



Statistics
Canada

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Use of Earth observations in Canada's Ecosystems Accounts

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CANADA 150

Telling Canada's
story in numbers

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EO4EA

Copenhagen, Denmark,

March 27, 2017

Canada 

Ecosystem accounting timeline

SNA '93: Satellite accounts for the environment

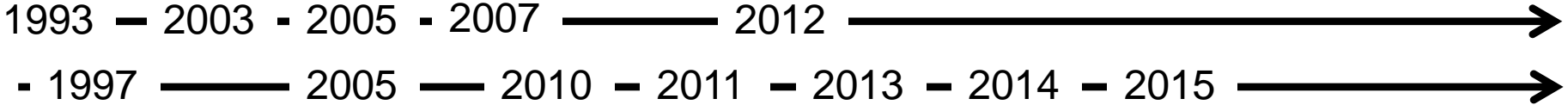
System of Environmental-Economic Accounting (SEEA, draft)

Millennium Ecosystem Assessment

SEEA-Water as a statistical standard

SEEA-Central Framework as a standard

SEEA Experimental Ecosystem Accounting



HAE 2015

Framework funding

HAE MEGS

Framework for Environmental Statistics

HAE Economy and the Environment

HAE Water Supply and Demand

Canadian Environmental Sustainability Indicators

Econnections: Linking the Environment and the Economy

Environmental accounts in Canada

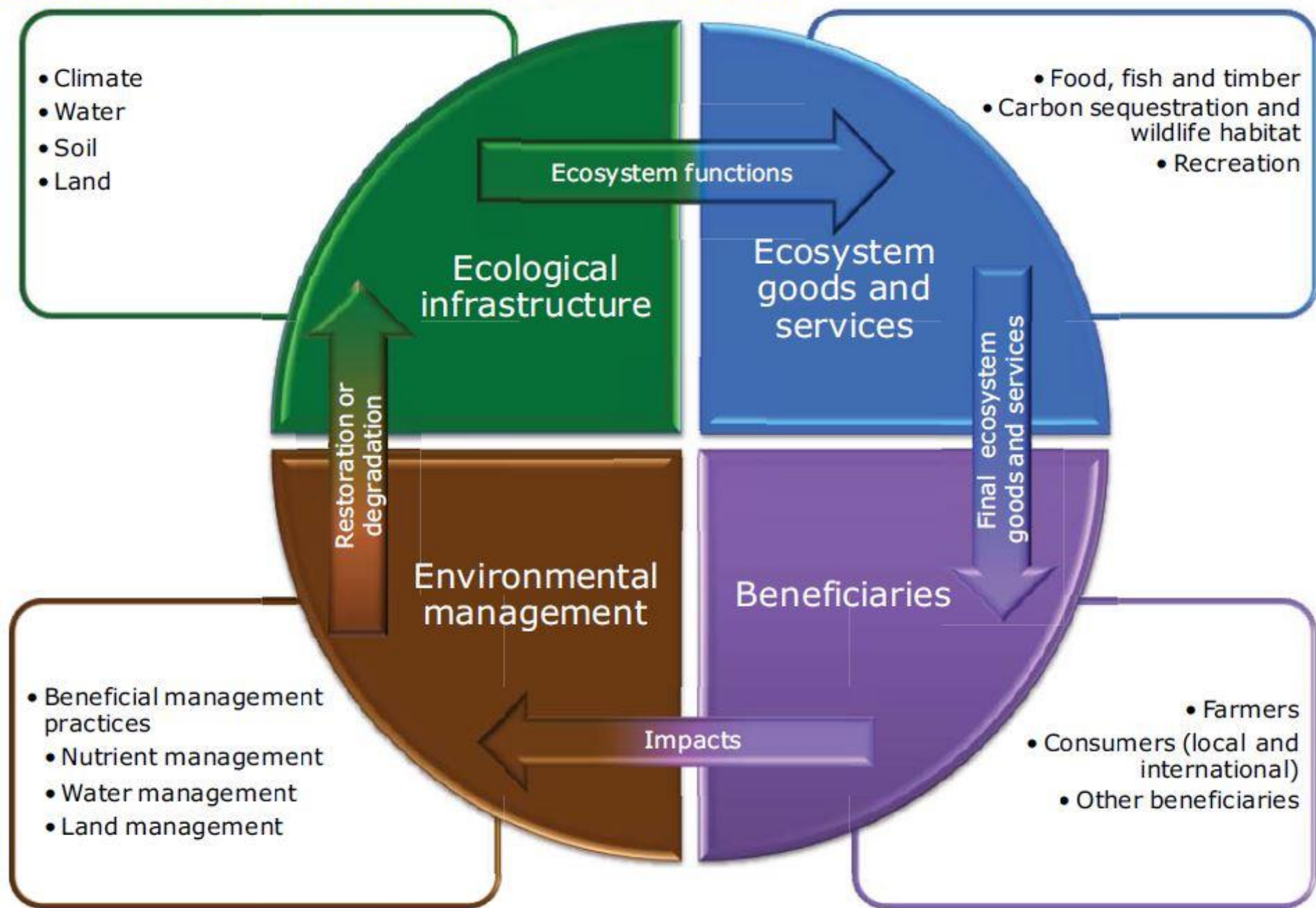
Natural capital stock accounts

- energy and mineral reserves (physical and monetary)
- timber stocks (monetary only)
- water (physical only)
- land (land use/cover, physical, some monetary)
 - Ecosystem Extent (incl. Condition)

