

EO 4 Ecosystem Accounting 2022



Mapping Ecosystems for Ecosystem Accounting using EO Data

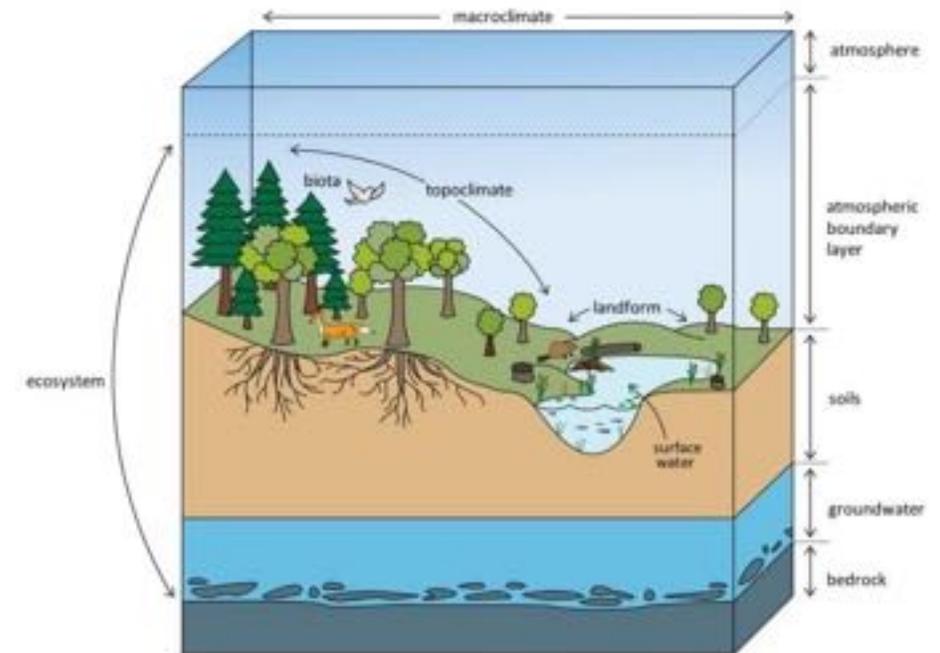
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December 1, 2022



- Ecosystems in the SEEA EA
- Three approaches for mapping and accounting for ecosystems
 1. Mapping ecosystems with a single characteristic: land cover
 2. Mapping ecosystems with multiple characteristics: land cover, climate, landform and soils
 3. Mapping ecosystems comprehensively considering interactions and dynamics: IUCN Global Ecosystem Typology
- EO challenges, opportunities and recommendations

- An ecosystem is “a ***dynamic*** complex of plant, animal and micro-organism communities and their non-living environment ***interacting*** as a ***functional unit***”.
- This definition requires data and integration of multiple characteristics in delineating ecosystem extent.
- **Measuring change over time** is a main objective of ecosystem accounting.
- SEEA EA recommends:
 - 1) Using existing national maps and data to generate ecosystem maps.
 - 2) Using the single-characteristic of land cover to start.

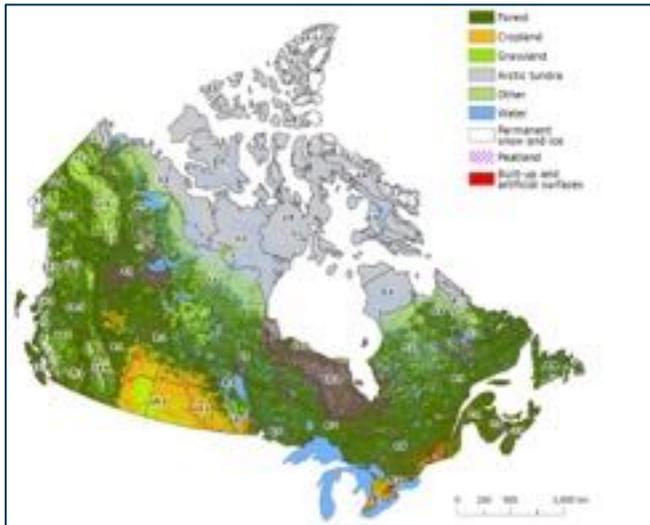


Source: System of Environmental-Economic Accounting: Ecosystem Accounting, [seea_ea_white_cover_final.pdf \(un.org\)](#) (adapted from Bailey et al., 1996).

