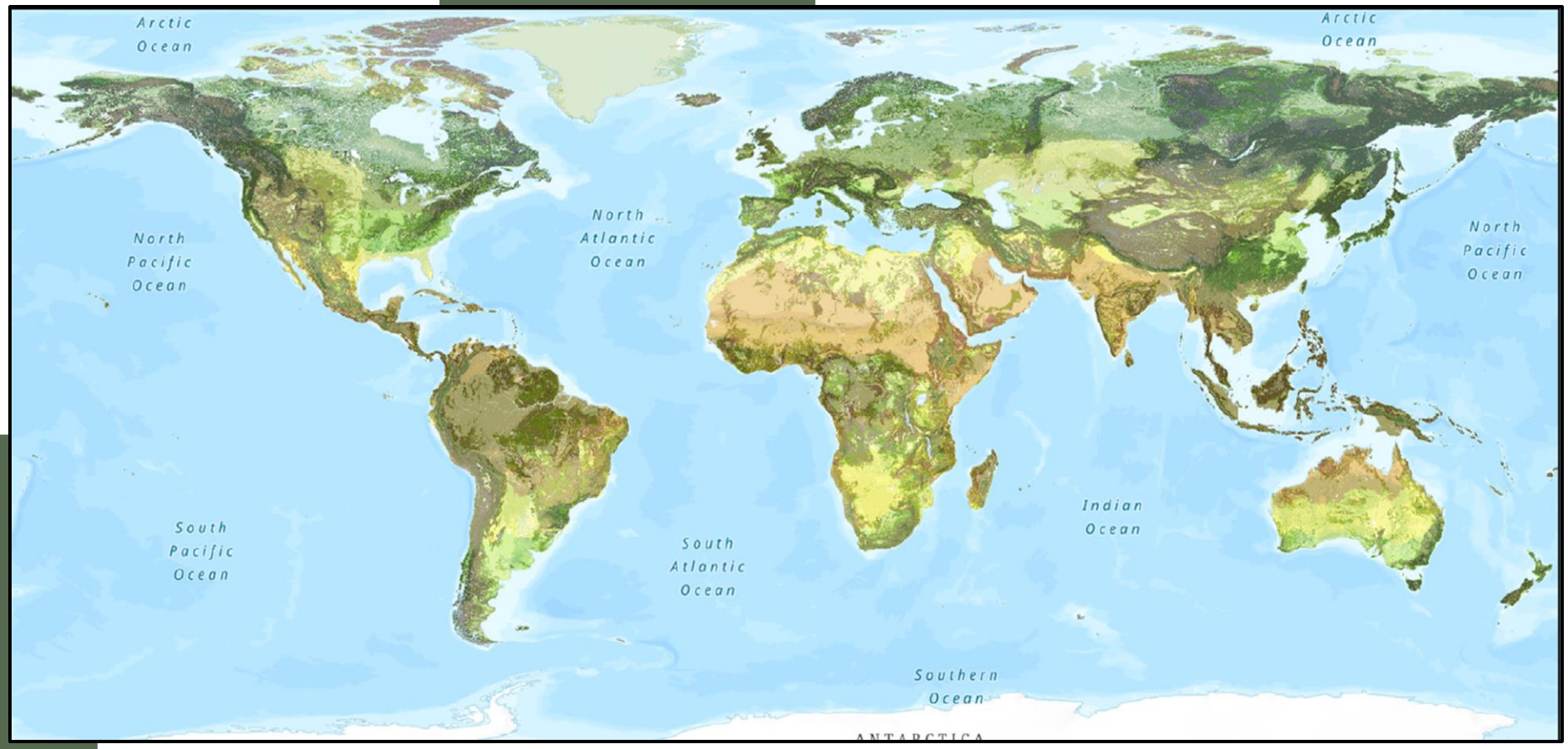
GROUP ON EARTH OBSERVATIONS

OPEN DATA & OPEN KNOWLEDGE Workshop

Open Ecosystems

Dr. Roger Sayre
U.S. Geological Survey
Geneva 16 JUN 2023



GROUP ON EARTH OBSERVATIONS

Outline

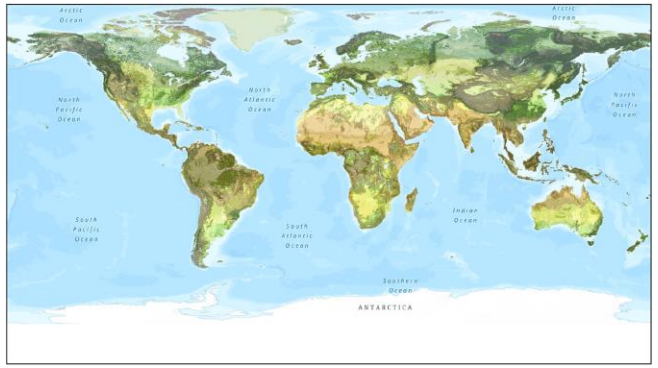
- GEO ECO Global Ecosystem Mapping
- GEO Knowledge Hub Resources
- The GEO Global Ecosystem Atlas – An Open Resource