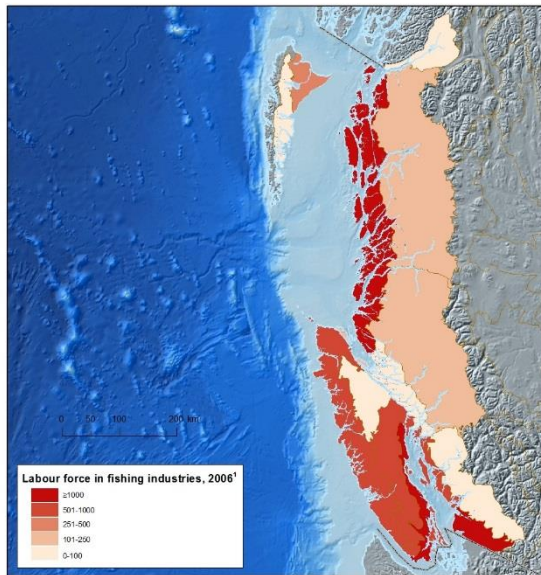
Physical flow accounts

- energy use
- greenhouse gases
- water use
- Ecosystem Service Flows

Ecosystem Goods and Services conceptual framework for agriculture

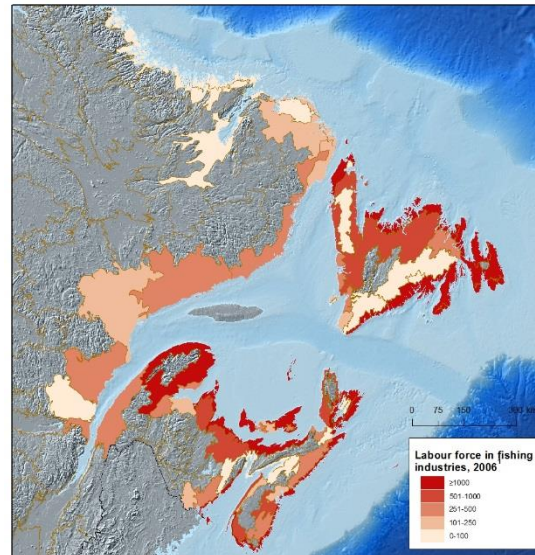


Measuring Ecosystem Goods and Services: Case studies



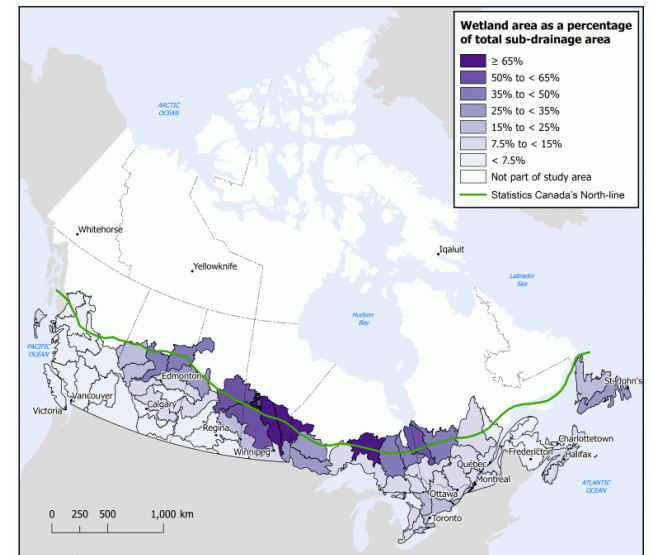
Note(s): ¹ Fishing Industries include: the Fishing industry (NAICS 1141), the Seafood Product Preparation and Packaging Industry (NAICS 3117) and the Aquaculture industry (NAICS 1125).

Source(s): Statistics Canada, 2013, 2006 Census of population, special tabulation.



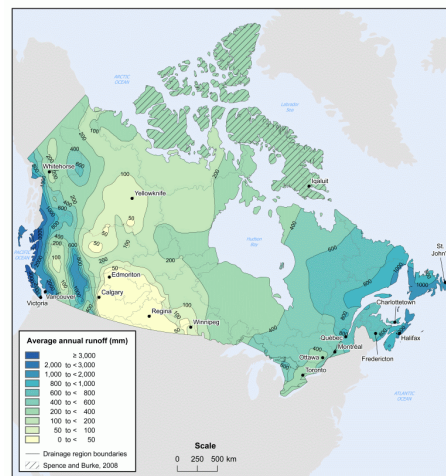
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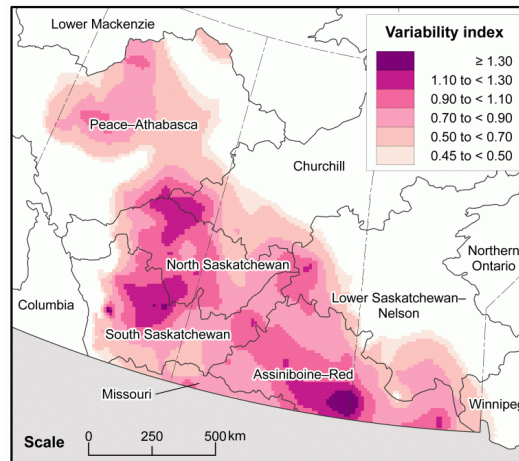


Note(s): Wetland estimates were calculated using coefficients derived from high resolution wetland datasets from the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Ontario, Quebec and Alberta and Environment Canada. Agriculture and Agri-Food Canada's 30 m land cover product was also used as a base layer reference. Wetland datasets represented full or partial coverage of the provinces.

