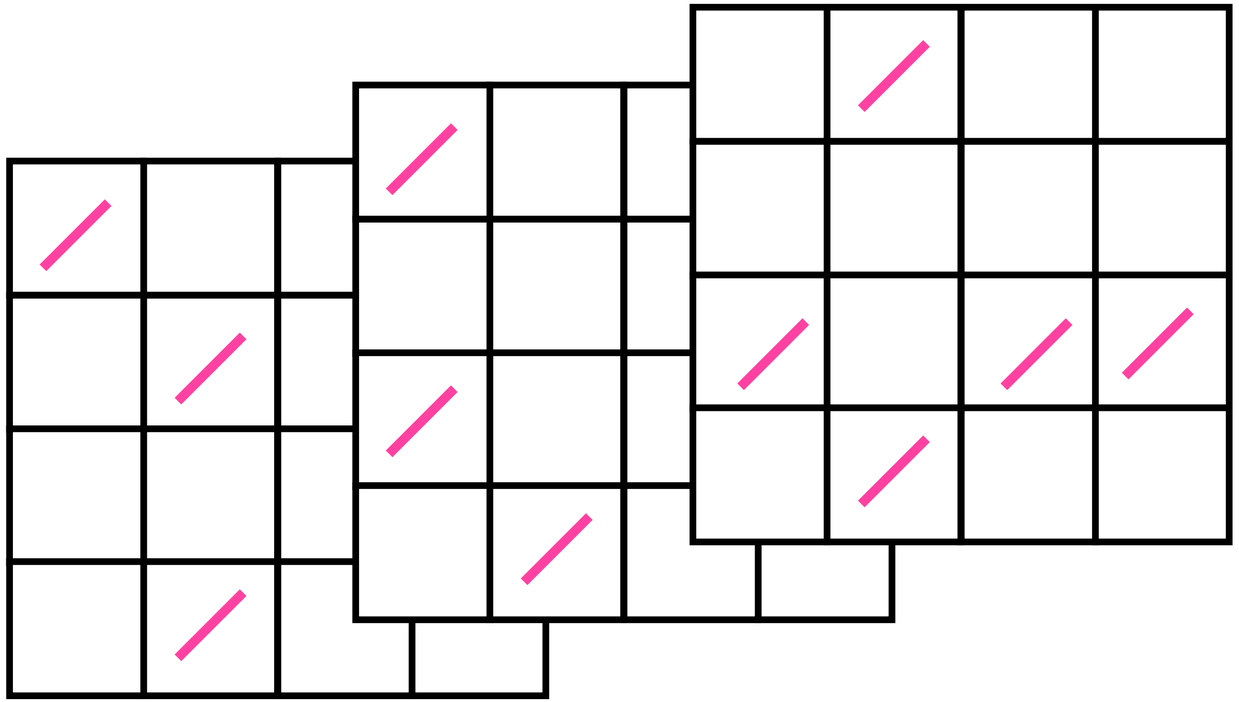
UNSTRUCTURED

Data types

Different types of sampling strategies



ONE TIME



REPEATED OVER TIME

Data sources

3. State

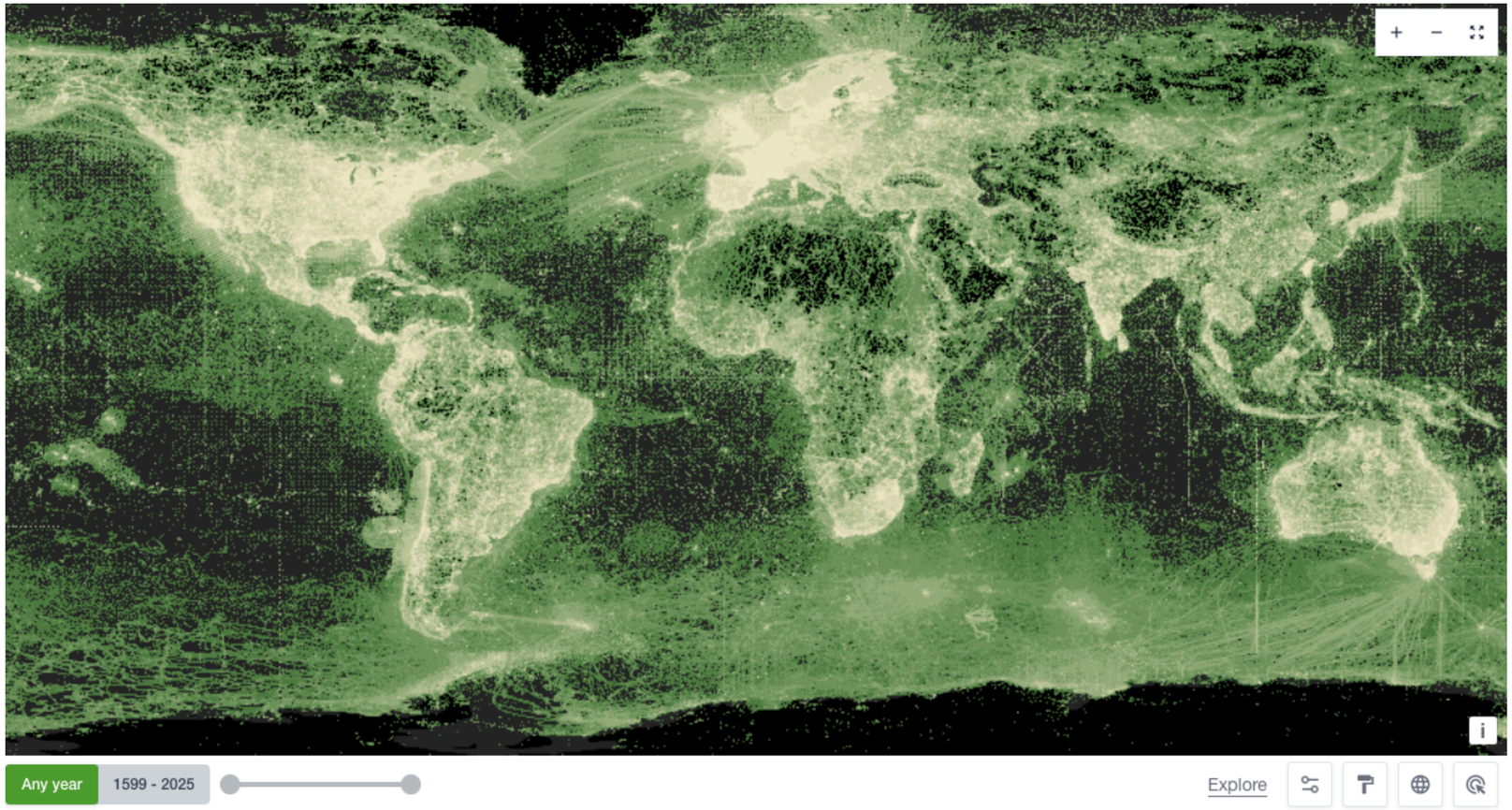
The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level

