



System of  
Environmental  
Economic  
Accounting

# Online Course on SEEA Experimental Ecosystem Accounting

2. Spatial units

3. Ecosystem extent account

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Statistics Canada



# Introduction

- Purpose of the online training
  - > To help participants acquire knowledge and skills to deepen their understanding of the accounting principles and basic data needs for compiling ecosystem accounts and valuing ecosystem services based on the SEEA Experimental Ecosystem Accounting (SEEA EEA)
  - > To become acquainted with the various biophysical modeling tools and global data resources;
- Components of the online training
  - > Self-paced online training modules
  - > Live webinars

# Self-paced online training module

- Consisted of 8 modules
  - i. Module 1: Key concepts
  - ii. Module 2: Spatial units
  - iii. Module 3: Ecosystem extent
  - iv. Module 4: Ecosystem condition
  - v. Module 5: Ecosystem services
  - vi. Module 6: Carbon accounting
  - vii. Module 7: Water accounting
  - viii. Module 8: Biodiversity accounting
- Available in English and Spanish
- Accessed through the e-Learning Platform of the United Nations Statistics Division (<https://elearning-cms.unstats.un.org/>)



# Live webinar schedule

	Topic	Date	Presenter
1	General introduction to SEEA and ecosystem accounting	18 September	Julian Chow, UNSD
2	Spatial units and ecosystem extent account	25 September	Statistics Canada
3	Ecosystem condition account	2 October	Joachim Maes, EU JRC
4	Ecosystem services	12 October	Lars Hein, Wageningen University
5	Valuation	16 October	Rocky Harris, UK DEFRA
6	Ecosystem accounts in the Netherlands	23 October	Sjoerd Schenau, Statistics Netherlands
7	Modelling techniques	30 October	Bethanna Jackson, University of Wellington
8	Policy aspects of ecosystem accounting	6 November	UN Environment



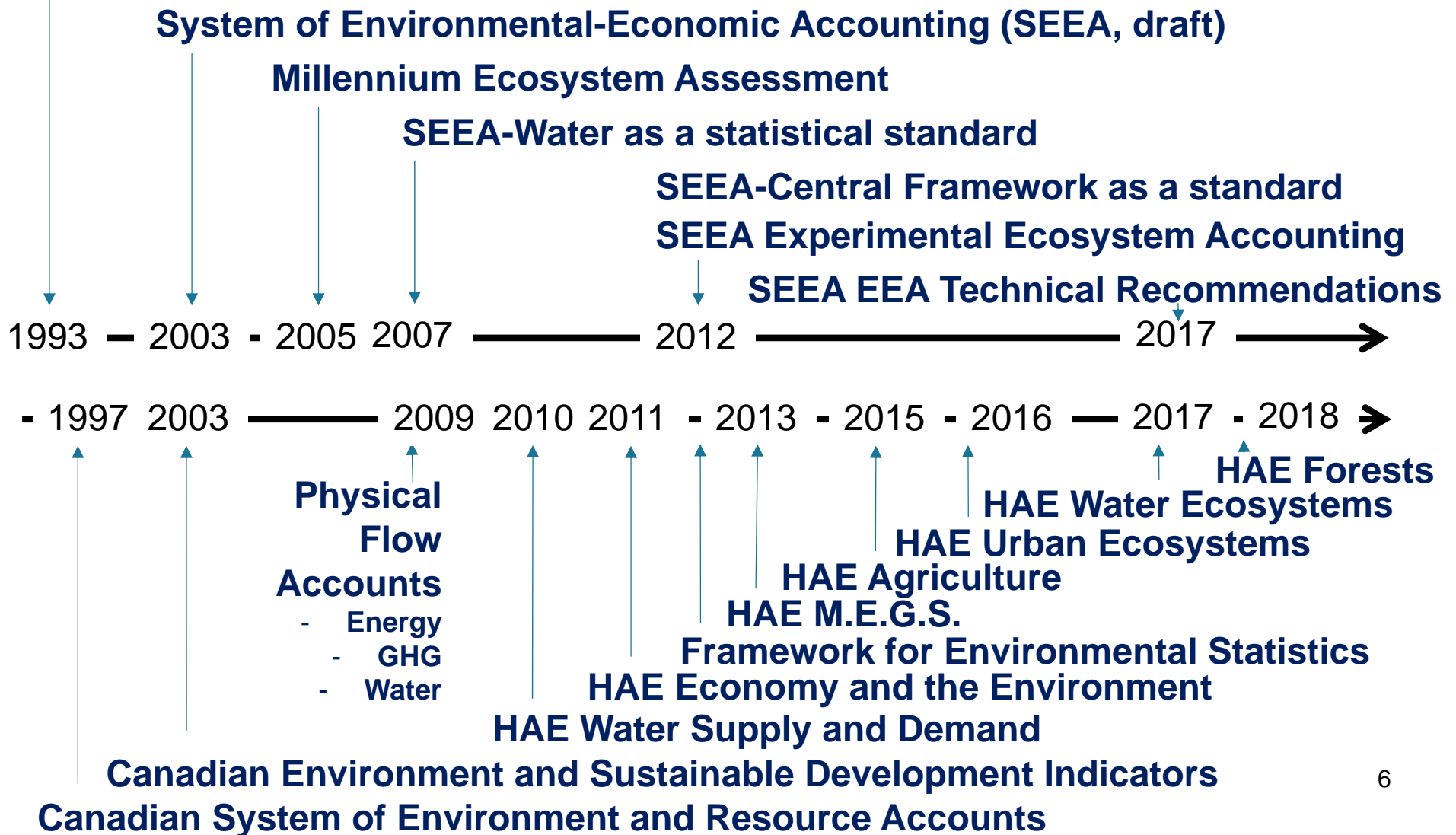
# Table of Content

1. Introduction: Canada and SEEA
2. Review of basic concepts
3. Experimental Applications in Canada
4. Official Applications in Canada
5. National Spatial Data Infrastructure
6. Questions and answers

# Introduction: Canada and SEEA

## Ecosystem accounting timeline

**SNA '93: Satellite accounts for the environment**



# Introduction: Canada and SEEA

## Accounts produced in Canada

### Natural capital stock accounts

- Energy and mineral reserves (physical and monetary)
- Timber stocks (monetary only)
- Water (physical only)
- Land (physical and monetary)
- **Ecosystems assets**