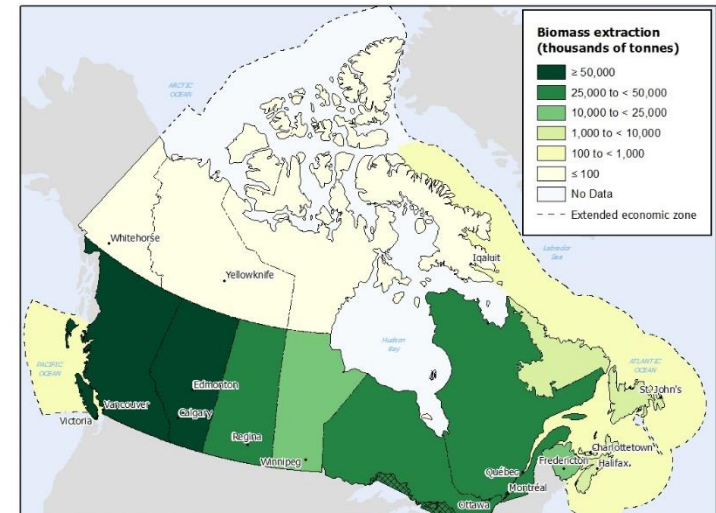
Source(s): Prince Edward Island Department of Environment, Energy and Forestry, 2009, 2009 PEI Wetland Inventory, www.gov.pe.ca/gov/index.php?number=103652&lang=E (accessed December 2012); Nova Scotia Department of Natural Resources, 2013, Forest



Note(s): Data were derived from discharge values contained in Environment Canada, 2010, Water Survey of Canada, Archived Hydrologic Data (HYD01) (www.wsc.ec.gc.ca/hydro/HQ/index_e.cfm?formname=4).



Note(s): Includes all or part of drainage regions 6, 9, 10, 11, and 12, the Peace-Athabasca, Missouri, North Saskatchewan, South Saskatchewan, Lower Mackenzie, Churchill, Northern Ontario, Columbia, North Saskatchewan, Lower Saskatchewan-Nelson, Assiniboine-Red, Winnipeg



Thousand Islands National Park case study

1. This study explores the use of “benefits transfer”, a monetary valuation method to estimate the annual value of EGS flows
2. The annual value of EGS flows assessed for the park is estimated to be between \$12.5 million and \$14.7 million (2012 dollars).
3. The annual value of recreational services is estimated at \$3.9 million (2012 dollars)

Using satellite imagery for ecosystem accounting

Table 4.3
Annual ecosystem service flows, by land cover type and selected land cover compilation, Thousand Islands National Park

	Area-weighted average value per hectare ²		Land cover compilation											
			Troy and Bagstad GIS, 15 m, 2008		AAFC land cover, 30 m, 2011		CCRS land cover, 250 m, 2011		SOLRIS, 15 m, 2008		MEGS geospatial database, 250 m ¹ , 2011		Parks Canada LANDSAT-TM, 30 m, 2007	
			land cover	valuation ³	land cover	valuation	land cover	valuation	land cover	valuation	land cover	valuation	land cover	valuation
	dollars	percent	dollars	percent	dollars	percent	dollars	percent	dollars	percent	dollars	percent	dollars	
Total		100.0	14,669,989	100.0	13,793,498	100.0	14,192,366	100.0	13,611,446	100.0	14,030,681	100.0	12,492,976	
Forest	4,776	68.9	7,334,476	82.0	8,733,404	76.8	8,170,562	71.7	7,629,237	71.9	7,655,654	82.4	8,775,725	
Shrubland ⁴	0	0.0	0	1.2	0	1.4	0	0.0	0	1.4	0	3.3	0	
Grassland	377	0.8	7,049	0.0	0	5.9	49,210	0.0	0	8.3	69,541	0.0	0	
Barrenland ⁵	0	0.0	0	0.3	0	0.0	0	10.1	0	0.0	0	0.0	0	
Wetland	15,908	18.5	6,557,799	11.3	3,994,971	5.1	1,794,411	16.2	5,757,333	11.0	3,890,792	10.0	3,551,735	
Cropland and field	151	8.7	29,176	1.8	6,004	1.1	3,799	0.7	2,197	0.6	2,111	1.7	5,593	
Built-up ⁶	0	1.3	0	0.9	0	0.0	0	0.8	0	1.1	0	2.2	0	
Water snow ice	19,081	1.7	741,489	2.5	1,059,119	9.8	4,174,384	0.5	222,679	5.7	2,412,584	0.4	159,923	



Using satellite imagery for ecosystem accounting

1. While the example is simplistic it does display all the steps required as well as main challenges
 1. E.g. The use of different land cover products produced significantly different results
2. The spread in these results could be greater than any actual change
3. Land cover classification concordance and roll-ups will influence results
4. ...