3,750,023,159
Occurrence records

125,238
Datasets

2,826
Publishing institutions

16,174
Peer-reviewed papers using data



Global Biodiversity Information Facility

https://www.gbif.org/

Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level



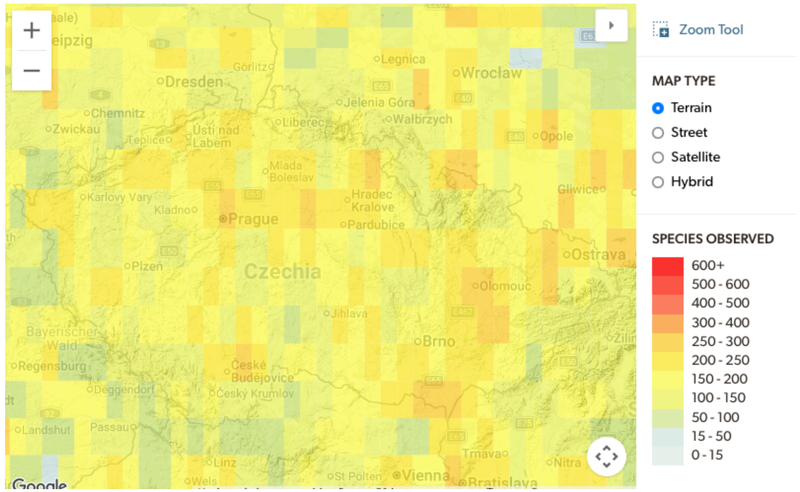
Find More Birds



Share Your Sightings



Track Your Lists





eBird

https://ebird.org

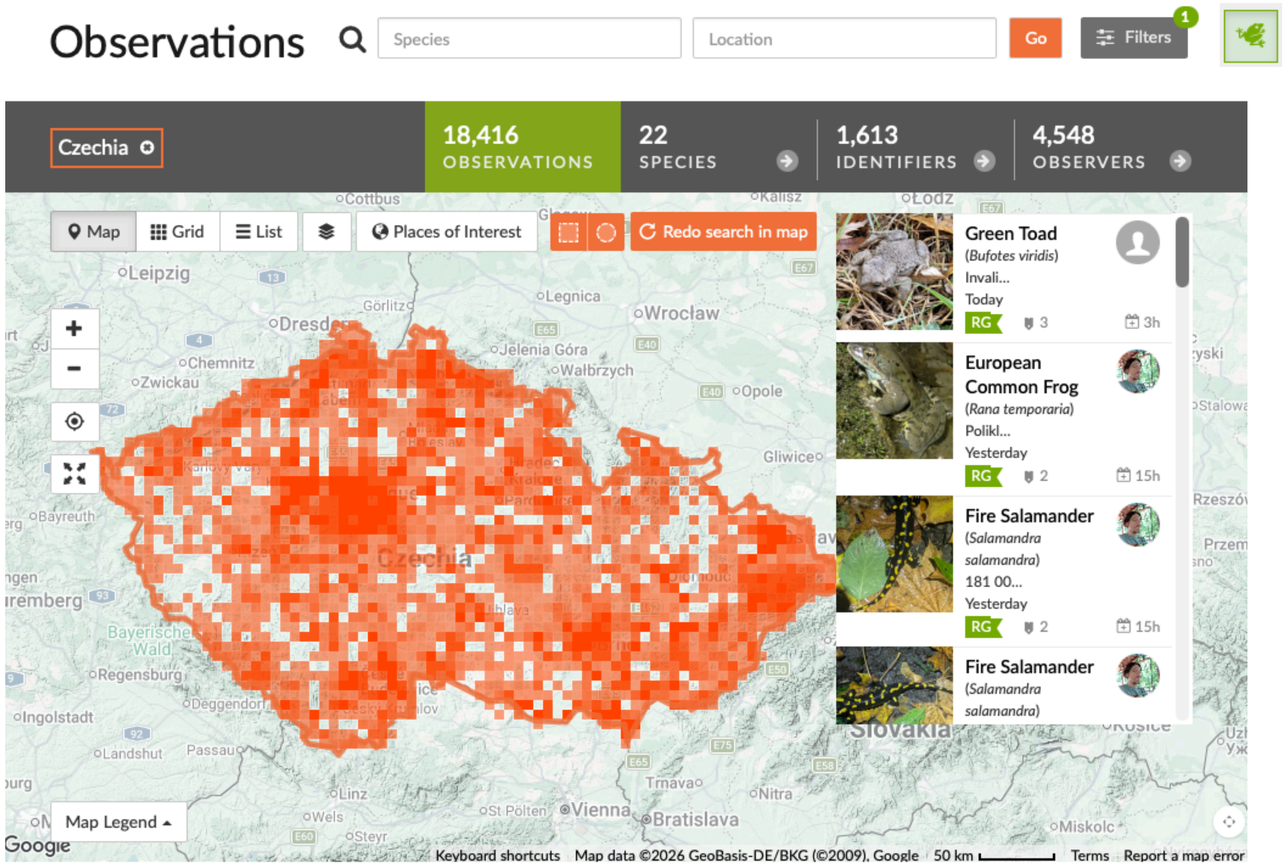
Strimas-Mackey et al. (2023). Best Practices for Using eBird Data. Version 2.0. https://ebird.github.io/ebird-best-practices/

Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level





iNaturalist

https://www.inaturalist.org/

Callaghan et al. (2026). Guidelines and best practices for the scientific use of global iNaturalist data. *BioScience* https://doi.org/10.1093/biosci/biag135

Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level

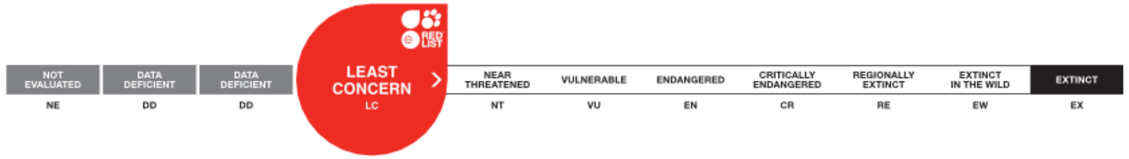


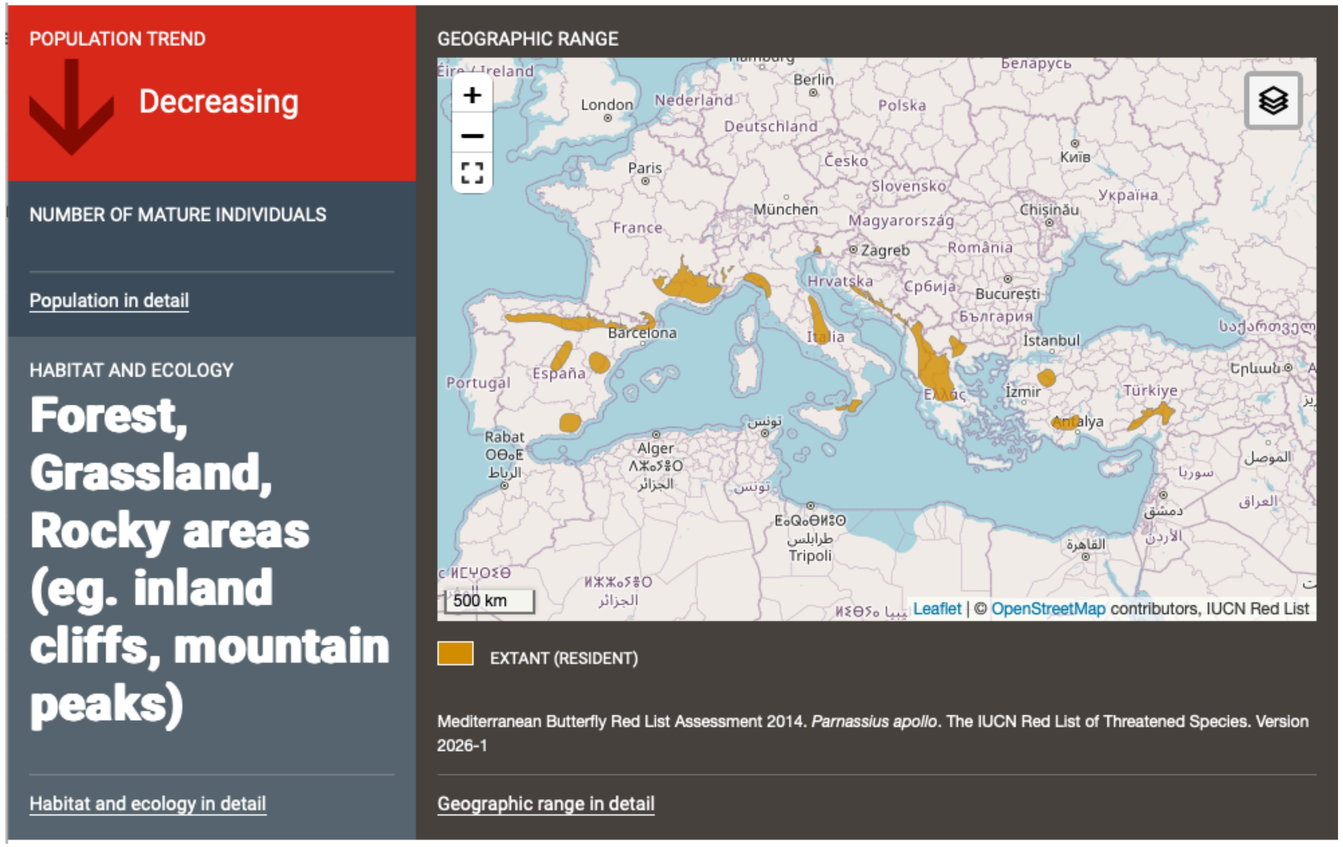
Apollo

Parnassius apollo

ABSTRACT

Apollo *Parnassius apollo* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2013. *Parnassius apollo* is listed as Least Concern.





