

Human Activity and the Environment: Freshwater in Canada, 1971 to 2013

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Imagine the amount of water tumbling over Niagara Falls every minute.

Canada's average annual water yield—an estimate of the country's supply of renewable freshwater—is so large that there is enough water to approximate a one-minute flow over Niagara Falls for each and every Canadian.

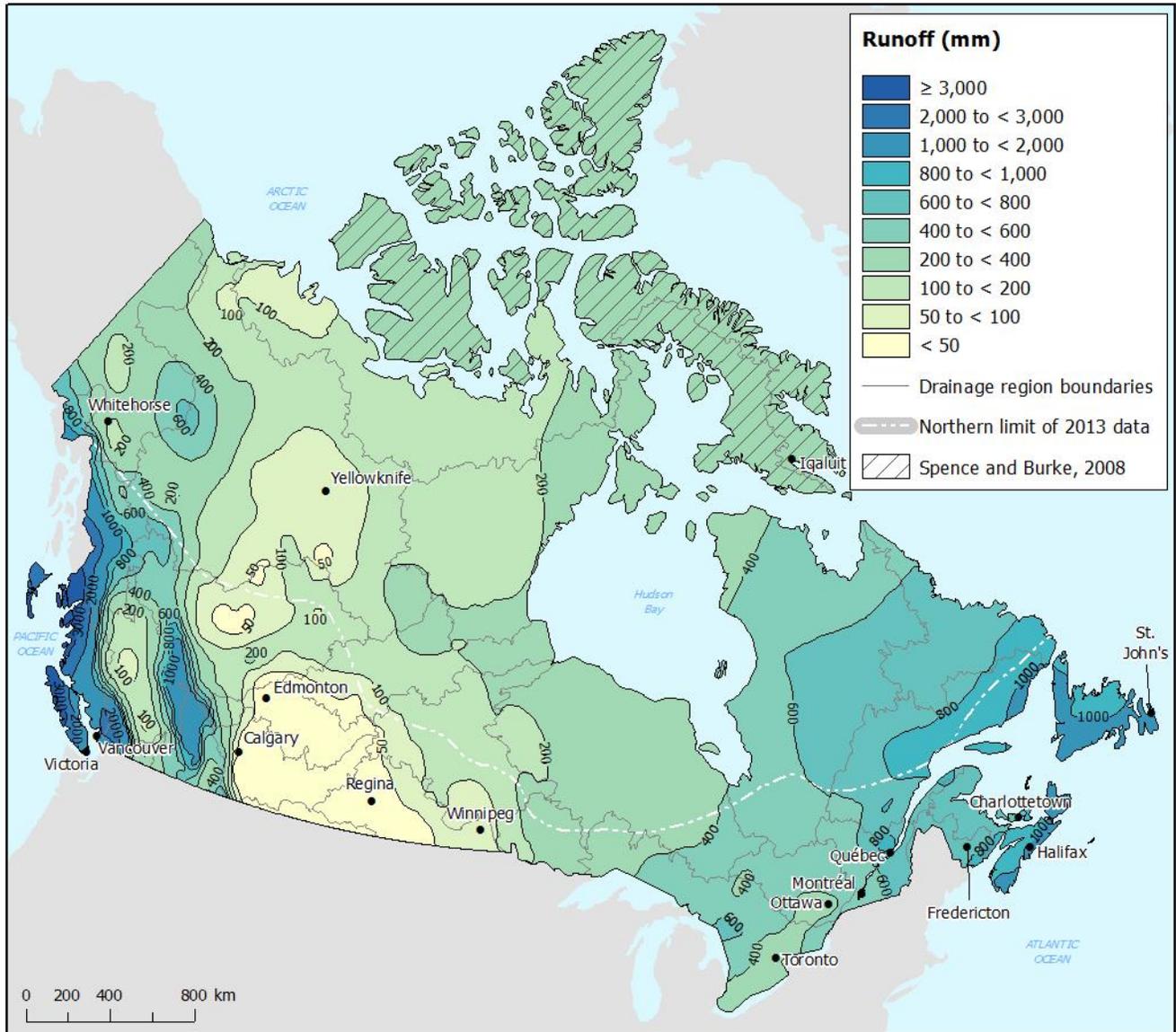
According to a new study in *Human Activity and the Environment*, the annual water yield averaged 3,478 km³ from 1971 to 2013. This yield represents, on average, 104,000 m³ for every single Canadian.