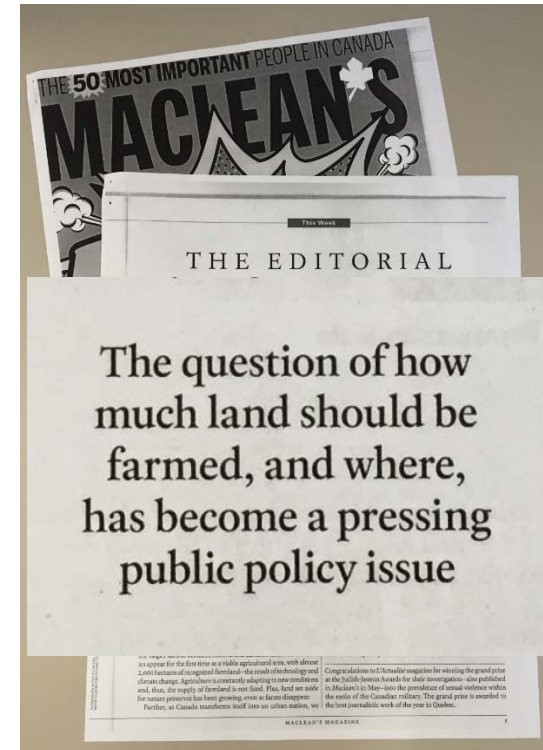
### Physical flow accounts

- Energy use
- Greenhouse gases (GHGs)
- Water use
- **Ecosystem services**

# Introduction: Canada and SEEA

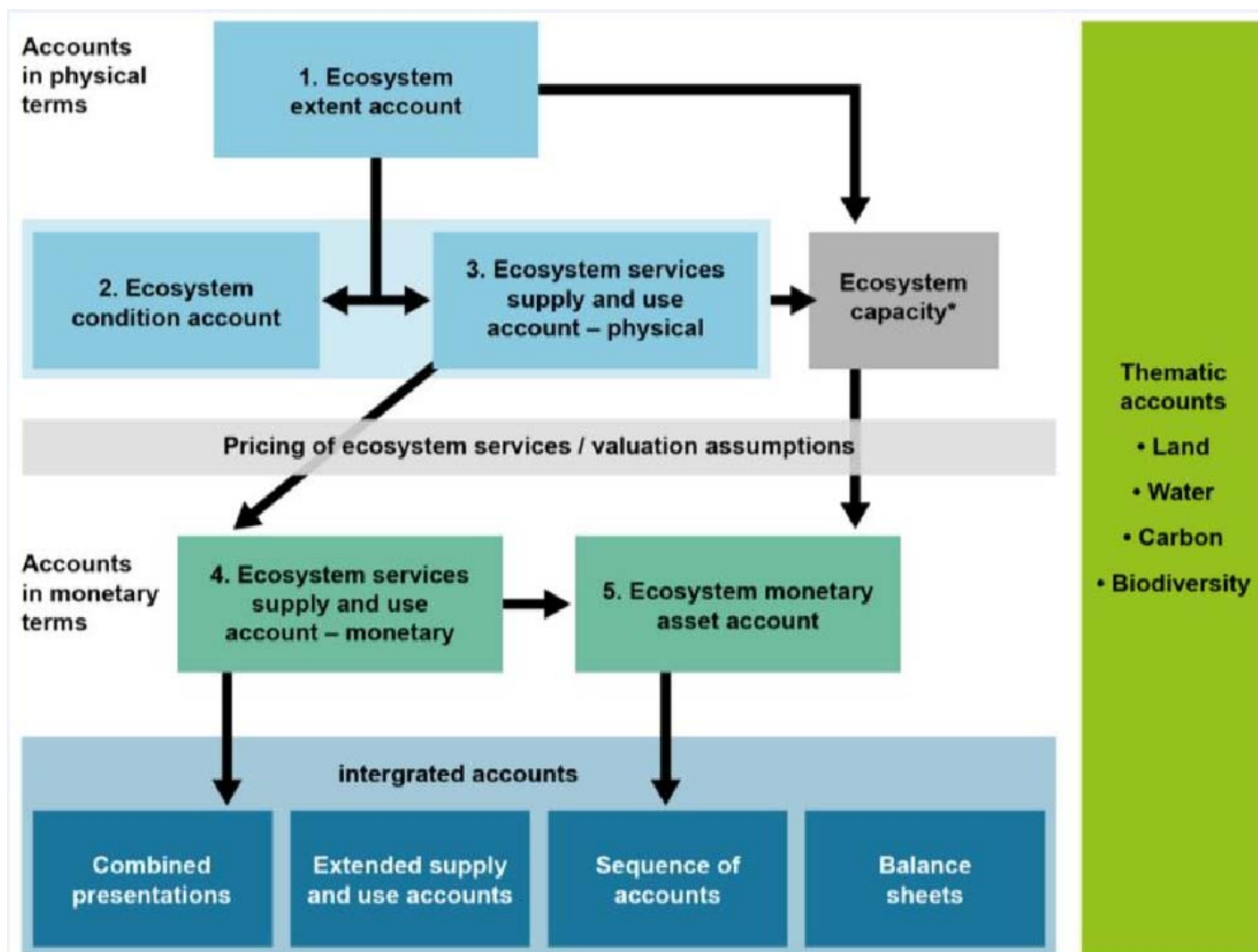
## Why do we produce the accounts?

- Informs public policy issues, for instance, the loss of the best agricultural land for urban land uses.
- Helps provide answers to local issues, such as urban sprawl.
- Contributes to the development of laws and policies aiming to frame spatial planning, namely metropolitan areas.