Three approaches for mapping and accounting for ecosystems

1. Single characteristic: Land cover as a proxy for ecosystems

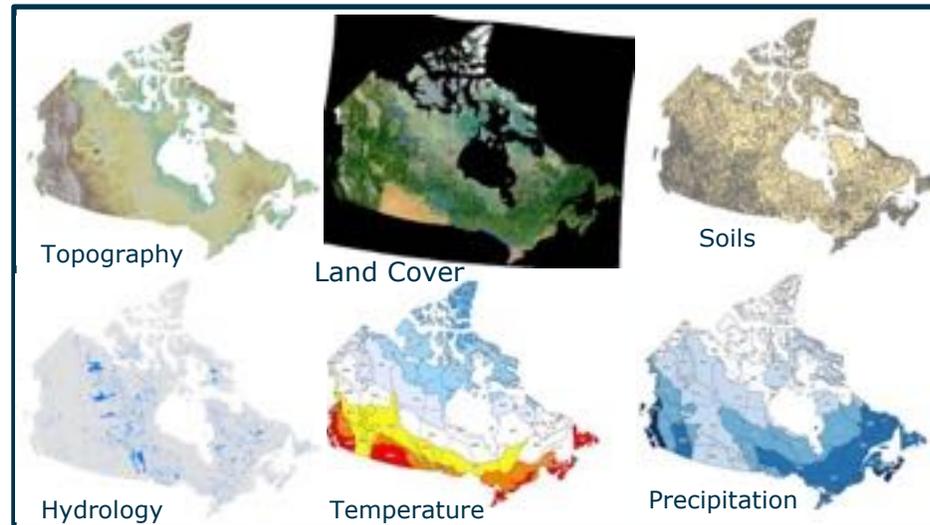
- Statistics Canada uses EO-derived land cover data to map ecosystems.



Source: Human Activity and the Environment 2021: Accounting for Ecosystem Change in Canada, [Accounting for ecosystem change in Canada \(statcan.gc.ca\)](https://www.statcan.gc.ca)

2. Multi-characteristic: Main ecosystem characteristics

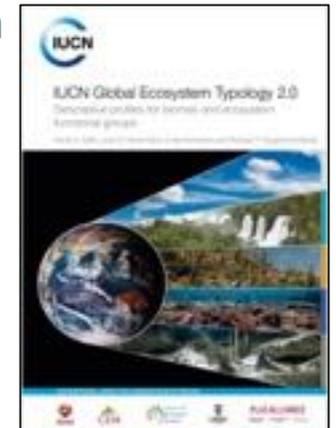
- Integrating multiple characteristics using national datasets.
- Can be used for mapping a 'statistical' extent, understanding potential change, and to bridge gaps between approaches (e.g., for mapping to IUCN GET).
- Approach used by the World Ecosystems (USGS/Esri), ARIES and others.



National-level data on various foundational characteristics

3. Comprehensive: Broadest set of ecosystem considerations (IUCN GET)

- A global typology based on ecosystem function and ecological processes.
- SEEA EA recommended reference classification
- Canadian ecological land classification uses similar approach



Some benefits and limitations of each approach in the context of ecosystem accounting

1. Land Cover

Benefits	Limitations
Useful proxy since influenced by other characteristics (e.g., climate, landform, etc.)	Simplistic representation of ecosystems
Practical (due to data availability)	Does not meet SEEA EA definition
	Will not capture ecosystem change other than land cover

2. Multi-characteristic

Benefits	Limitations
Data-driven	Does not include all ecosystem characteristics
Standardized	More data and processing intensive than land cover
Replicable	

3. Comprehensive(e.g., IUCN GET)

Benefits	Limitations
Incorporates ecosystem function and ecological processes	Lack of standardized criteria for implementing
Globally consistent	Lack of existing maps showing spatial distribution
	Challenges in measuring change
	Labour-intensive since expert-driven

		Ecosystem representation		
		Single characteristic	Multi-characteristic	Comprehensive
Characteristic	Land cover	✓	✓	✓
	Climate		✓	✓
	Topography		✓	✓
	Soils		✓	✓
	Biotic interactions			✓
	Disturbance regimes			✓
	Resources			✓
	Human activity			✓

Example: *Boreal and temperate high montane forests and woodlands*

- How do we consistently classify ecosystems such as this one?
- Need more mature criteria and standards for classifying characteristics such as temperate, lowland, montane, alpine, wet, etc.
 - e.g., IPCC definition of "Boreal" as Mean Annual Temperature < 0 °C, each Mean Monthly Temperature not < 10 °C.

Challenges

- Representing complexity of ecosystems in efficient and meaningful ways to generate ecosystem accounts; identifying measures to track the accuracy of change in both space and time
- Measuring real ecosystem extent change using any of the three approaches
- Developing standardized criteria for classifying ecosystem characteristics

Opportunities

- Develop a multi-characteristic model to complement the single characteristic and comprehensive approaches to mapping ecosystems
- Leverage widespread, consistent coverage and time series of EO data (e.g., EO-derived land cover)

Recommendations

- Improve quality of measures of change over time
- Explore integrating different types of EO data as well as EO-based indices, such as leaf area index (LAI), NDVI and land cover to improve measuring extent and monitoring ecosystem change

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Thank you!

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