GEO Ecosystems (GEO ECO) Global Ecosystems Mapping

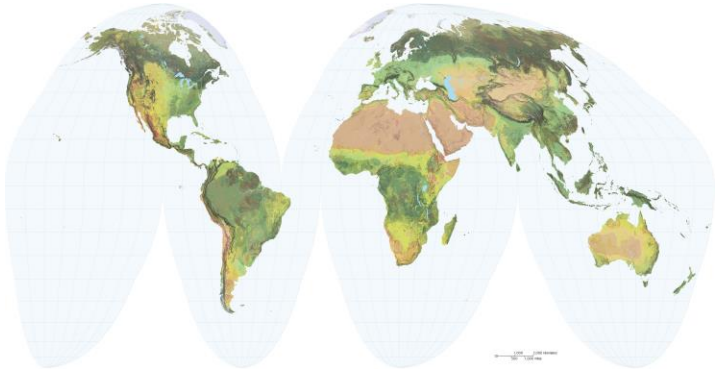
GROUP ON EARTH OBSERVATIONS

Develop standardized, robust, and practical global ecosystems classifications and maps for the planet's *terrestrial*, *freshwater* and *marine* ecosystems.

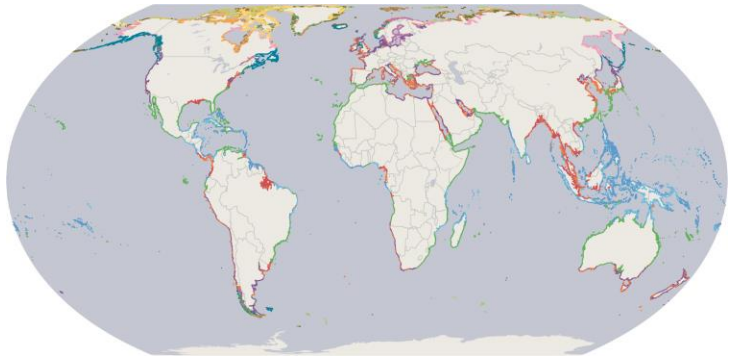
Lead: Roger Sayre (U.S. Geological Survey) Partners: Esri, The Nature Conservancy, Experts



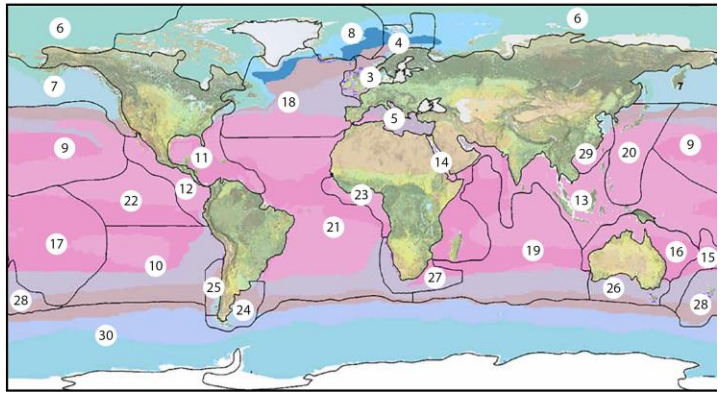
World Terrestrial Ecosystems (WTEs)



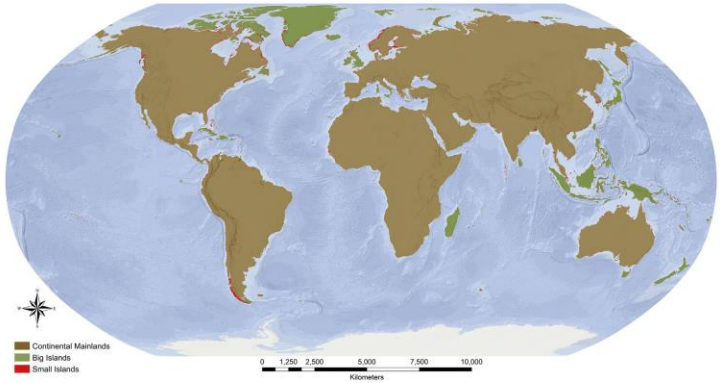
Ecological Land Units (ELUs)