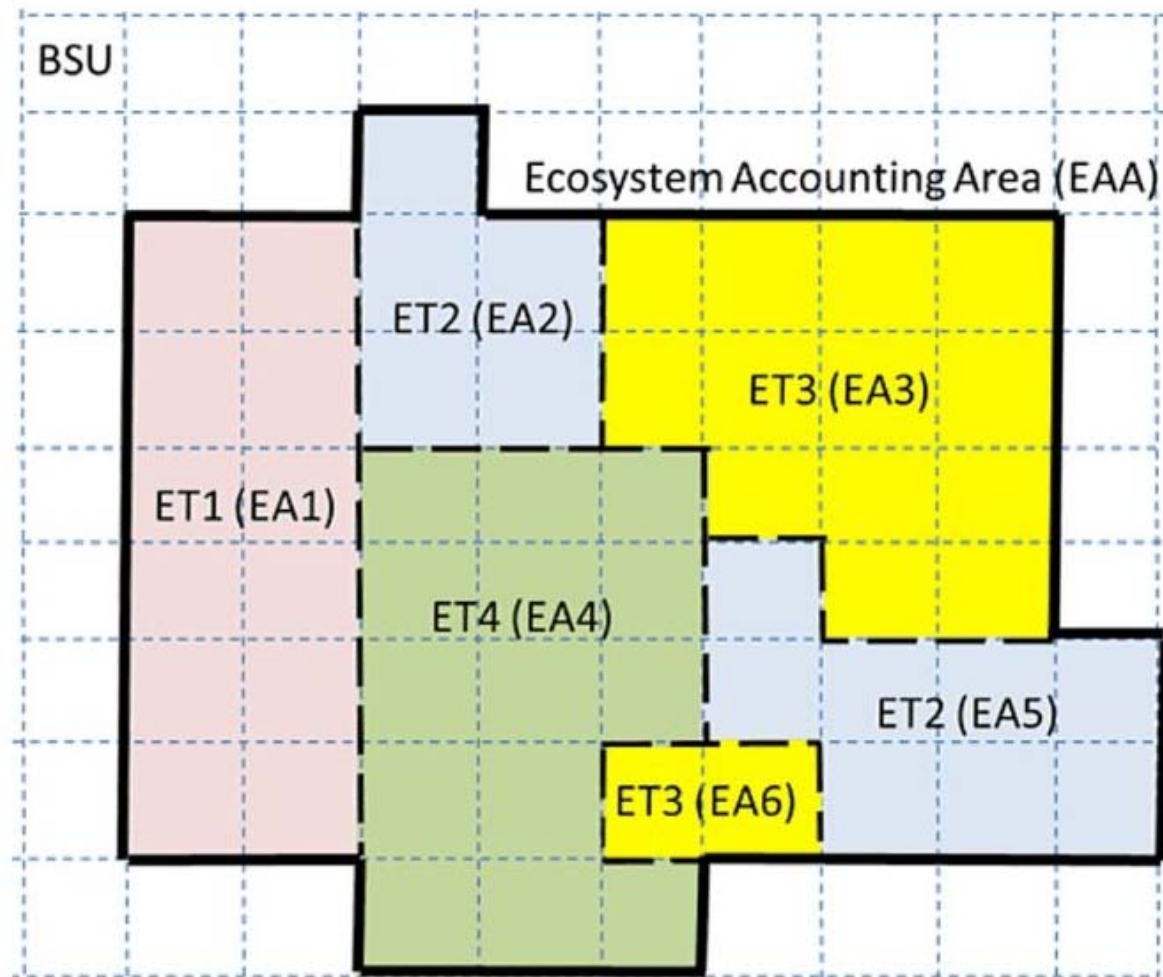
# Review of basic concepts



# Review of basic concepts

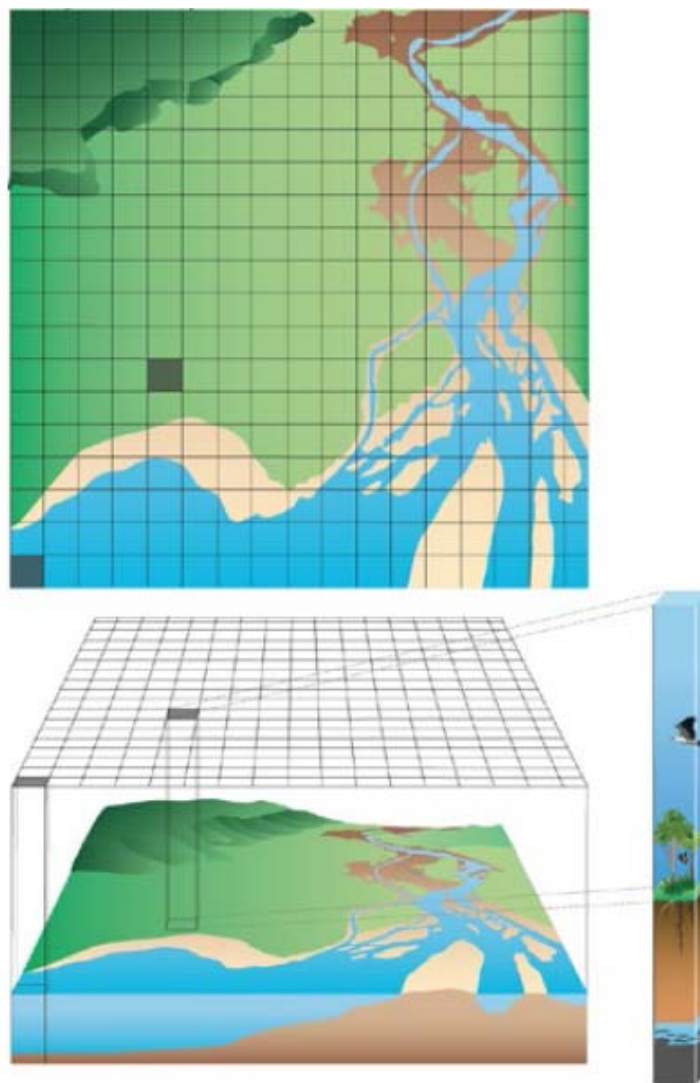
1. Basic Spatial Unit (BSU) is a small square, rectangle or polygon, to which basic data is attached, and that supports the delineation of EAs and ETs
2. Ecosystem assets (EA) are spatial areas comprising a combination of biotic and abiotic components and other characteristics that function together
3. Ecosystem types (ET) are essentially bins for grouping similar ecosystem assets into classes to simplify reporting in ecosystem accounts.
4. Ecosystem Accounting Areas (EAA) are the geographical units used to measure and report, over time, on ecosystem data.

# Review of basic concepts



# Review of basic concepts

- BSU
- EA
- ET
- EAA

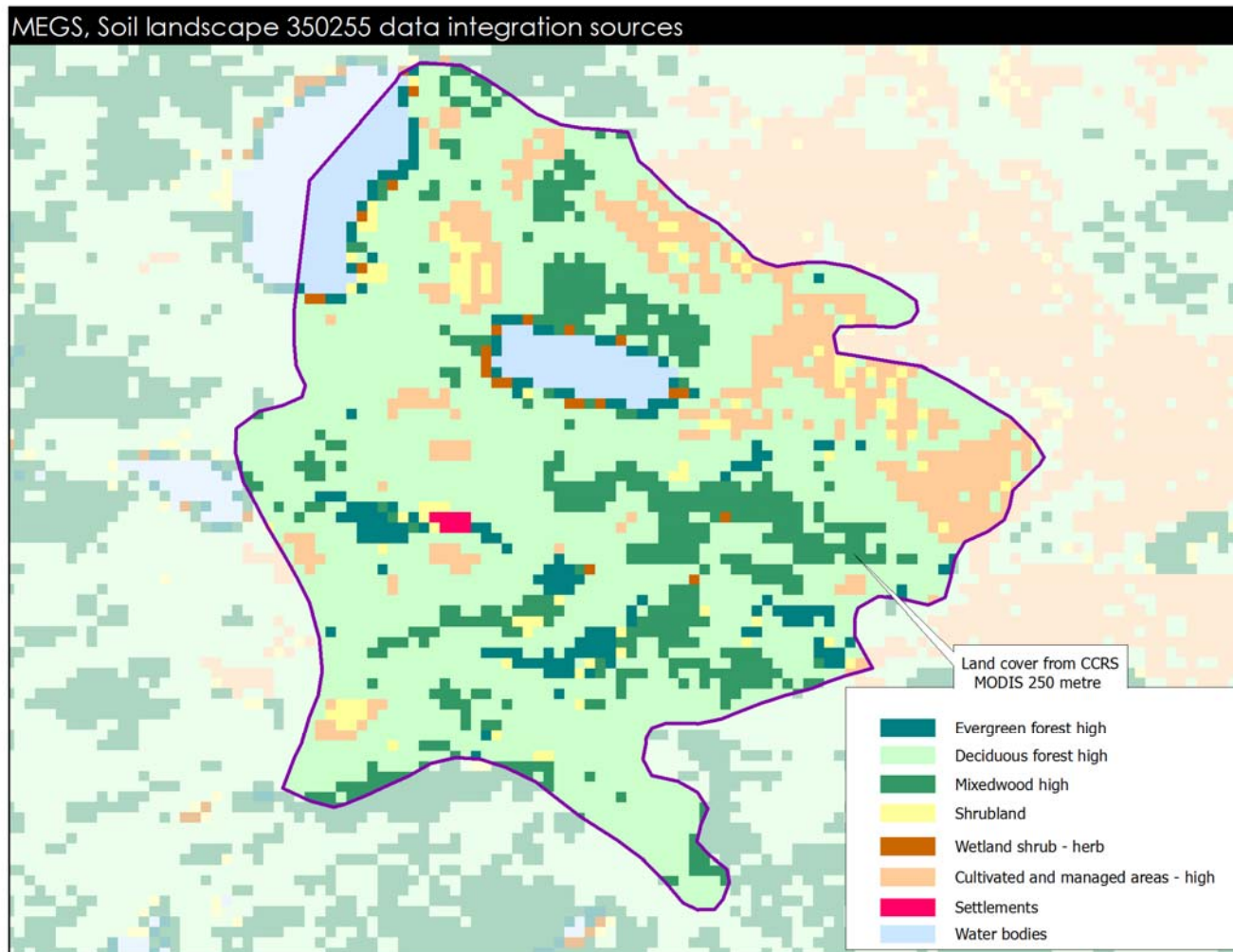


- Vegetation
- Hydrology
- Pedology
- Elevation
- Bio-climate
- Etc.