This huge volume of freshwater varies from year to year, by season and across different regions of the country.

[Click here to access the full publication.](#)



Map 1 – Average annual runoff in Canada, 1971 to 2013



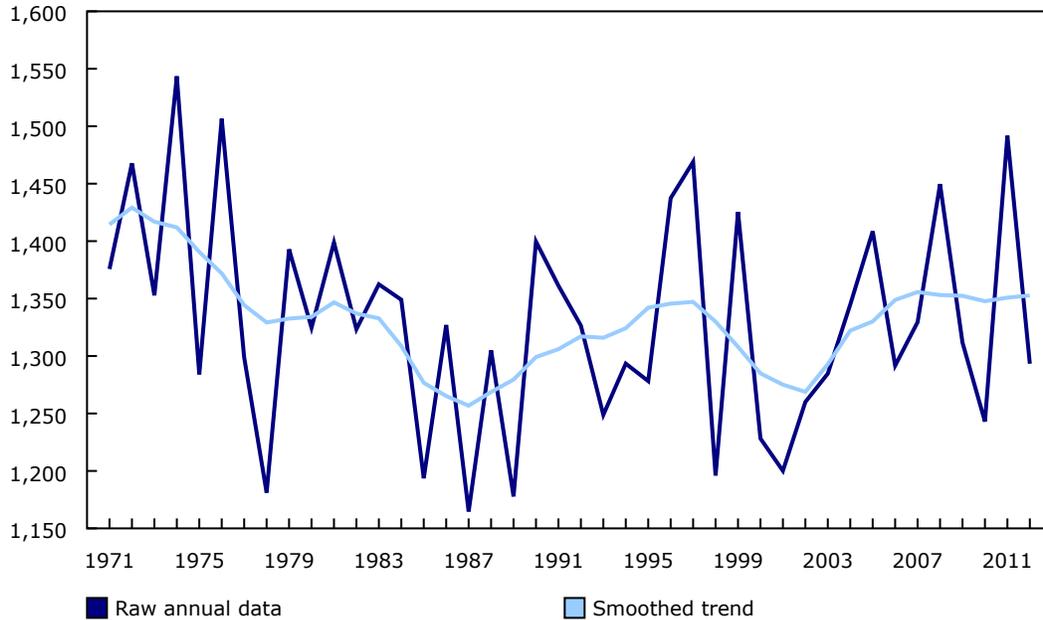
Note(s): Runoff data were derived from discharge values from hydrometric stations with natural flows for the period 1971 to 2013 below the boundary delineated on the map and 1971 to 2004 above the boundary line with the exception of the Arctic Islands where estimates were taken from Spence and Burke, 2008.

Source(s): Statistics Canada, Environment, Energy and Transportation Statistics Division, 2017, based on data from Environment and Climate Change Canada, 2015, *Water Survey of Canada, Archived Hydrometric Data (HYDAT)*, www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=4EED50F1-1 (accessed December 3, 2015); Spence, C. and A. Burke, 2008, "Estimates of Canadian Arctic Archipelago runoff from observed hydrometric data," *Journal of Hydrology*, Vol. 362, pp. 247–259.

The annual water yield in southern Canada has fluctuated over time, from a high of 1,544 km³ in 1974 to a low of 1,165 km³ in 1987. In 2012, the total volume of freshwater flows was 1,294 km³.

Chart 1
Annual water yield, southern Canada, 1971 to 2012

cubic kilometres



Note(s): Data points for the smoothed trend are provided only to understand what is represented by the smoothed trend line.

Source(s): Statistics Canada, Environment, Energy and Transportation Statistics Division and Business Survey Methodology Division, 2017, based on data from Environment and Climate Change Canada, 2015, Water Survey of Canada, Archived Hydrometric Data (HYDAT), www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=4EED50F1-1 (accessed December 3, 2015).