Ecological Coastal Units (ECUs)



Ecological Marine Units (EMUs)



Global Islands

World Landforms (Plains, Hills, Mountains, Tablelands)

- Knowledge Package 7
- Dataset 4
- Software 3

GEO Work Programme Activities

- GEO Global Ecosystems (GEO-ECO) 28
- Global Network for Observations and Information in Mountain Environments (GEO-MOUNTAINS) 1

Target Audience

- Spatial ecologists 28
- Conservation Advocacy Community 15
- Oceanographers 8
- Islands Research Community 7
- Mountains Research Community 7
- Terrestrial Ecosystems Research Community 7
- Coastal Ecosystems Research Community 5
- Mountains Policy Community 4
- Conservation Policy Community 3
- Marine Ecosystems Research Community 3

Engagement Priorities

- (SDG) Goal 15 - Life on land 18
- (SDG) Goal 14 - Life below water 15
- (SDG) Goal 13 - Climate action 2
- Convention on Biological Diversity 1
- (SDG) Goal 11 - Sustainable cities and communities 1
- Sendai Framework 1

GEO-ECO | June 11, 2022 (v1) | Knowledge Package | Metadata-only

Ecological Marine Units (EMUs)

Sayre, Roger

The Ecological Marine Units (EMU) resource, produced by the U.S. Geological Survey and Esri, is a true 3D geospatial data layer that contains detailed attribute information on the essential environmental settings of volumetric regions in the ocean. A spatially explicit 3D point mesh model was constructed based on the spatial format and resolutio...

Uploaded on October 28, 2022

GEO-ECO | June 10, 2022 (v1) | Knowledge Package | Metadata-only

Global Islands

Sayre, Roger

The Global Islands resource, produced by the U.S. Geological Survey, Esri, and The World Conservation Monitoring Center, is a 30 m base resolution, Landsat-derived, island polygons datalayer. The islands were derived from a 30 m global shoreline vector (GSV) that was produced from a semi-automated interpretation of every 2014 Landsat scene that ...

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GEO-ECO | June 10, 2022 (v1) | Knowledge Package | Metadata-only

Global Mountains

Sayre, Roger

The Global Mountains resource is a 250m global raster data layer which identifies four classes of mountains: High Mountains, Low Mountains, Scattered High Mountains, and Scattered Low Mountains. The mountains data were extracted as a subset of the global Hammond Landforms data layer which was developed using a 250 m global digital elevation mode...

Uploaded on October 28, 2022

GEO-ECO | June 11, 2022 (v1) | Knowledge Package | Metadata-only

Ecological Land Units (ELUs)

Sayre, Roger

The Ecological Land Units (ELUs) resource, produced by the U.S. Geological Survey and Esri, is a 250 m global raster characterization of distinct terrestrial ecological settings. The ELUs are a combination of four inputs: climate region, landform, lithology, and land cover class. These inputs represent the primary abiotic and biotic elements of ...

Uploaded on October 28, 2022

GEO-ECO | June 12, 2022 (v1) | Knowledge Package | Metadata-only

Ecological Coastal Units (ECUs)

Sayre, Roger

The Ecological Coastal Units resource was produced by the U.S. Geological Survey and Esri in a collaboration with the Marine Biodiversity Observation Network (MBON) of the Group on Earth Observations Biodiversity Observation Network (GEO BON). A 30 m resolution global shoreline vector (GSV) that was produced from a semi-automated interpretation ...

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World Terrestrial Ecosystems

Sayre, Roger

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Published June 12, 2022 | Version v1

GEO-ECO | Knowledge Package | Metadata-only

World Terrestrial Ecosystems

Sayre, Roger[1]

Show affiliations

Citation

Style APA

Sayre, R. (2022). World Terrestrial Ecosystems. GEO Knowledge Hub. https://doi.org/10.60566/kbwg5-4dc85

Description

The World Terrestrial Ecosystems (WTEs) datalayer, produced by the U.S. Geological Survey, Esri, and The Nature Conservancy, is a new map and associated raster geospatial data of globally comprehensive, standardized, high resolution (250 m), and data-derived World Terrestrial Ecosystems. The WTEs are land areas with distinct combinations of climate regime, landforms, and vegetation/land cover assemblages. 431 ecosystems were mapped. The approach taken to map the WTEs was an ecosystem structure-based mapping approach, including both abiotic structural elements (climate and landforms), and biotic structural elements (vegetation assemblages). Data were obtained to understand the global distribution of terrestrial ecosystems that were identified and mapped using a standardized, data-derived process, and to assess their representation in global protected areas.