Using EO to analyse the changing landscape of metropolitan areas

Land use patterns in cities

- Introduction to urban land use patterns; sprawl, densification
- Factors affecting land use patterns

Land use in and around census metropolitan areas, 1971 to 2011

- Built-up area change
- Land use intensity

Arable land use change

- Loss of agricultural land by soil capability classification

Natural and semi-natural land cover change

- Access to nature

Principal data sources

Statistics Canada

- Census of Population 1971, 1991, 2001, 2011
- Census of Agriculture 1971, 1991, 2001, 2011

Agriculture and Agri-Food Canada

- Interpolated Census of Agriculture 1971, 1991, 2001, 2011
- Crop Inventory, 2011 Data Product
- Land Use 1990, 2000 and 2010 Data Product

Natural Resources Canada

- Canada Land Inventory : Land Use (circa 1966)
- Canada Land Use Monitoring Program (1971)

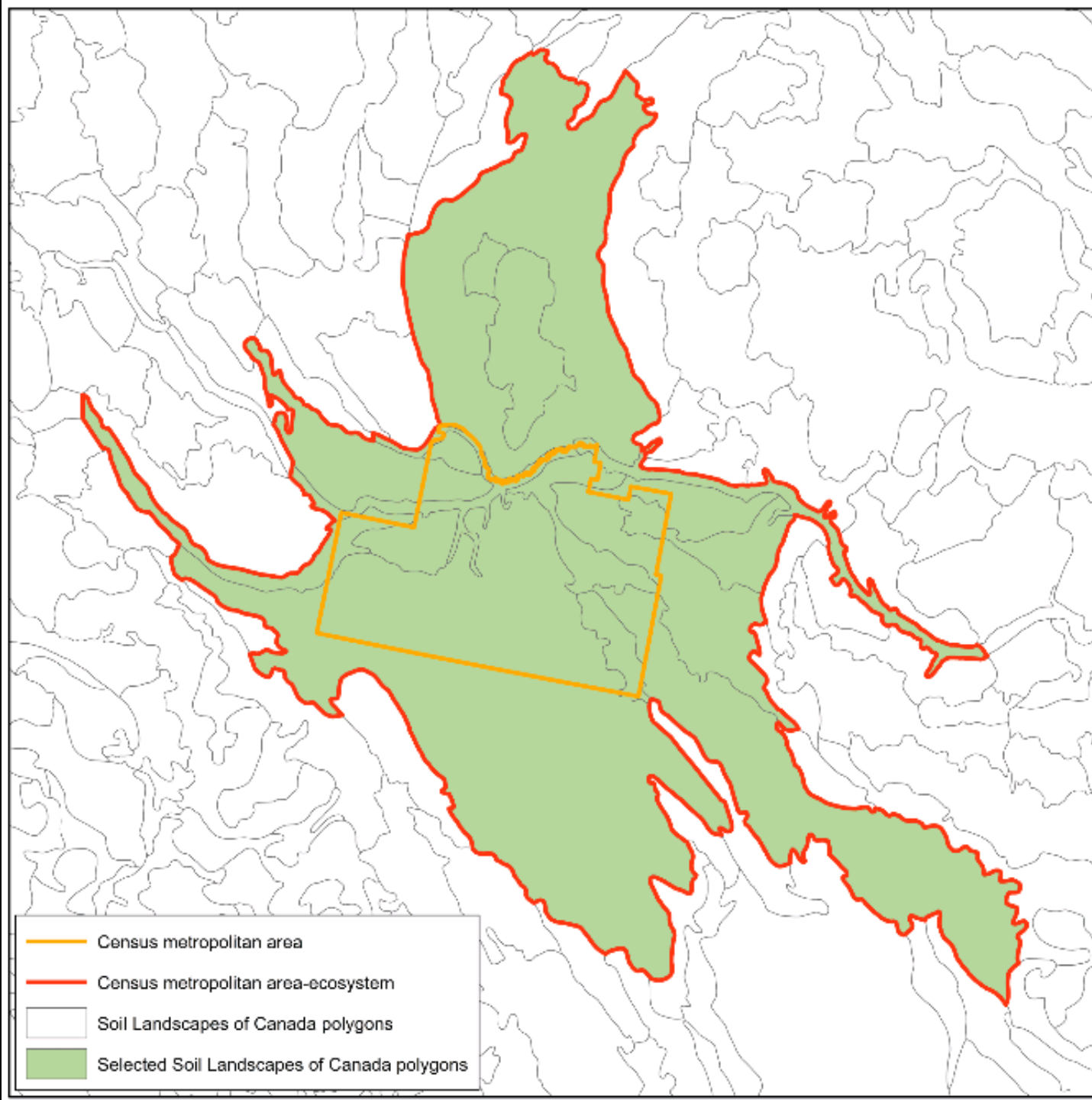


Figure 2.1