The highest flows generally occur in spring and early summer. The median monthly water yield for southern Canada from 1971 to 2013 peaked at 218 km³ in May, before dropping to 76 km³ in August. The lowest came in February with a median flow of 50 km³.

Yield lowest on the Prairies

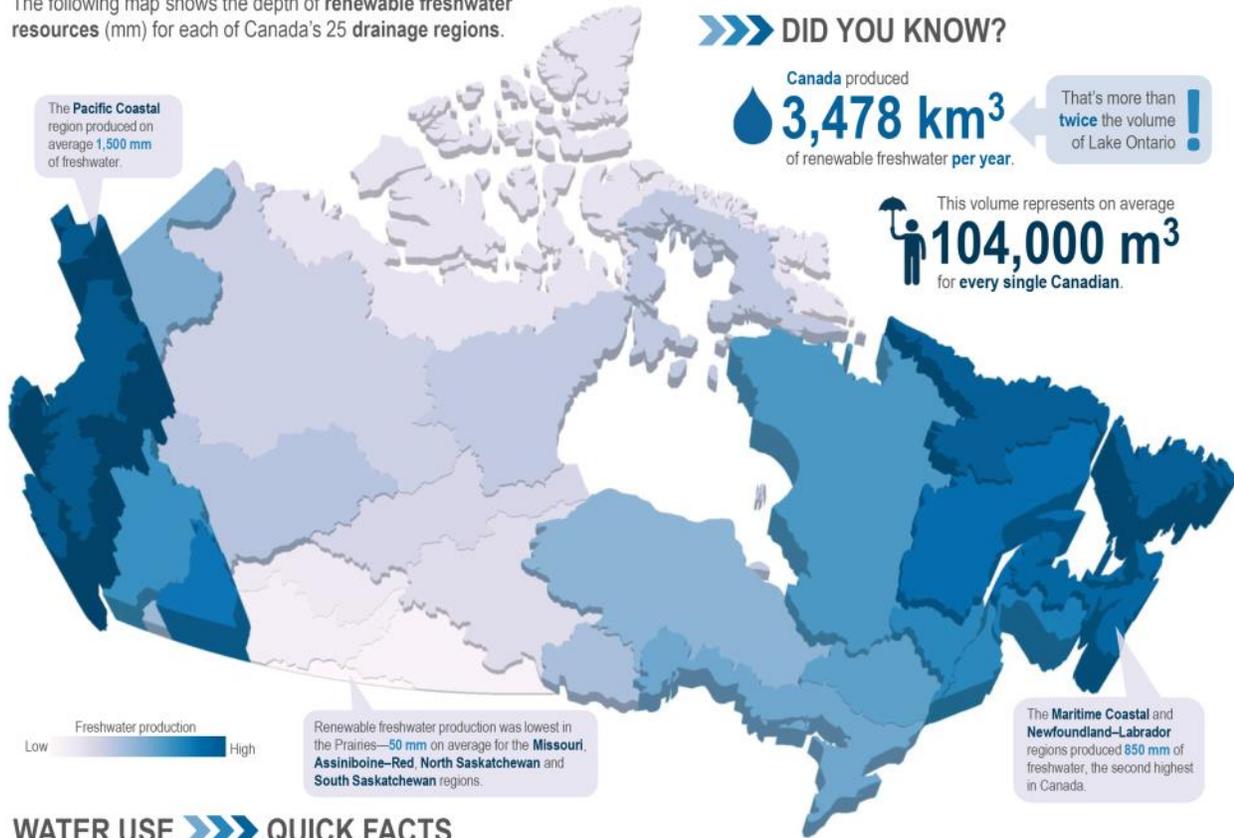
The annual average water yield corresponds to a depth of 349 mm across the entire country. This yield ranges from 50 mm on average across the Missouri, Assiniboine–Red, South Saskatchewan and North Saskatchewan drainage regions in the Prairies to 1,500 mm in the Pacific Coastal drainage region of British Columbia.