IUCN Red List of Threatened Species

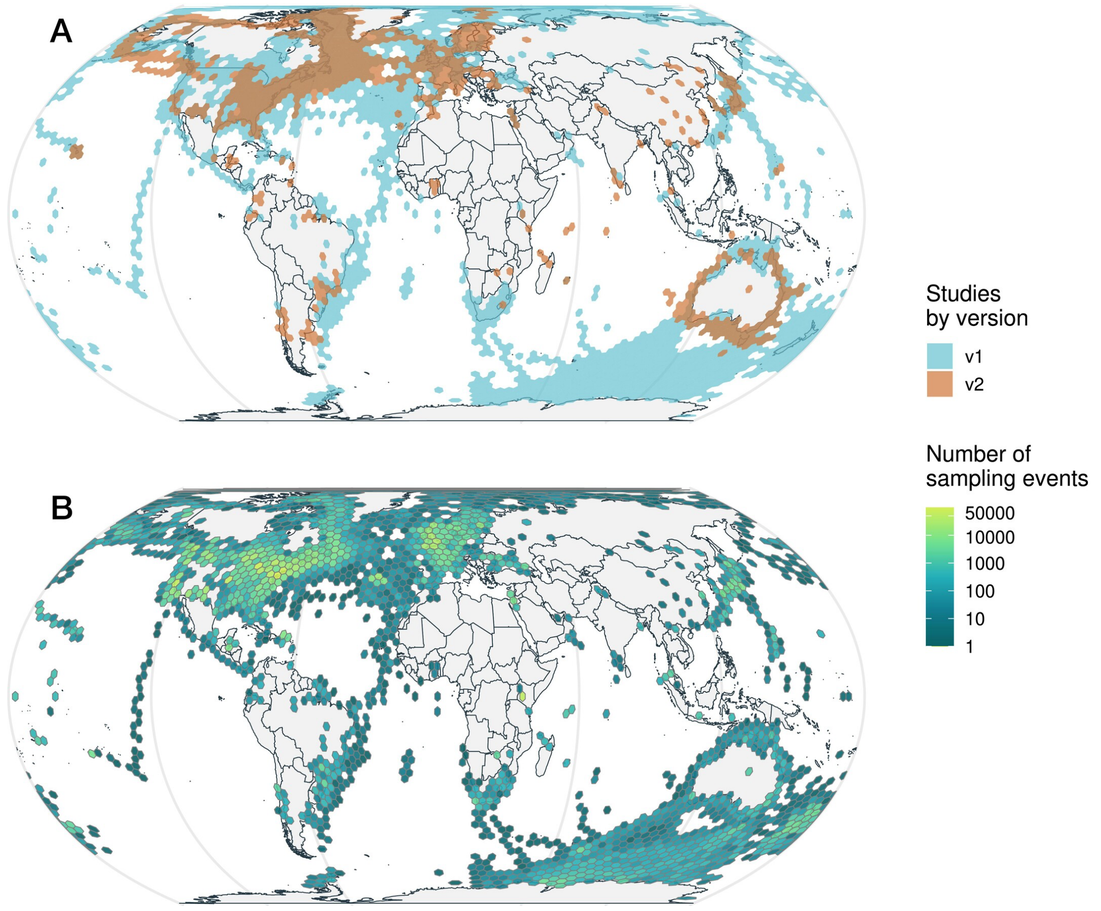
https://www.iucnredlist.org/

Data sources

3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level





BioTIME

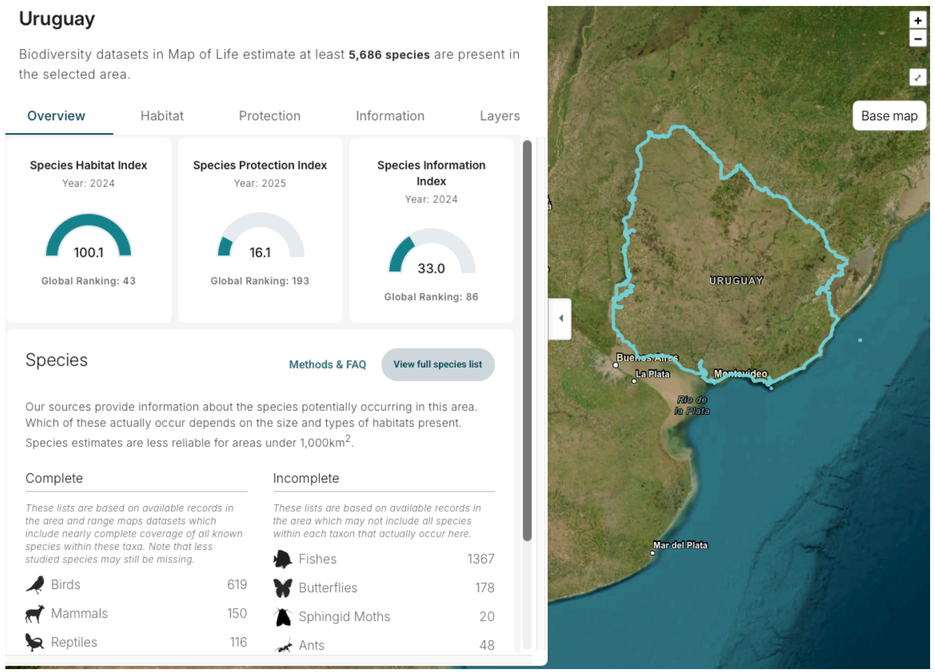
https://biotime.st-andrews.ac.uk/

Dornelas et al (2025) *Global Ecol Biogeogr* https://doi.org/10.1111/geb.70003

Data sources

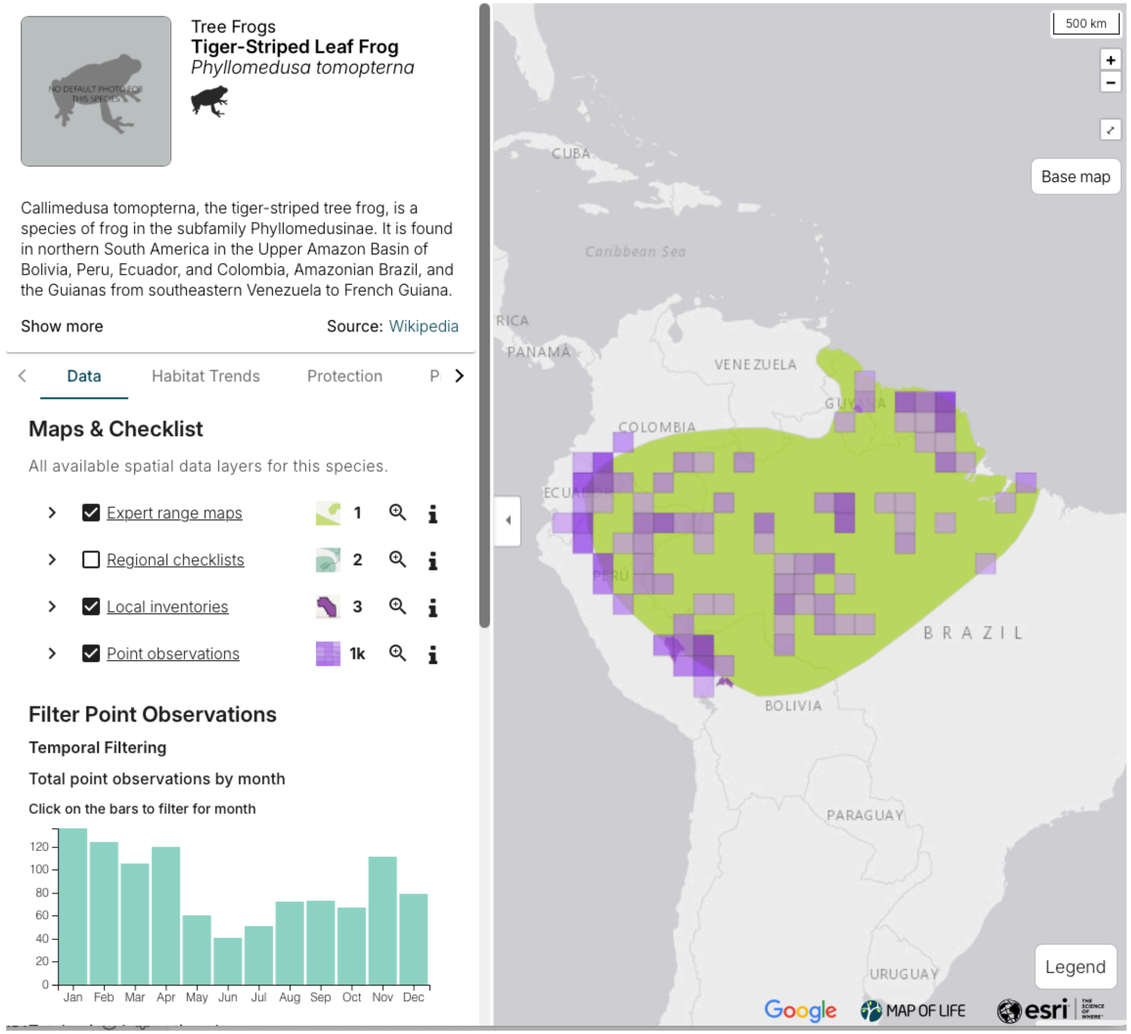
3. State

The present level of abundance, distribution or condition of biodiversity at a gene, species or ecosystem level



