Session 3a: Spatial units

A reference classification for ecosystem types

Sjoerd Schenau

Aim of the session

To discuss the options for the ecosystem type classification

1. IUCN Red List of Ecosystems
2. USGS/Esri GDBBS
3. A two-tier approach building upon and linking IUCN RLE and USGS/Esri GDBBS

Outline of this session

A) Presentations explaining in more detail the options.

- Sjoerd Schenau: short introduction on set up and aim of the session (5 minutes)
- Patrick Bogaart : ecological theory (5 minutes)
- Emily Nickolson: option 1 (20 minutes)
- Roger Sayre : option 2 (20 minutes)
- Patrick Bogaart : option 3 (20 minutes)

B) Break out discussions (40 minutes) in 4 smaller groups focusing of 4 key questions

C) Reporting back (15 minutes)

Key questions for discussion

1. What are the requirements for the reference ET classification from an *ecological* **point of view**, i.e. how much ecological detail (e.g. structure, functioning) is needed in the classification? How do you evaluate the presented classification options with this in mind?

2. What are the requirements for the reference ET classification from a *practical* **point of view**? Considering (1) *mappability*, given biophysical data (un)availability, and (2) *assessment of ecosystem condition and the flow of ecosystem services*. How do you evaluate the presented classification options with this in mind?

3. How should the SEEA-EEA reference ET classification **relate to existing national and international classifications of ecosystems**, habitats, land cover etc. ?

4. What are your recommendations for further **refining and testing** of presented options?
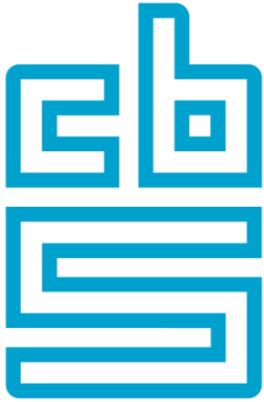
SEEA-EEA WG1 on Spatial Units

Ecological theory

Patrick Bogaart and WG1 members

SEEA-EEA Forum of Experts 2019

CBD Ecosystem definition

"[A] dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (CBD)
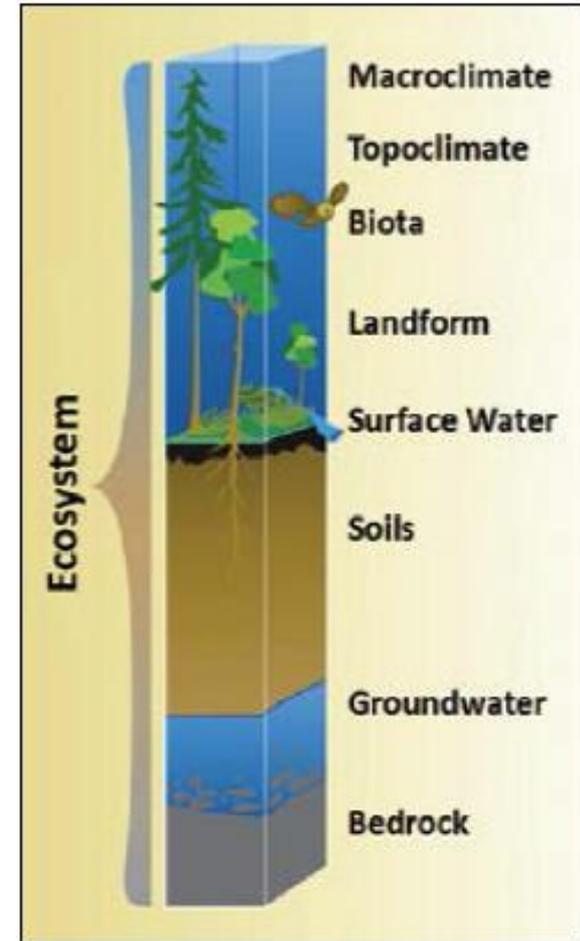
Related concepts: *Earth's Critical Zone*

"the heterogeneous, near-surface environment in which complex interactions involving rock, soil, water, air, and living organisms regulate the natural habitat and determine the availability of life-sustaining resources" (NRC, 2001)