Built-up area growth, census metropolitan areas of Canada, 1971 to 2011



Built up area increased

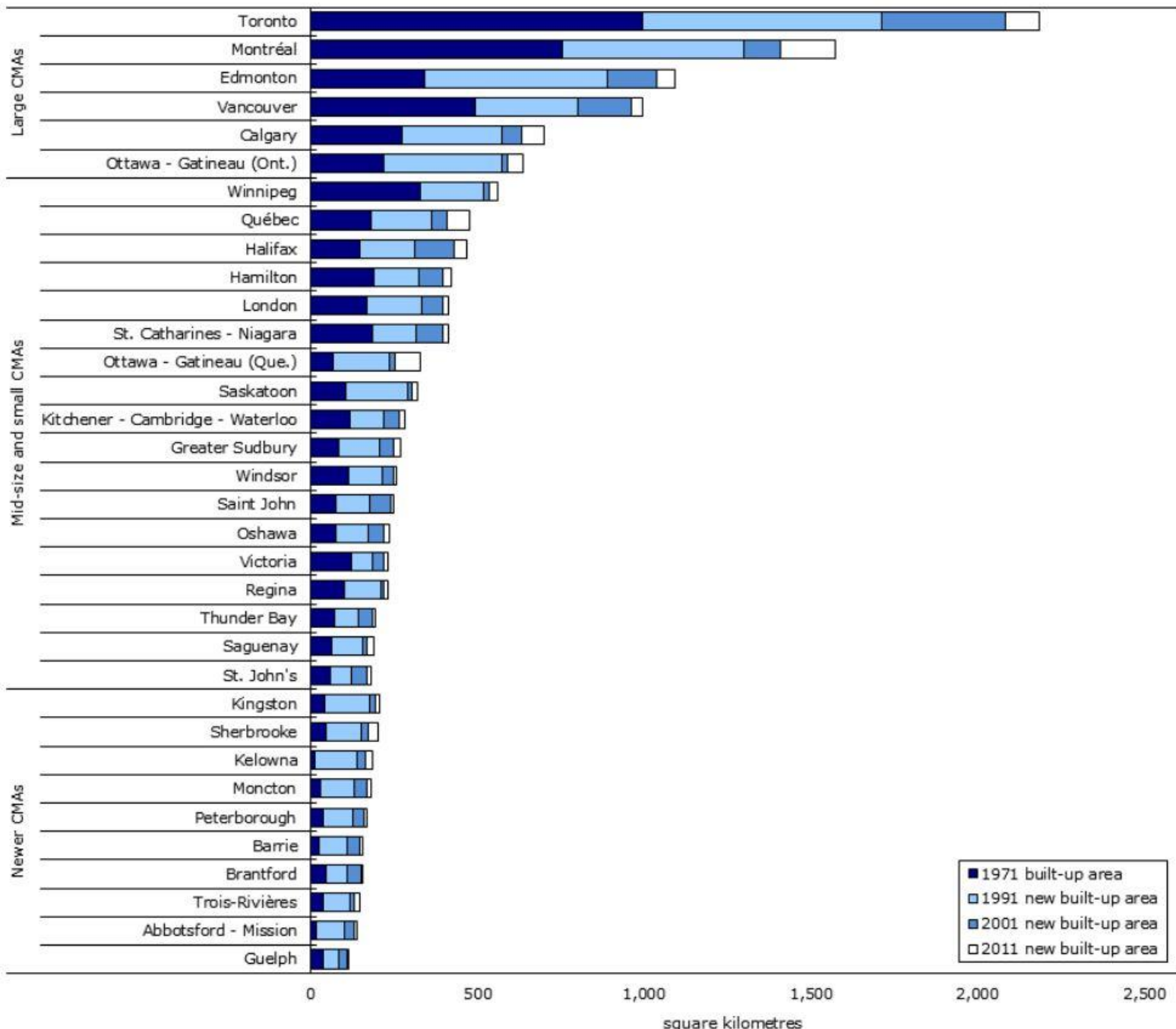
157%

from 5,651 km² in 1971
to 14,546 km² in 2011

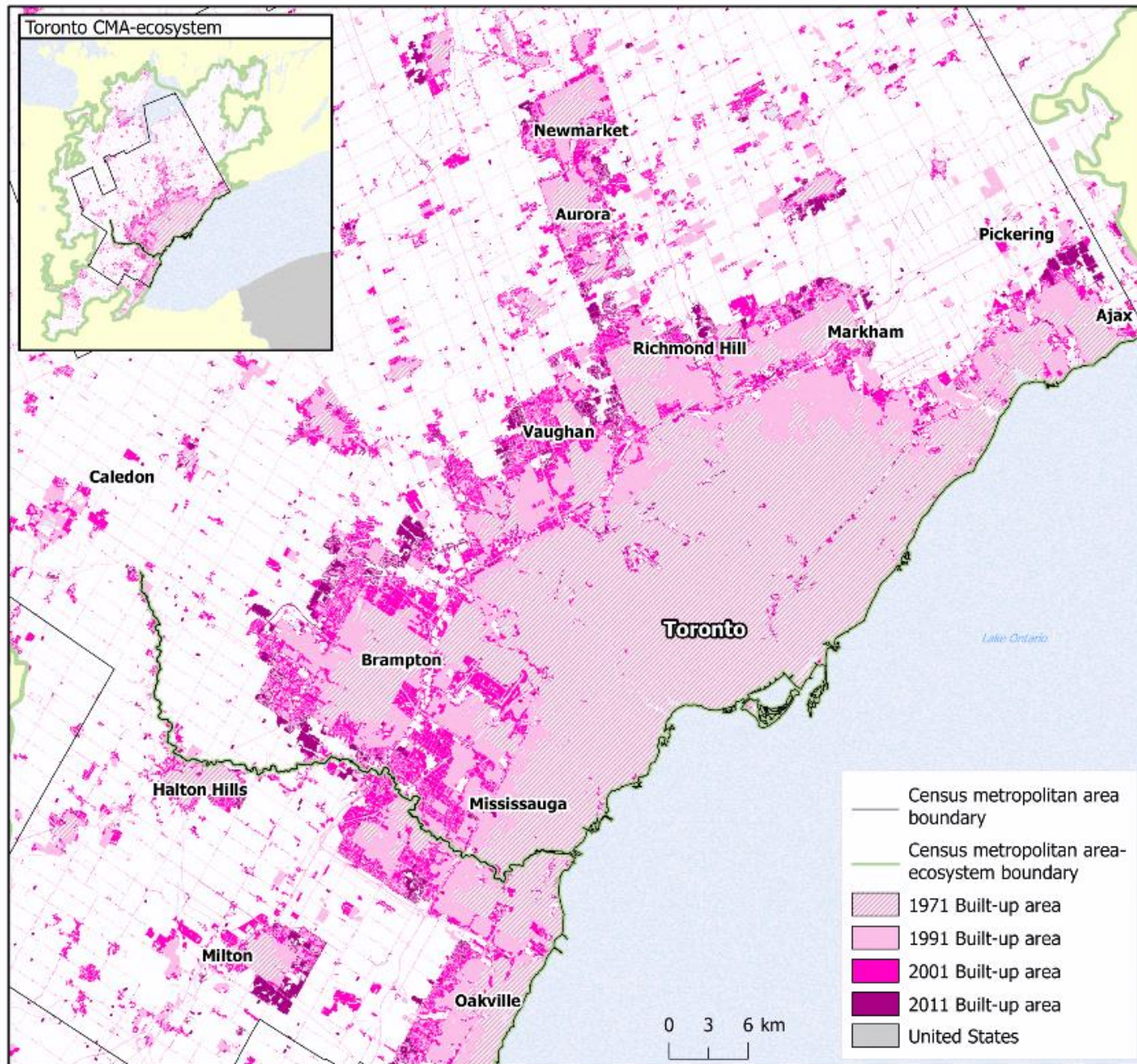


Chart 2.4

Built-up area by census metropolitan area, 1971, 1991, 2001 and 2011



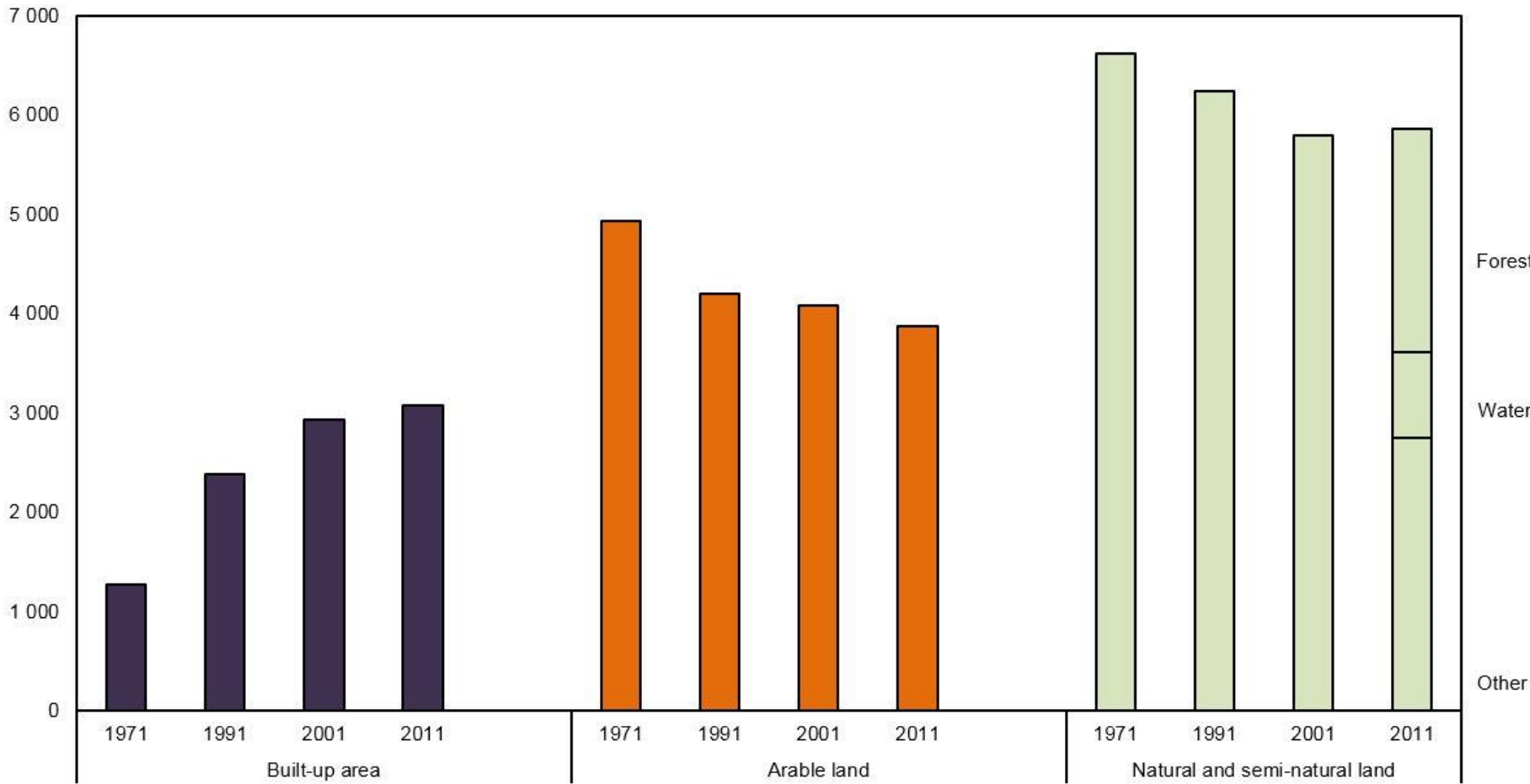
Built-up area, Toronto census metropolitan area (CMA) and census metropolitan area-ecosystem (CMA-E), 1971, 1991, 2001 and 2011