Map of Life

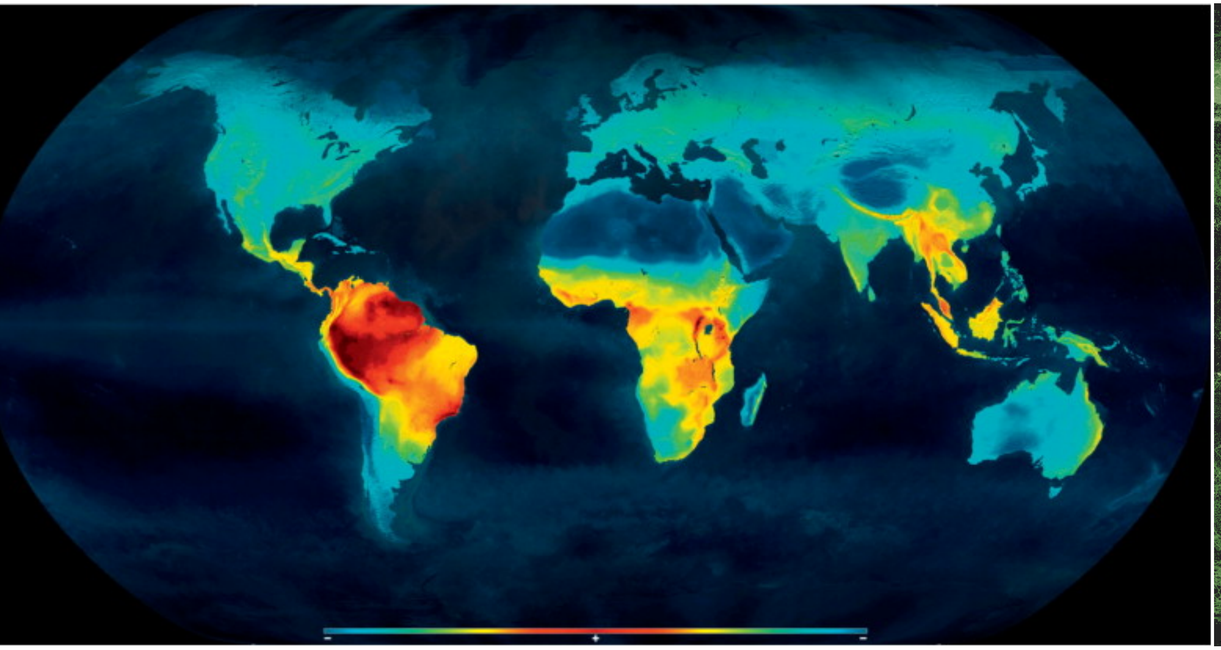
https://mol.org/



Biases in data

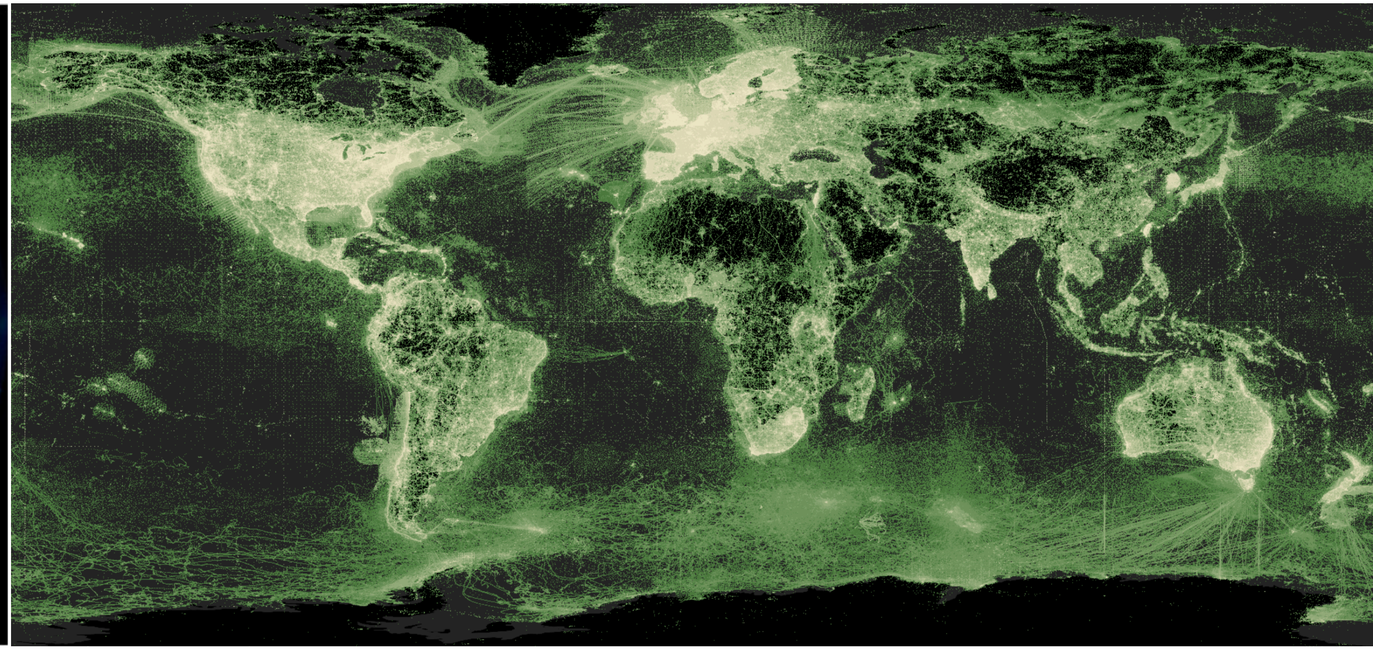
Knowledge shortfalls

BIODIVERSITY DISTRIBUTION



Mannion et al. (2014). *Trends in Ecology & Evolution*
https://doi.org/10.1016/j.tree.2013.09.012

BIODIVERSITY DATA



GBIF (2026) 30th October
https://www.gbif.org/

Biases in data

Knowledge shortfalls

TAXONOMIC REPRESENTATION



1,867,055 observations

1,553,138 birds (83.2%)



414,944 Tyrannidae, Thraupidae y Columbidae (26.7%)