**Figure 13. Schematic representation of a single grid-based basic spatial unit.**

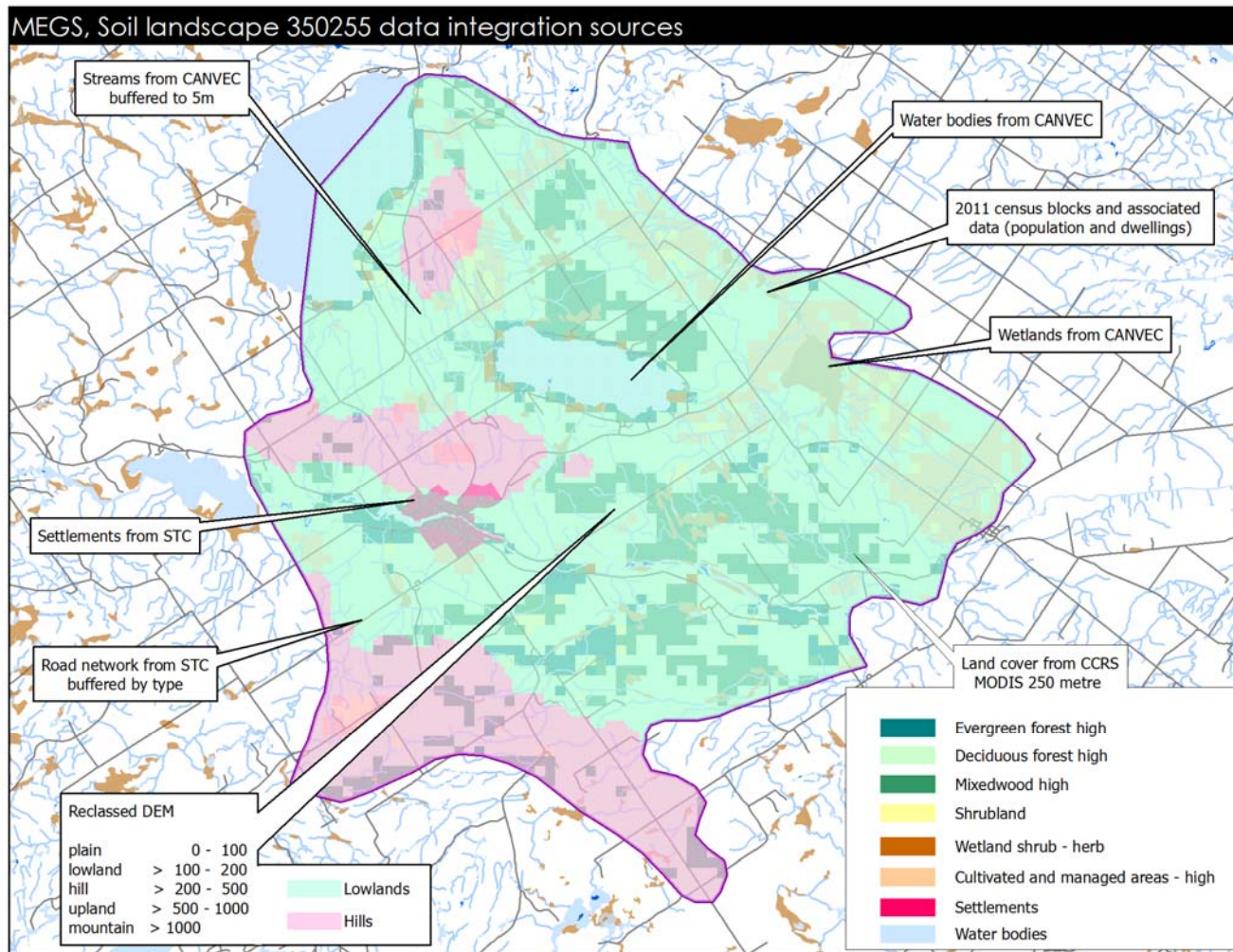
This figure illustrates how a single grid cell can be considered as a slice of reality and attributed with characteristics of the ecosystem at that location, including flora, fauna, elevation, soil type, groundwater, ecological connectivity, and position in the landscape.

# Experimental Applications in Canada





# Experimental Applications in Canada



# Experimental Applications in Canada

Individual  
EAs

Ecosystem Types  
(defined by three variables)

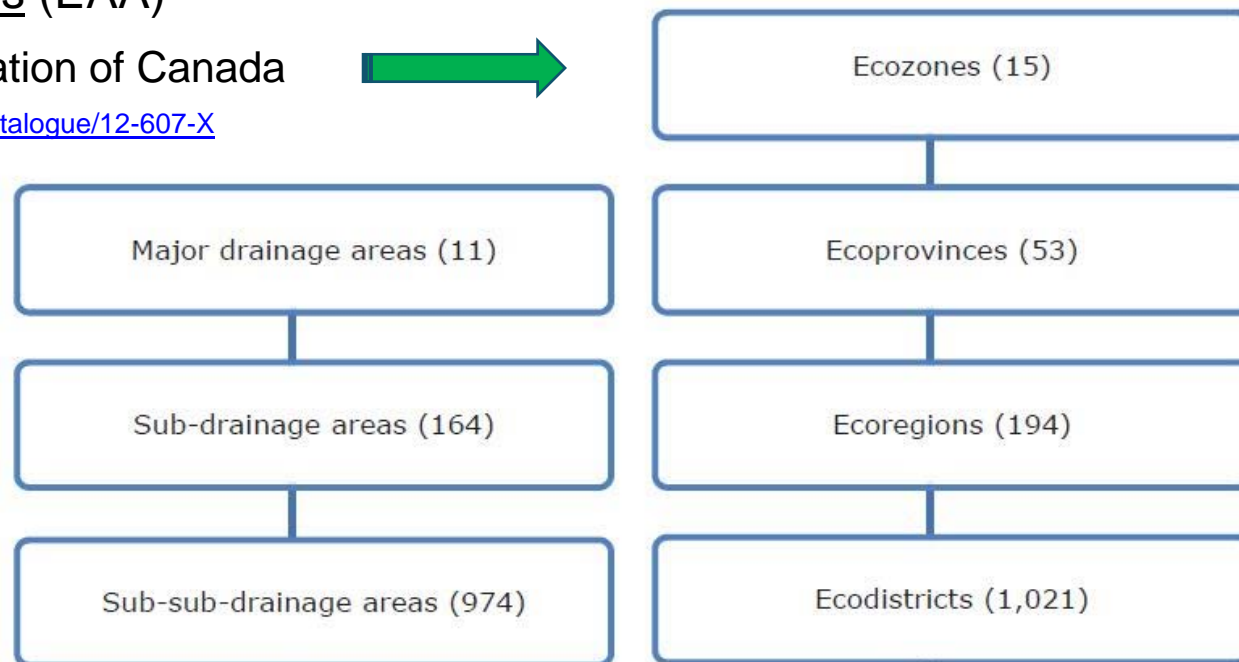
	Count	Land cover	Elevation	Terrain ruggedness index	Area (km <sup>2</sup> )	Percent
1	13,215	Water natural and artificial	Plain	Moderately rugged surface	104,902.6	1.1
2	12,438	Water natural and artificial	Plain	Extremely rugged surface	68,196.3	0.7
3	12,154	Water natural and artificial	Plain	Highly rugged surface	54,511.0	0.6
4	11,425	Water natural and artificial	Lowland	Moderately rugged surface	100,814.1	1.0
5	11,082	Water natural and artificial	Plain	Intermediately rugged surface	66,329.1	0.7
6	10,869	Water natural and artificial	Lowland	Highly rugged surface	58,217.6	0.6
7	10,648	Water natural and artificial	Lowland	Extremely rugged surface	37,206.0	0.4
8	9,741	Water natural and artificial	Lowland	Intermediately rugged surface	53,631.4	0.5
9	9,617	Water natural and artificial	Plain	Slightly rugged surface	52,258.9	0.5
10	9,563	Wetland	Plain	Moderately rugged surface	48,421.0	0.5
11	9,045	Evergreen forest	Hill	Extremely rugged surface	368,372.2	3.7
12	8,813	Wetland	Lowland	Moderately rugged surface	63,733.6	0.7
13	8,743	Water natural and artificial	Plain	Level terrain surface	271,280.9	2.8
14	8,694	Water natural and artificial	Lowland	Slightly rugged surface	37,255.8	0.4
15	8,657	Water natural and artificial	Plain	Nearly level surface	49,254.3	0.5
16	8,375	Water natural and artificial	Hill	Extremely rugged surface	26,964.3	0.3
17	8,288	Evergreen forest	Lowland	Moderately rugged surface	181,858.8	1.8
18	8,244	Evergreen forest	Lowland	Extremely rugged surface	152,162.2	1.5
19	8,123	Wetland	Plain	Intermediately rugged surface	50,428.9	0.5
20	7,742	Water natural and artificial	Lowland	Nearly level surface	31,743.2	0.3