Elements of the Knowledge Package

Dataset	Publication	Software	Other
2 resources	3 resources	2 resources	0 resources

Search for a record

Esri Living Atlas Data: World Terrestrial Ecosystems

Esri; USGS; The Nature Conservancy;

Apr 1, 2020 | GEO-ECO | Dataset | Metadata-only

World Terrestrial Ecosystems - Public Domain Data

USGS; Esri; The Nature Conservancy;

2020 | GEO-ECO | Dataset | Open

Versions

Version v1 (Jun 12, 2022)

Any question ?

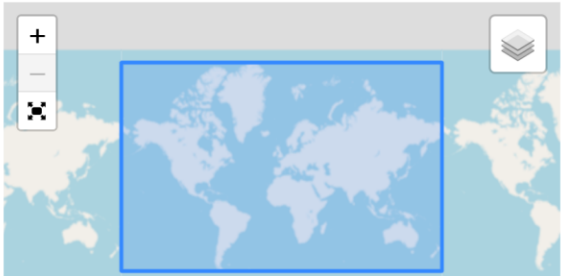
Ask the provider

Feedback space

Learn the community experience with this package

Engagement Priorities

Geographic Locations



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Search for a record

Mapping World Terrestrial Ecosystems - GIS and Cartographic Approaches

Sayre, Roger; Martin, Madeline; Karagulle, Deniz; Frye, Charlie; Boucher, Timothy; Wolffe, Nicholas;

2020 | GEO-ECO | Publication | Open

World Terrestrial Ecosystems

Sayre, Roger; Martin, Madeline; Karagulle, Deniz; Frye, Chris; Breyer, Sean; Wright, Dawn; Butler, Kevin; VanGraafeiland, Keith; Boucher, Timothy; McGowan, Jennifer;

Jan 1, 2020 | GEO-ECO | Book section | Metadata-only

An assessment of the representation of ecosystems in global protected areas using new maps of World Climate Regions and World Ecosystems

Sayre, Roger; Karagulle, Deniz; Frye, Charlie; Boucher, Timothy; Wolff, Nicholas H.; Breyer, Sean; Wright, Dawn; Martin, Madeline; Butler, Kevin; Van Graafeiland, Keith; Touval, Jerry; Sotomayor, Leonardo; McGowan, Jennifer; Game, Edward T; Possingham, Hugh;

Mar 2020 | GEO-ECO | Journal article | Open

Versions

Version v1 (Jun 12, 2022)

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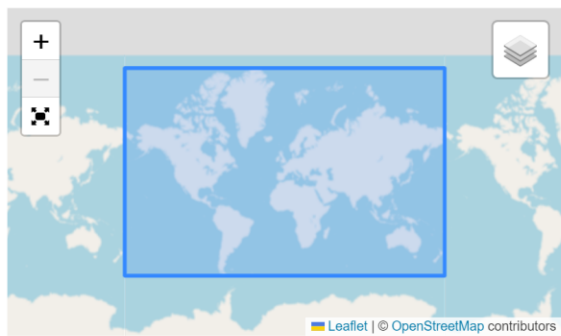

Target audiences, engagement priorities and subjects

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Global Ecology and Conservation 21 (2020) e00860

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: http://www.elsevier.com/locate/gecco

Original Research Article

An assessment of the representation of ecosystems in global protected areas using new maps of World Climate Regions and World Ecosystems

Roger Sayre [a, *], Deniz Karagulle [b], Charlie Frye [b], Timothy Boucher [c], Nicholas H. Wolff [d], Sean Breyer [b], Dawn Wright [b], Madeline Martin [a], Kevin Butler [b], Keith Van Graafeiland [e], Jerry Touval [c], Leonardo Sotomayor [f], Jennifer McGowan [c], Edward T. Game [g], Hugh Possingham [g]