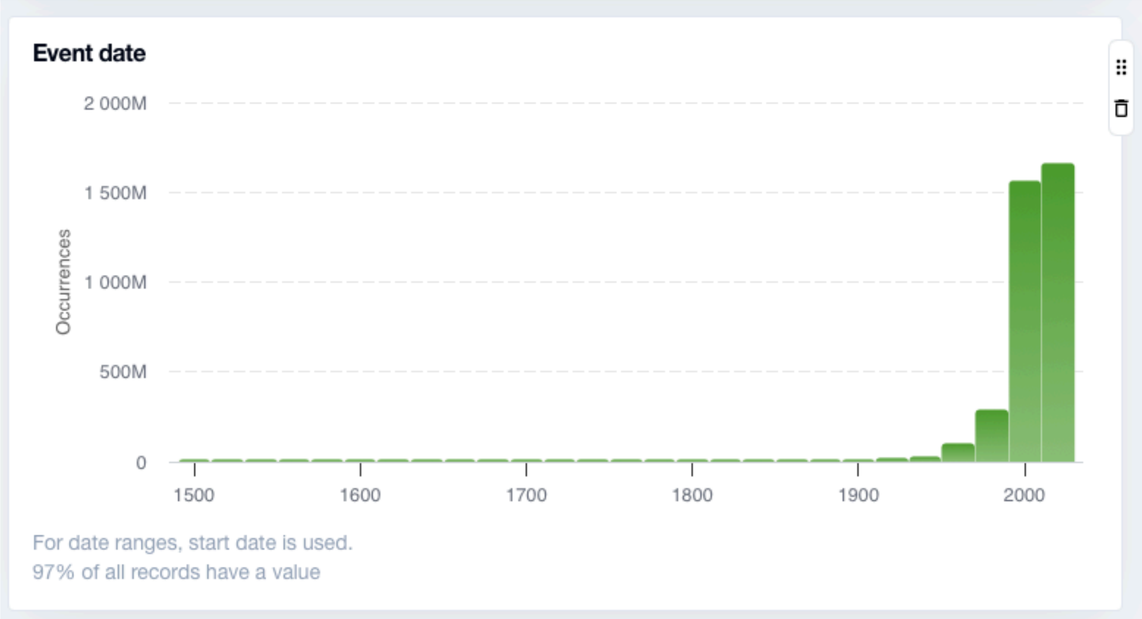
47,261 *Furnarius rufus*

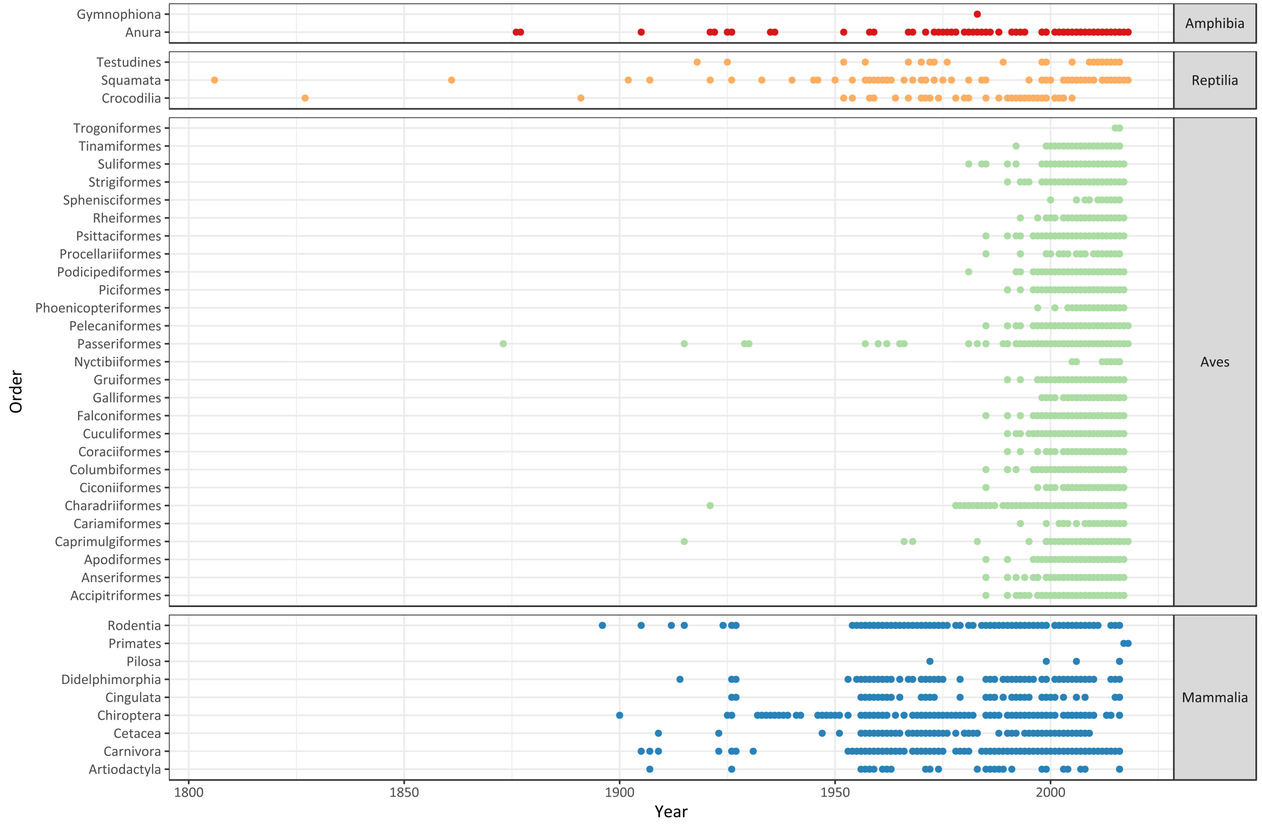
23,303 Amphibia + Reptilia + Mammalia

Biases in data

Knowledge shortfalls

TEMPORAL COVERAGE





GBIF (2026) 30th October
https://www.gbif.org/

Grattarola et al. (2019). *Biodiversity Data Journal*.
https://doi.org/10.3897/BDJ.7.e36226

Data sources

4. Responses

Recommendations on how to respond to drivers of biodiversity loss

1. How conservation interventions work

EXAMPLES

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

Data sources

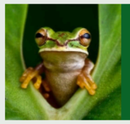
4. Responses

Conservation Evidence
Providing Evidence to Improve Practice

Recommendations on how to respond to drivers of biodiversity loss

Exclude domestic animals or wild hogs by fencing	Likely to be ineffective or harmful	5	
Add lime to water bodies to reduce acidification	Trade-off between benefit and harms	5	
Use antifungal skin bacteria or peptides to reduce chytridiomycosis infection	Unlikely to be beneficial	5	
Create ponds for amphibians	Beneficial	30	

Species


Amphibian Conservation
130 Actions


Bat Conservation
200 Actions


Bee Conservation
117 Actions


Biodiversity of Marine Artificial Structures
43 Actions

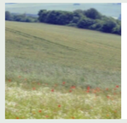

Bird Conservation
454 Actions


Butterfly and Moth Conservation
152 Actions


Control of Freshwater Invasive Species
161 Actions


Coral Conservation
75 Actions


Eel Conservation in Inland Habitats
128 Actions


Farmland Conservation
119 Actions


Fish Conservation in Inland Habitats
39 Actions


Management of Captive Animals
96 Actions


Marine and Freshwater Mammal Conservation
180 Actions


Marine Fish Conservation
120 Actions


Primate Conservation
162 Actions


Reptile Conservation
312 Actions


Subtidal Benthic Invertebrate Conservation
226 Actions


Terrestrial Mammal Conservation
294 Actions

https://www.conservationevidence.com/

Create ponds for amphibians

Overall effectiveness category
Beneficial

Number of studies: 30

Hide assessment score | How is the evidence assessed?

Effectiveness 80%

Certainty 80%

Harms 0%

Data sources

5. Benefits

Data on the benefits biodiversity and ecosystem services provide for people

1. Benefits of nature for people
2. Use of wild species by people

EXAMPLES

Kemp et al. (2026) *Annual Review of Environment and Resources*
https://doi.org/10.1146/annurev-environ-121224-084200

Data sources

5. Benefits

Species Use Database

Data on the benefits biodiversity and ecosystem services provide for people

Improving knowledge and understanding of how wild species are used, where they are used, if that use is sustainable or unsustainable, and what impacts that use is having

Contains	On	In
2277 records	549 species	116 countries

Species Use Database

https://speciesusedatabase.com/

Target species scientific name	Common name(s)	Broad taxonomic group(s)	Geographic location	IUCN Red List status	Purpose(s) of end use	Practice of use	Record considered ecologically sustainable / unsustainable	Publication date	Entered
Haliotis laevigata	Greenlip abalone	Other Animalia, Molluscs	Australia, Oceania	VU	Food and feed	Targeted fishing harvesting/exploiting or collecting wild aquatic resources	Yes, considered sustainable		Nov 2022
Octopus maya	Maya octopus	Other Animalia, Molluscs	Mexico, Northern America	LC	Food and feed	Targeted fishing harvesting/exploiting or collecting wild aquatic resources	Yes, considered sustainable		Dec 2022
Octopus vulgaris	Common Octopus, Polvo-comum	Other Animalia, Molluscs	Italy, Europe	LC	Food and feed	Targeted fishing harvesting/exploiting or collecting wild aquatic resources	Yes, considered unsustainable		Dec 2022
Octopus vulgaris	Common Octopus, Polvo-comum	Other Animalia, Molluscs	Greece, Europe	LC	Food and feed	Targeted fishing harvesting/exploiting or collecting wild aquatic resources	Yes, considered sustainable		Dec 2022

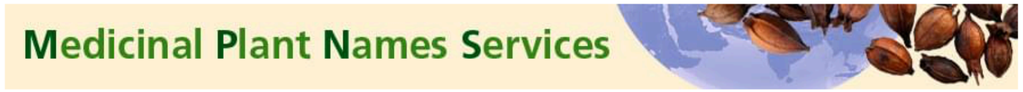
Data sources

5. Benefits

Data on the benefits biodiversity and ecosystem services provide for people

Medicinal Plant Names Services

https://mpns.science.kew.org/



Enter a plant name or herbal drug name:

Please enter a name to search the MPNS resource

Name type:

All names

Search

Using your search term MPNS found 5 plant(s) recorded as having medicinal use

Accepted scientific name of each plant	Frequency that plant appears in medicinal sources
Ilex paraguariensis A.St.-Hil.	35
Ilex paraguariensis var. paraguariensis	1
Ilex dumosa var. dumosa	0
Ilex paraguariensis var. sincorensis Loes.	0
Ilex paraguariensis var. vestita (Reissek) Loes.	0

These plants were selected because your search term "***Ilex paraguariensis***"...