# Experimental Applications in Canada

## Ecosystem Accounting Areas (EAA)

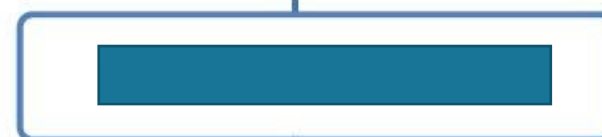
### 1. Ecological Land Classification of Canada

<https://www150.statcan.gc.ca/n1/en/catalogue/12-607-X>



### 2. Drainage Area Classification of Canada

<https://www.statcan.gc.ca/eng/subjects/standard/sdac/sdac>



Ecosystem types (920,613)

Basic statistical units (39,904,728)

Land cover  
Elevation  
Ruggedness

MODIS  
250m x 250m  
16



# Applications in Canada

## Ecological Land Classification of Canada

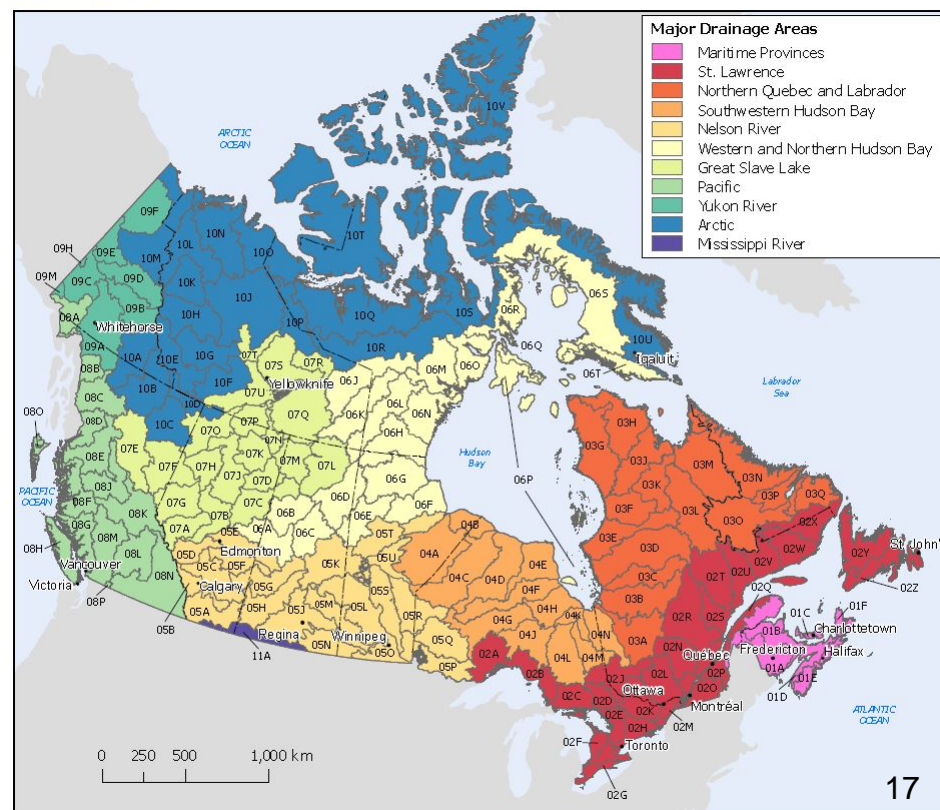
### Terrestrial ecozones and marine ecoregions of Canada



Source(s): Wiken, E.B., D. Gauthier, I. Marshall, K. Lawton and H. Hirvonen, 1996, *A Perspective on Canada's Ecosystems: An Overview of the Terrestrial and Marine Ecozones*, Canadian Council on Ecological Areas, Occasional Paper, no. 14, Ottawa. Fisheries and Oceans Canada, 2009, *Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas*, Fisheries and Oceans Canada Canadian Science Advisory Secretariat, Scientific Advisory Report 2009/056.

## Standard Drainage Area Classification

### Sub-drainage areas



Note(s): For more information, see Statistics Canada, Standards Division, 2009, *Standard Drainage Area Classification (SDAC) 2003*, [www.statcan.gc.ca/subjects-sujets/standard-norme/sdac-ctad/sdac-ctad-eng.htm](http://www.statcan.gc.ca/subjects-sujets/standard-norme/sdac-ctad/sdac-ctad-eng.htm) (accessed October 15, 2013).

## Ecosystem extent accounts

This table shows a basic ~~condition~~ extent account using **high level ecosystem types based on the land cover classification in the SEEA Central Framework**.

Additional sub-classes may be added depending on the ecosystem types of most relevance within a country.