HAE 2015: The changing landscape of CMAs

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

square kilometres



Land cover and land use

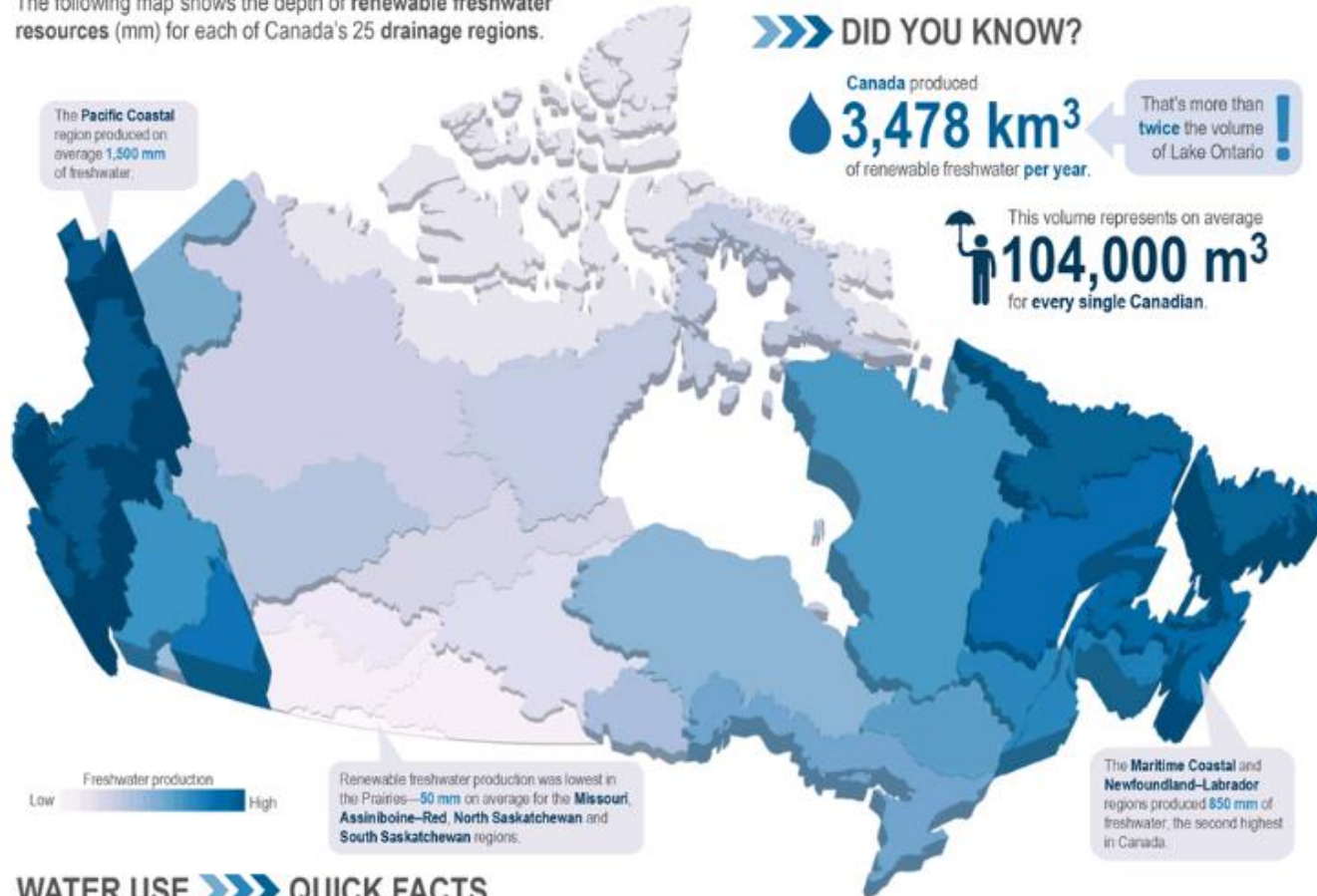
Ecosystem asset account, Toronto census metropolitan area-ecosystem , 1971 to 2011

	Total built-up area¹		Arable²	Natural and
	Settled	Roads		semi-natural³
	square kilometres			
Opening stock 1971	850	418	4 930	6 615
Land lost to settled area	-961	-448
Balance of change ⁴	1 409	403	-102	-300
Closing stock 2011	2 260	821	3 867	5 866

FRESHWATER IN CANADA

A look at Canada's freshwater resources from 1971 to 2013

The following map shows the depth of **renewable freshwater resources** (mm) for each of Canada's 25 drainage regions.



WATER USE QUICK FACTS



Canadians used **37.9 km³** of water for **economic and household activities** in 2013.