is cited in 35 medicinal sources

containing 49 common or pharmaceutical names

containing 19 scientific names as used in medicinal sources

HOW

Data sources

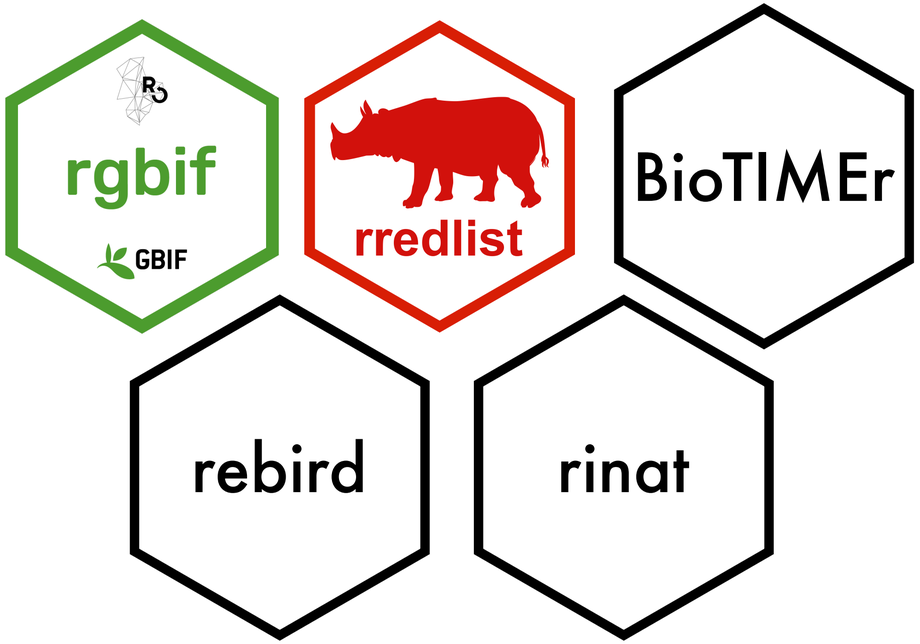
1. Data types
2. Data sources (drivers, pressures, state, response, and benefits)
3. Biases in the data

HOW

Tools

How to download data

R, Python



eBird

Historic Observations

Obtain a list of species reported on a specific date in a given region

```
ebirdhistorical(loc = 'US-VA-003', date = '2019-02-14',max = 10)
#> # A tibble: 10 × 13
#>    speciesCode comName  sciName locId locName obsDt howMany   lat   lng obsValid
#>    <chr>       <chr>    <chr>   <chr> <chr>   <chr>   <int> <dbl> <dbl> <lgl>
#>  1 cangoo      Canada … Branta… L139… Lickin… 2019…      30  38.1 -78.7 TRUE
#>  2 mallar3     Mallard  Anas p… L139… Lickin… 2019…       5  38.1 -78.7 TRUE
#>  3 gnwtea      Green-w… Anas c… L139… Lickin… 2019…       8  38.1 -78.7 TRUE
#>  4 killde      Killdeer Charad… L139… Lickin… 2019…       1  38.1 -78.7 TRUE
#>  5 baleag      Bald Ea… Haliae… L139… Lickin… 2019…       1  38.1 -78.7 TRUE
#>  6 belkin1     Belted … Megace… L139… Lickin… 2019…       1  38.1 -78.7 TRUE
#>  7 carwre      Carolin… Thryot… L139… Lickin… 2019…       1  38.1 -78.7 TRUE
#>  8 whtspa      White-t… Zonotr… L139… Lickin… 2019…       2  38.1 -78.7 TRUE
#>  9 norcar      Norther… Cardin… L139… Lickin… 2019…       1  38.1 -78.7 TRUE
#> 10 canvas      Canvasb… Aythya… L331… Montic… 2019…      19  38.0 -78.5 TRUE
#> # ℹ 3 more variables: obsReviewed <lgl>, locationPrivate <lgl>, subId <chr>
```

How to download data

GoogleEarthEngine

Earth Engine Data Catalog

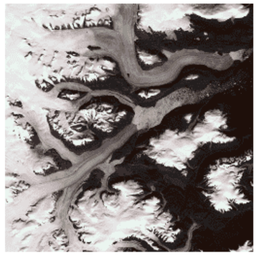
Page Summary

Earth Engine's public data catalog includes a variety of standard Earth science raster datasets. You can import these datasets into your script environment with a single click. You can also upload your own raster data or vector data for private use or sharing in your scripts.

Looking for another dataset not in Earth Engine yet? Let us know by suggesting a dataset.

Filter list of datasets

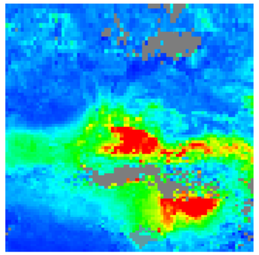
2000 Greenland Mosaic - Greenland Ice Mapping Project (GIMP)



This dataset provides a complete 15 m resolution image mosaic of the Greenland ice sheet derived from Landsat 7 ETM+ and RADARSAT-1 SAR imagery from the years 1999 to 2002. The methods include a combination of image cloud masking, pan sharpening, image sampling and resizing, ...

arctic · gimp · greenland · imagery · nasa · polar

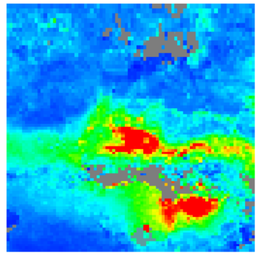
AERDB_D3_VIIRS_NOAA20.002: VIIRS/NOAA-20 Deep Blue Aerosol Optical Depth Daily L3



The Visible Infrared Imaging Radiometer Suite (VIIRS) Deep Blue Level-3 Daily Global 1-Degree Gridded product (AERDB_D3_VIIRS_NOAA20) provides daily global gridded aerosol parameters derived from the NOAA-20 (JPSS-1) VIIRS sensor. Data are generated using the Deep Blue (DB) algorithm over land and the Satellite Aerosol for ...

aerosol · aot · atmosphere · daily · nasa · noaa

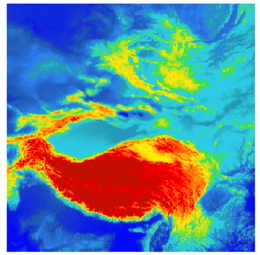
AERDB_D3_VIIRS_SNPP.002: VIIRS/SNPP Deep Blue Aerosol Optical Depth Daily L3 Global 1.0



The Visible Infrared Imaging Radiometer Suite (VIIRS) Deep Blue Level-3 Daily Global 1-Degree Gridded product (AERDB_D3_VIIRS_SNPP) provides daily global gridded aerosol parameters derived from the Suomi National Polar-orbiting Partnership (SNPP) VIIRS sensor. Data are generated using the Deep Blue (DB) algorithm over land and the ...

aerosol · aot · atmosphere · daily · nasa · noaa

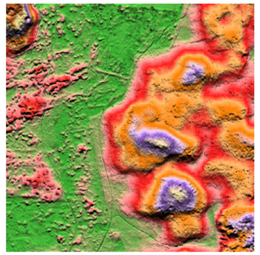
AG100: ASTER Global Emissivity Dataset 100-meter V003



The Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Emissivity Database (ASTER-GED) was developed by the National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory (JPL), California Institute of Technology. This product includes the mean emissivity and standard deviation for all 5 ASTER Thermal Infrared ...

aster · elevation · emissivity · geophysical · infrared · jpl

AHN Netherlands 0.5m DEM, Interpolated

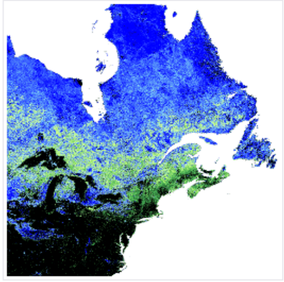


The AHN DEM is a 0.5m DEM covering the Netherlands. It was generated from LIDAR data taken in the spring between 2007 and 2012. It contains ground level samples with all other items above ground (such as buildings, bridges, trees etc.) removed. This version is ...

ahn · dem · elevation · elevation-topography · geophysical · lidar

MOD10A1.061 Terra Snow Cover Daily Global 500m

Page Summary



Dataset Availability
2000-02-24T00:00:00Z–2026-10-27T00:00:00Z

Dataset Producer
NASA NSIDC DAAC at CIRES

Earth Engine Snippet
`ee.ImageCollection("MODIS/061/MOD10A1")`

Cadence
1 Day

Tags
albedo · cryosphere · daily · geophysical · global · modis · nasa · nsidc · snow · terra · mod10a1

Description | Bands | Terms of Use | Citations | DOIs

The MOD10A1 V6.1 Snow Cover Daily Global 500m product contains snow cover, snow albedo, fractional snow cover, and quality assessment (QA) data. Snow cover data are based on a snow mapping algorithm that employs a Normalized Difference Snow Index (NDSI) and other criteria tests.