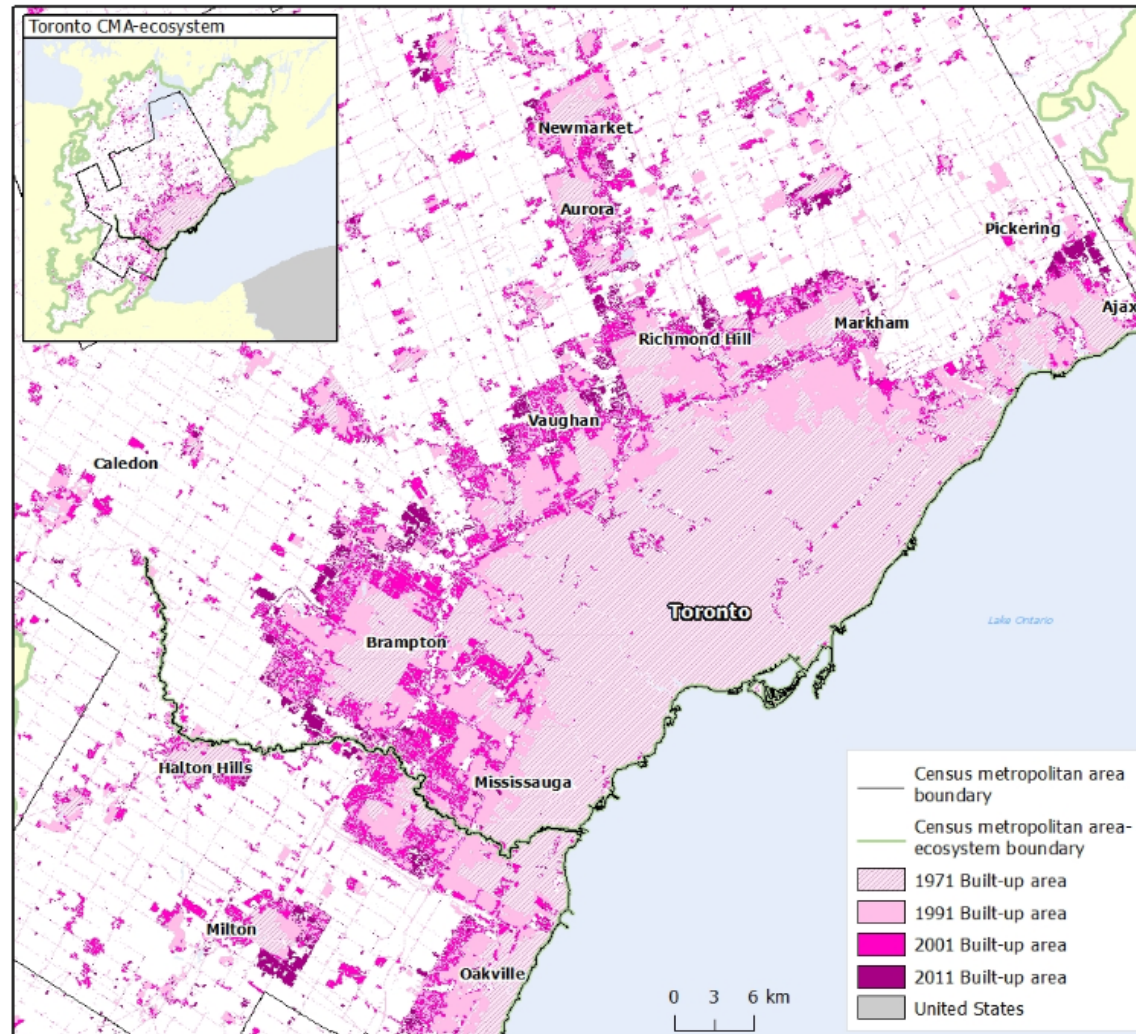
**Explore the highlighted areas to get more information!**

		Proxy ecosystem type (based on land cover)															
		Artificial surfaces	Herbaceous crops	Woody crops	Multiple or layered crops	Grassland	Tree-covered areas	Mangroves	Shrub-covered areas	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow and glaciers	Inland water bodies	Coastal water and inter-tidal areas	Sea and marine areas	TOTAL
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Opening extent																	
	Additions to extent																
	Managed expansion																
	Natural expansion																
	Upward reappraisals																
Reductions in extent																	
	Managed regression																
	Natural regression																
	Downward reappraisals																
Net change in extent																	
Closing extent																	

- Is a BSU of 250m appropriate to measure ecosystem change in Canada?

# Official Applications in Canada

## Metropolitan Landscapes

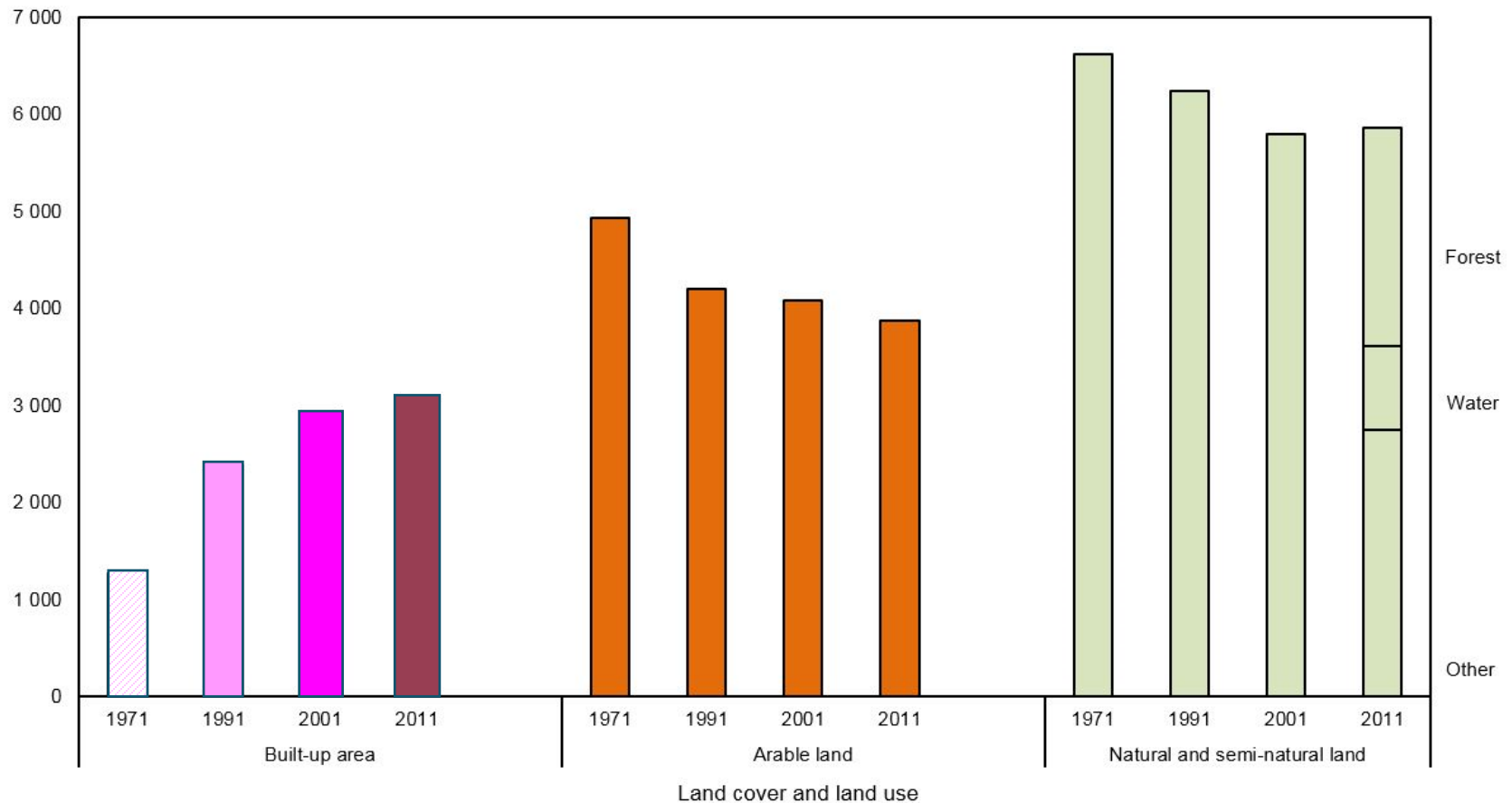


# Official Applications in Canada

## Metropolitan Landscapes

Land cover and land use, Toronto census metropolitan area-ecosystem (CMA-E), 1971, 1991, 2001 and 2011