Issue: should (for SEEA-EEA purposes) the concept of ecosystems be extended towards geo-ecosystems to allow for abiotic services and conditions?
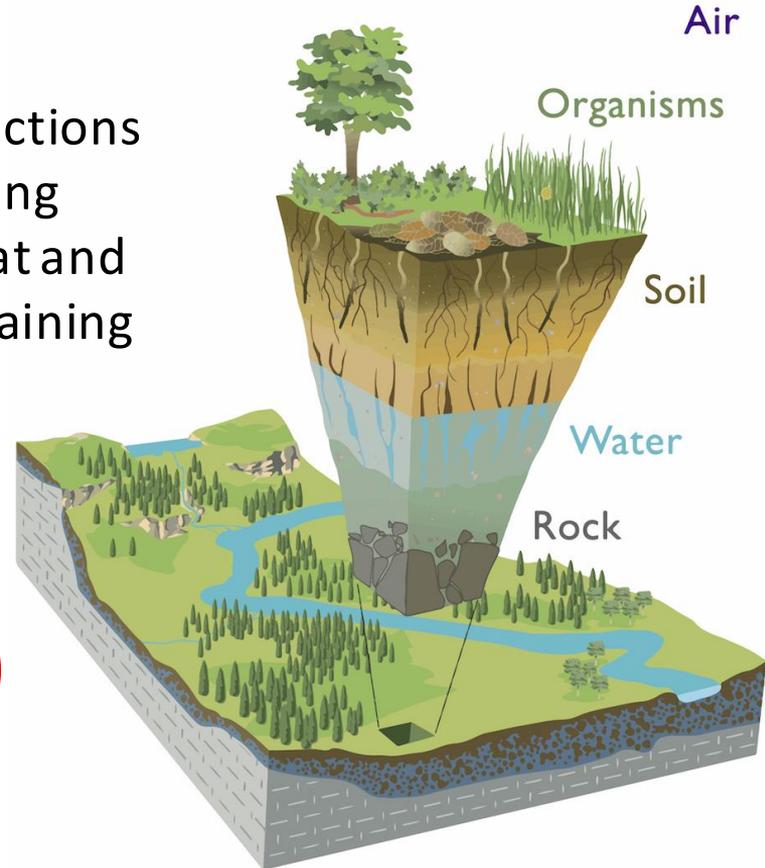
Air

Organisms

Soil

Water

Rock

"A dynamic complex of **plant**, animal and micro-organism communities and their non-living environment interacting as a functional unit"

Vegetation…

- is the most recognizable component and an important functional property of many ecosystems.

- plays a key role in many ecosystem services

- Is described by species-independent plant functional traits, e.g.

  – Growth form (trees, shrubs, herbs, grass, etc); canopy architecture

  – Leaf type and phenology (broadleaved, needleleaved, deciduous)

  – Adaptations (phreatophytes, halophytes, xerophytes)

"A dynamic complex of plant, animal and micro-organism communities and their **non-living environment** interacting as a functional unit"

- Climate
  - Temperature
  - Precipitation
  - Seasonality/phase
- Geomorphology
  - Elevation, landform
  - Slope, Aspect
  - Curvature

- Substrate
  - Lithology
    - Type: igneous, sedimentary
    - Chemical: acidic, mafic
  - Soils
    - Texture
    - Water retention
    - CEC etc

"A dynamic complex of plant, animal and micro-organism communities and their non-living environment **interacting as a functional unit**"

- **Abiotics ⟹ biotics**
  - Supply of resources
    - Energy
    - Water
    - Nutrients
  - Selection pressures
    - Adaptations
    - Niche differentiation
    - Biodiversity

- **Biotics ⟹ abiotics**
  - Ecosystem engineering
    - e.g. soil water retention
  - Carbon sequestration
  - Climate regulation
    - e.g. precipitation recycling

- **Disturbance regime feedbacks**
  - Fires, floods

Scales, hierarchy, pattern formation

- Biosphere
- Biomes
- Ecosystem complexes
- Ecosystems
- Communities
- Species
- Populations
- Individuals
- Genes

- Hierarchy of structure:
  - patterns in higher levels are reflected in the lower levels
    - *(e.g. climate reflected in soils or vegetation)*

- Hierarchy of processes:
  - higher level attributes control self-organization at lower levels
    - *e.g. Climate and lithology control drainage network formation*

Design criteria

1. The classification typology should **represent ecosystems**
2. The classification units can be **spatially delineated**
3. The classification units are **geographically and conceptually exhaustive**, and **comprehensive** across all environmental domains
4. The classification types are **mutually exclusive**, both conceptually and geographically.
5. The classification should be **practicable**
6. The classification should be **linkable** to other established classification systems

Review of existing classification schemes

	IUCN ET	USGS/Esri	MAES / Eosystems types for Europe	IUCN habitat	EUNIS habitat	WWF Biomes	FAO LCCS	Corine (CLC) level 2	GLC2000
1) Ecological base	ecosystems	Biophysical Settings	ecosystems	habitat	habitat	Biomes	Land cover	Land cover	Land cover
2) Spatial delineation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3) Domain comprehensive and exhaustive	Yes	Yes	Yes?[1]	Yes	Yes?[1]	No	Focus on land	No detail for marine	Focus on land
4) Mutally exclusive classes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes	Yes
5) Practical	Yes	Yes	Yes	?	Yes	?	Yes	Yes	?
6) Linkable to other classifciations	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes	Yes
Number of levels in hierarchy	6	variable	2 or 3	2	3	2	variable	3	2

1 As these are European classification schemes, it is not clear whether they are comprehensive and exhaustive on a global scale