General documentation

Best practices for data use

Using APIs

- An **API** (Application Programming Interface) is a standardised way for programs to query a database and retrieve data on demand.

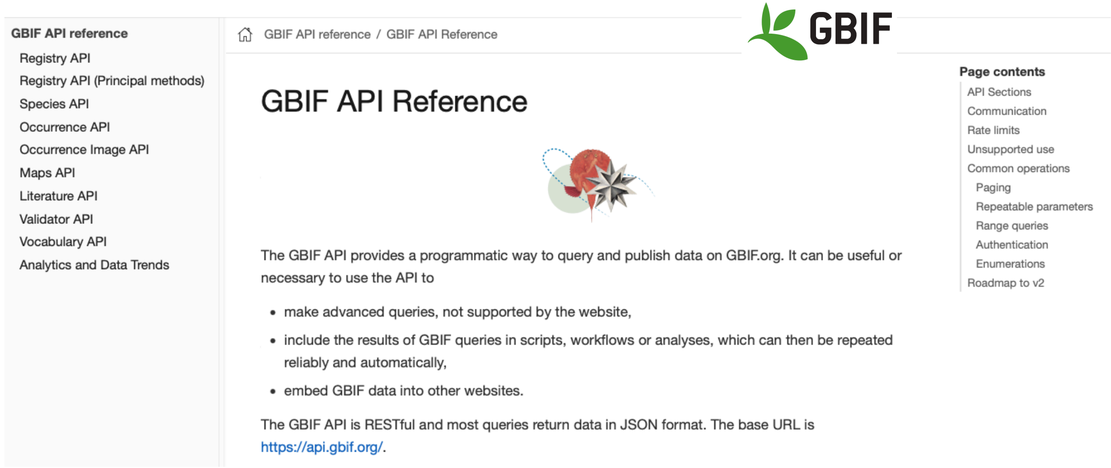
https://api.gbif.org/v1/occurrence/search?country=CZ

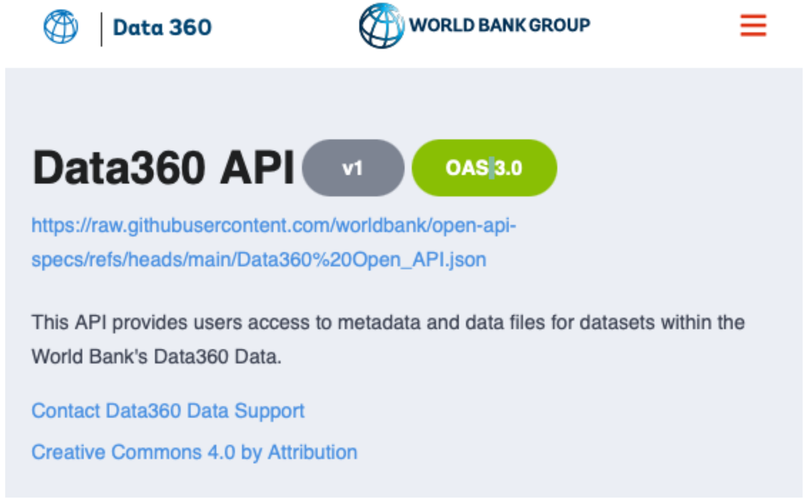
BASE URL RESOURCE ENDPOINT

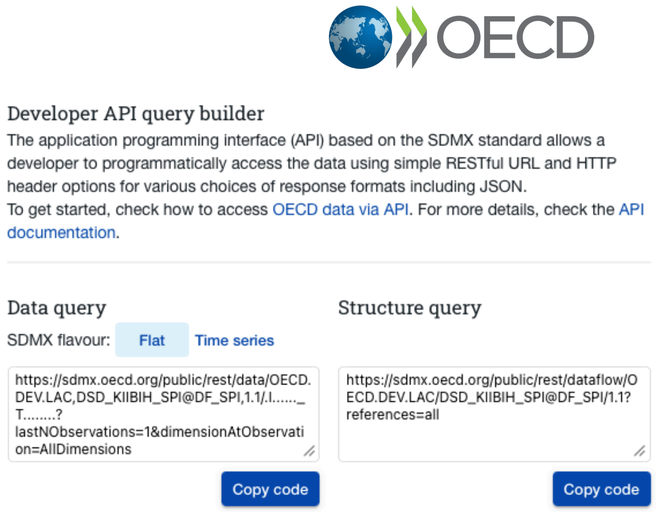
Best practices for data use

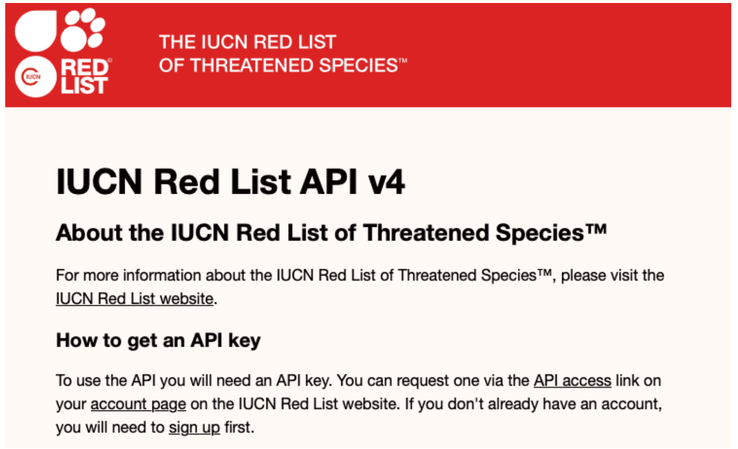
Using APIs

- Most databases have developed their own API to enable data access









Best practices for data use

Implications in the era of agentic AI

1. Declare how you use AI
2. Verify AI outputs
3. Log (document) what the agent did (record provenance and versions)
4. Don’t lose the attribution in the pipeline (credit data providers)

HOW

Tools

1. How to download data
2. Best practices for data use

WHY

Importance of open science

Three grounding premises

Importance

Purpose of science

1

- As scientistis, we are the people entrusted by society with the task of **expanding the knowledge available about the world we live in.**
- We do not work for ourselves, but for those who support our work.

Importance

“Everything is a remix”

2

- Science is a **cumulative process** that builds on previously discovered knowledge.
- We can do this because **knowledge** becomes accessible and we are able to access it (*knowledge commons*).

Kirby Ferguson (2015) Everything is a Remix.
https://archive.org/details/RemixRemasteredVimeo



Elinor Ostrom (1990) Governing the Commons: The Evolution of Institutions for Collective Action.
https://archive.org/details/governing-the-commons

Importance

Reform research assessment

3

It must not be left solely in the hands of researchers. **Top-down initiatives**:

- Reform the scientific **evaluation system** (research, researchers and research institutions).
- Implement **incentive** schemes for open (participatory) science.
- Provide **training** in open science and offer support.

Any doubts?

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