square kilometres





# Official Applications in Canada

## Metropolitan Landscapes

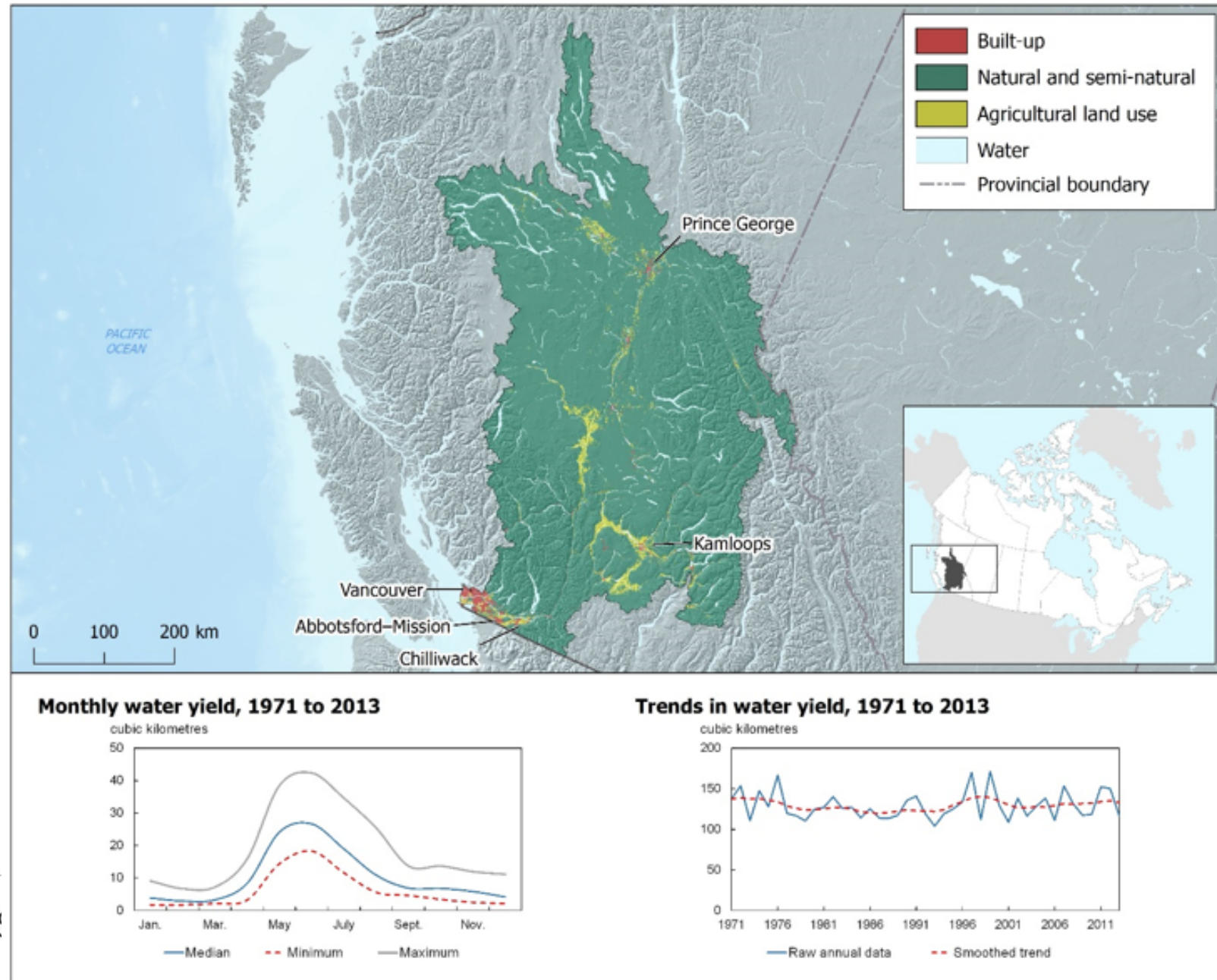
**Ecosystem asset account, Toronto census metropolitan area-ecosystem , 1971 to 2011**

	<b>Total built-up area<sup>1</sup></b>		<b>Arable<sup>2</sup></b>	<b>Natural and</b>
	<b>Settled</b>	<b>Roads</b>		<b>semi-natural<sup>3</sup></b>
	square kilometres			
Opening stock 1971	850	418	4 930	6 615
Land lost to settled area	...	...	-961	-448
Balance of change <sup>4</sup>	1 409	403	-102	-300
Closing stock 2011	2 260	821	3 867	5 866





**Map 3.3.2**  
**Land use and water yield for the Fraser–Lower Mainland drainage region**



## Developing a NSDI

Establishing the spatial areas required for ecosystem accounting is **best undertaken within a broader context of work**. While not being essential to commence work, a national spatial data infrastructure (NSDI) would **support integration of environmental and socio-economic data**:

- The starting point in utilizing an NSDI is an inventory of **what spatial data infrastructure already exists in a country**, in particular within government agencies such as spatial planning or environmental agencies.
- This assessment should include documenting the most commonly used **GIS software packages and the available datasets**. Where feasible, the development of a spatial data infrastructure for accounting should build upon existing infrastructure.
- The development of spatial data infrastructure also requires selecting **hardware with sufficient processing, storage and back-up capacity, and GIS software**.