[a] U.S. Geological Survey, 516 National Center, Reston, VA, 20192, USA
[b] Esri, 380 New York Street, Redlands, CA, 92373, USA
[c] The Nature Conservancy, 4245 Fairfax Drive, Arlington, VA, 22203, USA
[d] The Nature Conservancy, 14 Maine Street, New Brunswick, ME, 04011, USA
[e] Esri, 8619 Westwood Center Drive, Vienna, VA, 22182, USA
[f] The Nature Conservancy, Avenida de los Shyris E9-38 y Bélgica, Edificio Shyris Century Oficina 2D, Quito, Ecuador
[g] The Nature Conservancy, University of Queensland, St. Lucia, QLD, 4072, Australia

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Sayre, Roger; Karagulle, Deniz; Frye, Charlie; Boucher, Timothy; Wolff, Nicholas H.; Breyer, Sean; Wright, Dawn; Martin, Madeline; Butler, Kevin; Van Graafeiland, Keith; Touval, Jerry; Sotomayor, Leonardo; McGowan, Jennifer; Game, Edward T; Possingham, Hugh;

Mar 2020 | GEO-ECO | Journal article | Open

Leaflet | © OpenStreetMap contributors

Anchor Paper

Data Description

Location of Data

Reproducible Methodology

Published June 12, 2022 | Version v1

GEO-ECO | Knowledge Package | Metadata-only

World Terrestrial Ecosystems

Sayre, Roger[1]

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Elements of the Knowledge Package

Dataset	Publication	Software	Other
2 resources	3 resources	2 resources	0 resources

Search for a record

StoryMap: World Climate Regions

Karagulle, Deniz;

2020 | GEO-ECO | Web Portal | Metadata-only

StoryMap: World Terrestrial Ecosystems

Karagulle, Deniz;

2021 | GEO-ECO | Web Portal | Metadata-only

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Versions

Version v1 (Jun 12, 2022)

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Geographic Locations

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Published June 10, 2022 | Version v1

GEO-ECO | Knowledge Package | Metadata-only

Global Mountains

Sayre, Roger[1]

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Sayre, R. (2022). Global Mountains. GEO Knowledge Hub. https://doi.org/10.60566/9r50z-brw15

Description

The Global Mountains resource is a 250m global raster data layer which identifies four classes of mountains: High Mountains, Low Mountains, Scattered High Mountains, and Scattered Low Mountains. The mountains data were extracted as a subset of the global Hammond Landforms data layer which was developed using a 250 m global digital elevation model (DEM) and feature-based extraction algorithms using raster processing and variable neighborhood analysis window (NAW) sizes. Of the 16 Hammond Landforms that were mapped, four were mountain classes. E. H. Hammond was a pioneer of landform mapping and identified three parameters for distinguishing different types of plains, hills, mountains, and tablelands: 1) slope, 2) relative relief, and 3) profile, where the profile parameter assesses the amount of relatively flat terrain in upland locations to delineate tablelands. The global mountains layer produced from the Hammond landforms analysis is called the K3 mountains layer, and joins two other widely recognized global mountain extent data layers which are called K1 and K2. The use of the K1, K2, and K3 labels stems from the fact that the last name of the primary developer of these resources happens to begin with the letter K (i.e. Kapos, for K1; Koerner, for K2; and Karagulle, for K3). In addition to the data, the Global Mountains GEO Knowledge Hub also contains other knowledge products (publications, online explorer tools, etc.) related to the Global Mountains resource.

Elements of the Knowledge Package

Dataset	Publication	Software	Other
2 resources	3 resources	1 resources	0 resources

Search for a record

Online Explorer Tool: The Global Mountain Explorer 2.0

Sayre, Roger; Cress, Jill;

2021 | GEO-ECO | Web Portal | Metadata-only

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Versions

Version v1 (Jun 10, 2022)

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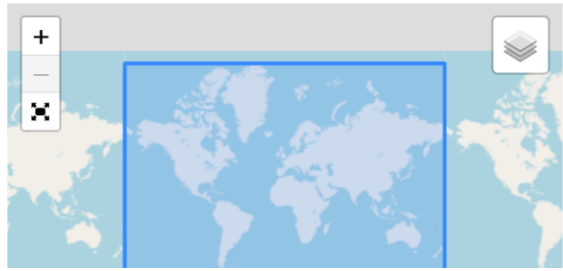

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Online Explorer Tool: The Global Mountain Explorer 2.0

Sayre, Roger; Cress, Jill;

2021 | GEO-ECO | Web Portal | Metadata-only

Page size: 3

What People Want

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- Data
- Maps
- Publications
- Online Explorer Tools
- StoryMaps
- Models and Workflows

GEO Knowledge Hub

Global Ecosystems Atlas

Co-developing an open online resource with explorable interface to monitor and report on ecosystem type distributions and changes in ecosystem extent, with the goal of prompting urgent action to protect biodiversity and inform nature-based solutions to fight climate change.