These drainage regions had the highest **surface water withdrawals** in Canada:



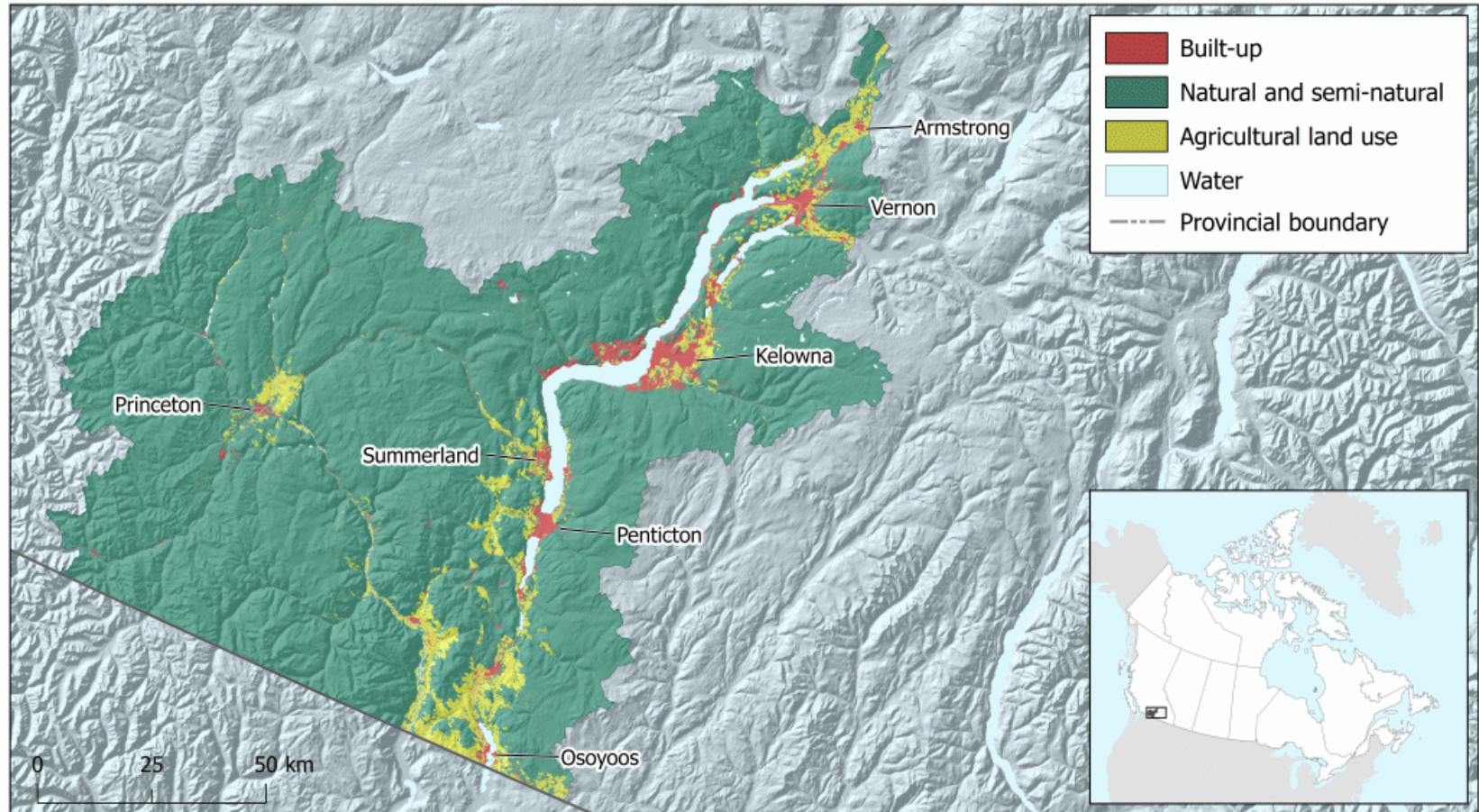
Each Canadian used on average **250 litres** of water per day in 2013.



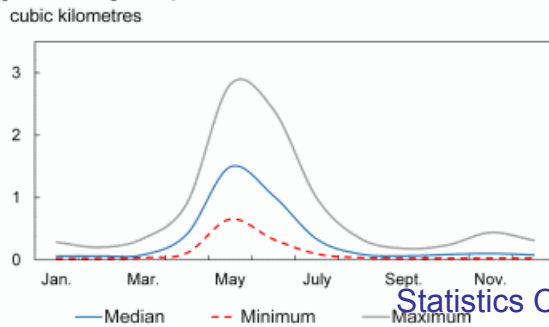
Total household water use was **3.2 km³**.

That's over **1.2 million** Olympic swimming pools!

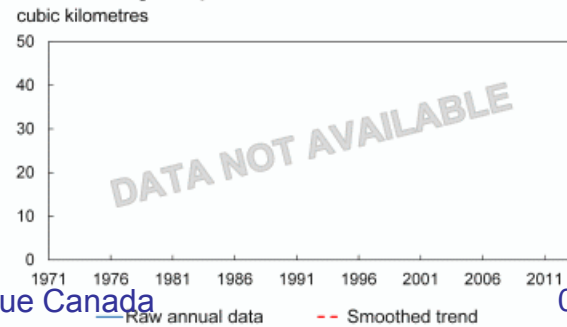
Map 3.3.3
Land use and water yield for the Okanagan–Similkameen drainage region



Monthly water yield, 1971 to 2013



Trends in water yield, 1971 to 2013





CENSUS OF ENVIRONMENT

WHITE PAPER

STATISTICAL INFRASTRUCTURE