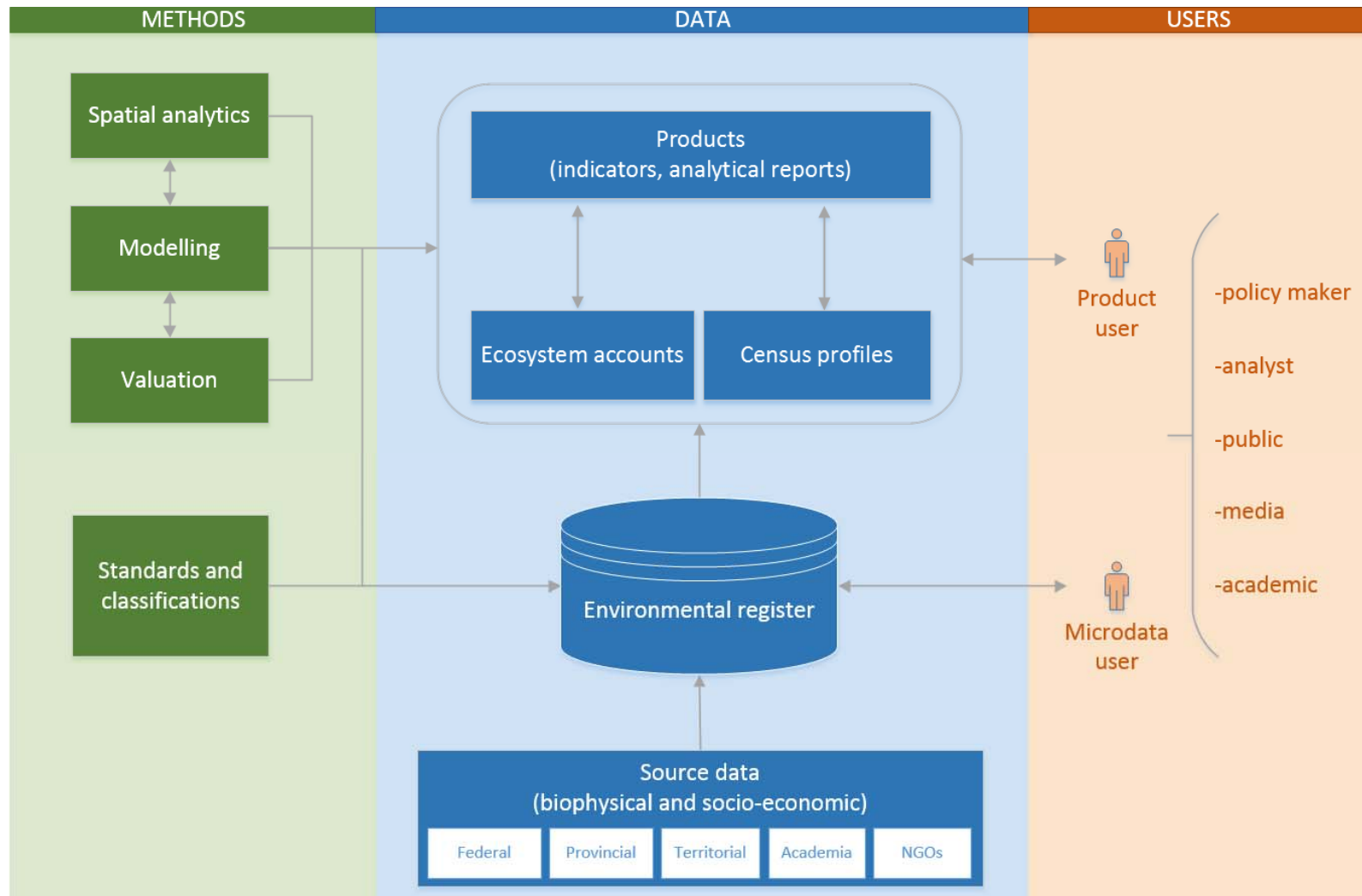
- Official boundaries (country, administrative, statistical, river basins, biogeographic areas, shorelines, etc.) as polygon vector data
- Elevation and topography data, based on a digital elevation model (DEM) to distinguish elevation and slope of BSU
- Land cover data
- Land management/use
- Vegetation type
- Soil and geology data
- Hydrological data related to rivers, lakes, streams, coastal and marine areas
- Data on urban infrastructure, including cities, villages, industrial zones, and transport (rail, road), needed for assessing ecosystem condition and understanding ecosystem use (e.g. relevant for mapping fragmentation and other impacts)
- Socio-economic data including population data, employment, economic activity, etc.

List of data layers recommended for integration in a spatial data infrastructure



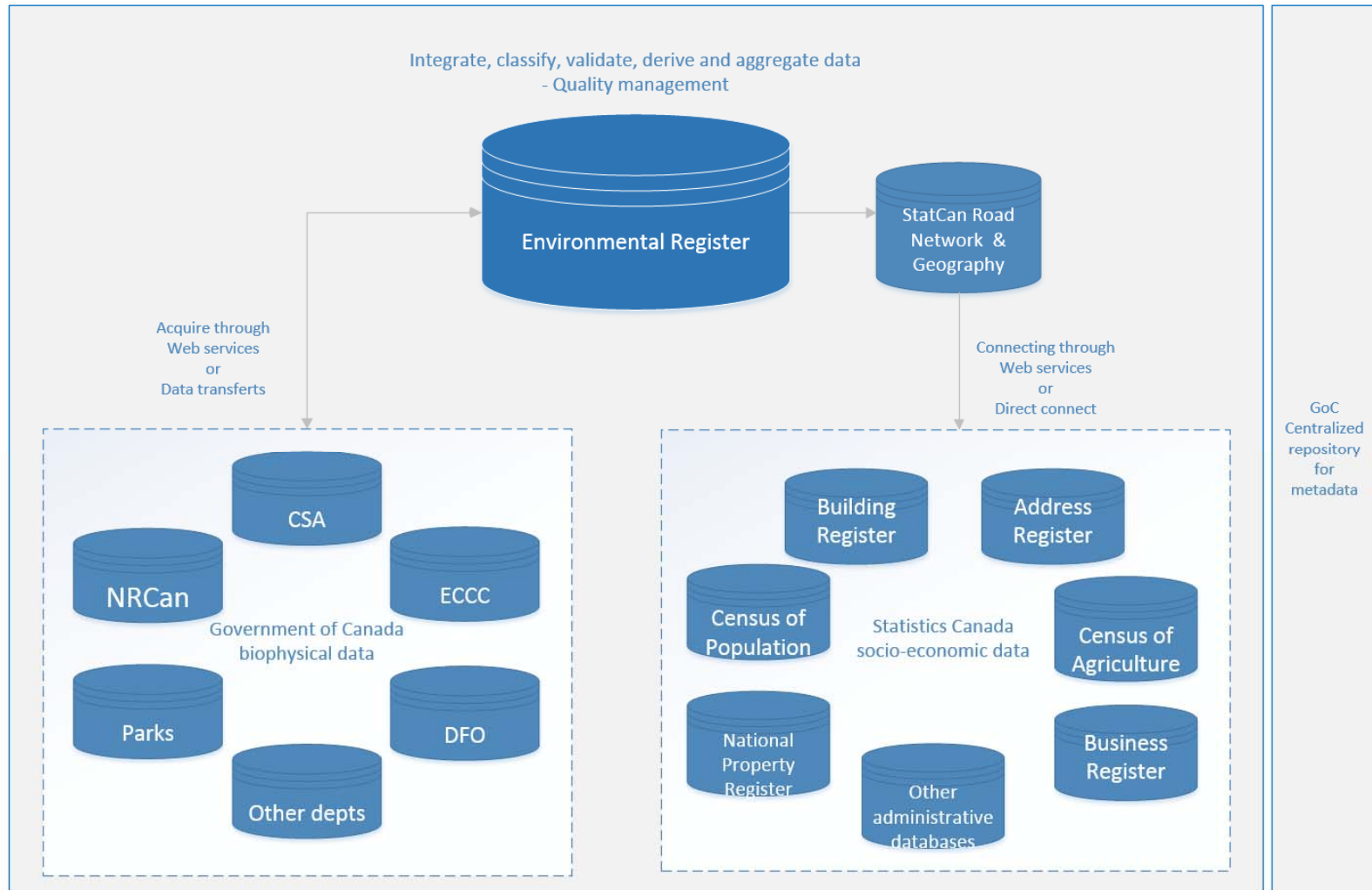
# Official Applications in Canada

## National Spatial Data Infrastructure



# Official Applications in Canada

## National Spatial Data Infrastructure



## Conclusion: SEEA (E)EA in Canada

1. Currently researching and integrating the databases required to build ecosystem accounts at a national scale.
2. Developing the I.T. environment and interdepartmental partnerships required to build comprehensive ecosystem accounts
3. Initiating work to create Ocean ecosystem accounts, in partnership with Canada's Department of Fisheries and Oceans.

# Questions and answers

Check out our annual publication:

Human Activity and the Environment

<https://www150.statcan.gc.ca/n1/en/catalogue/16-201-X>

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