GEO GROUP ON EARTH OBSERVATIONS

Convention on Biological Diversity

United Nations Convention to Combat Desertification

Ramsar Convention on Wetlands

United Nations Framework Convention on Climate Change

Resilience Frontiers

Components - Global Ecosystem Atlas

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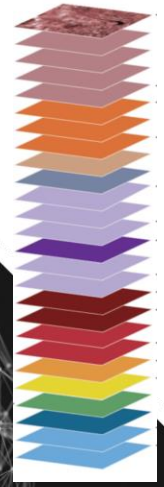
A Multiple, Fully Tessellated Ecosystems (Wall-to-Wall)

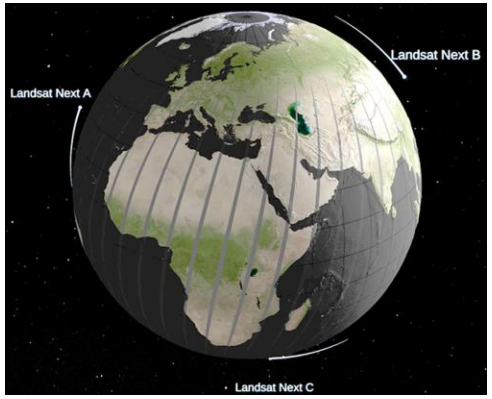
1 Terrestrial

a Global

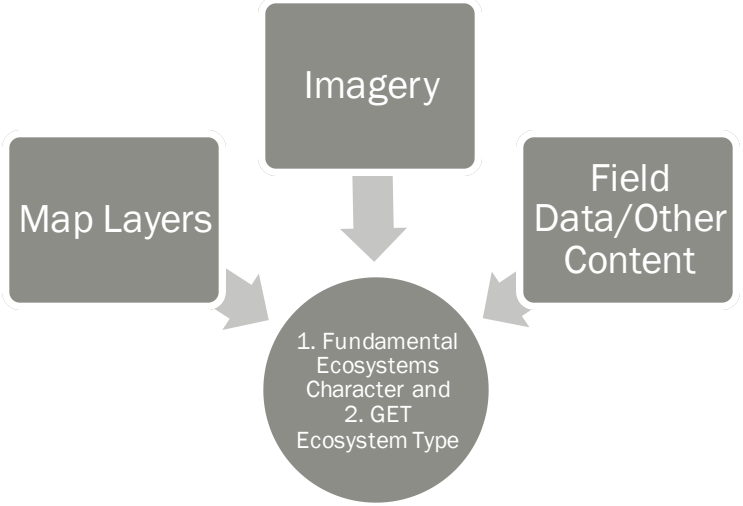
- Global Ecosystem Typology (IUCN) (to be developed) (various hierarchical levels as available
- Global Land Cover (ESA CCI) timeseries (2000 – 2023)
- World Terrestrial Ecosystems (USGS/Esri/The Nature Conservancy) 2020
- World Terrestrial Ecosystems (USGS/Esri/The Nature Conservancy) 2050
- World Vegetation Formations (NatureServe)
- Global Ecological Land Units (USGS/Esri)
- Global Agro-Ecological Zones (FAO)
- Global Map of Terrestrial Habitats (IUCN)
- Terrestrial Ecoregions (WWF)
- Ecoregions of the Continents (Bailey)
- Floristic Regions (Takhtajan)
- Biogeographical Provinces and Realms (Udvardy)



GIS Data



Time Series Imagery



AI/ML

GEO GLOBAL ECOSYSTEMS ATLAS

GIS Platform

Conclusions

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- **OEOA Challenges and Opportunities**

  *1 Open data concept is straightforward (simple format conversions) but open applications are more complicated.

  *2 Metadata development is burdensome.

  *3 ‘Making everything open’ is challenging when working with corporate sector, yet the benefits from public/private partnerships are undeniable. Many people use COTS technologies.

- **GEO Knowledge Hub**

  Phenomenal resource, ‘pointer of choice’.

- **GEO Global Ecosystems Atlas**

  The Atlas will be an open resource.

Thank you!

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CONTACT DETAILS

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Land Change Science Program
U.S. Geological Survey

rsayre@usgs.gov