Infographic 1 – Freshwater in Canada: A look at Canada's freshwater resources from 1971 to 2013

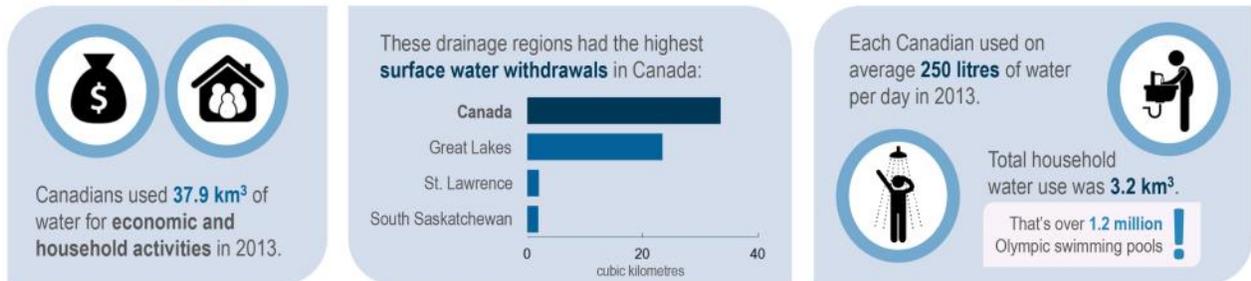
FRESHWATER IN CANADA

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



Statistics Canada, 2017, "Freshwater in Canada," *Human Activity and the Environment*, Catalogue no. 16-201-X.

Water yields in the Okanagan–Similkameen and the Assiniboine–Red drainage regions are the most heavily influenced by spring flows. In these areas, the median water yields for April, May and June accounted for about three-quarters of the annual flows over the 1971-to-2013 period for both the Okanagan–Similkameen and the Assiniboine–Red.

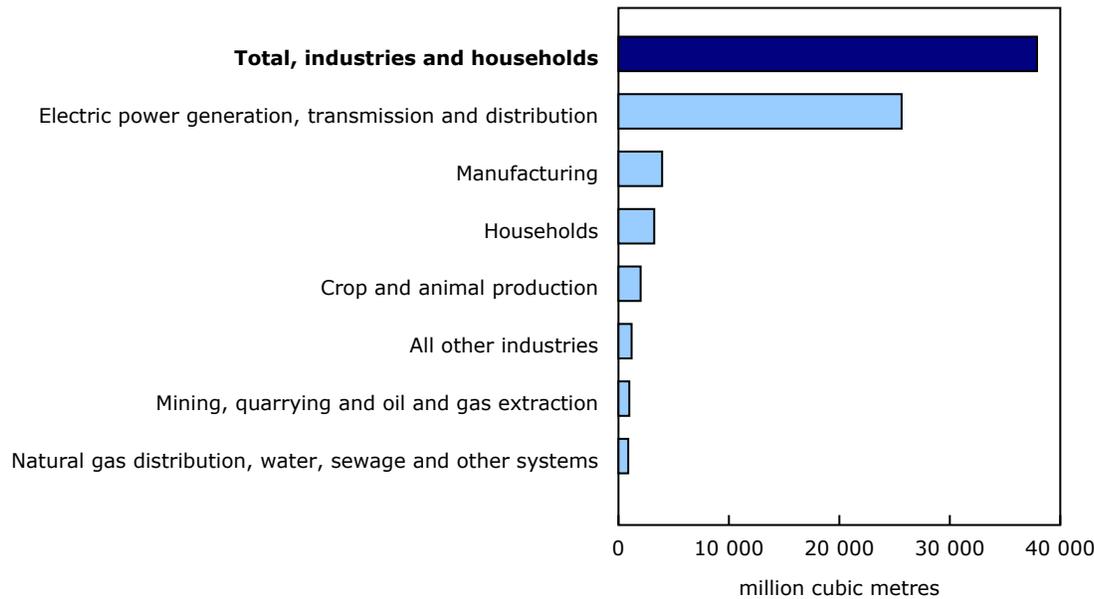
The monthly water yield is most variable in the Assiniboine–Red, Missouri, Okanagan–Similkameen and the South Saskatchewan drainage regions. Periods of high or low flows can create water management challenges.

Canadian households conserving more

In 2013, Canadians withdrew 37.9 km³ (or 37,892 million m³) of water for economic and household activities. Although some of this water was consumed—for example, lost to evaporation or included in products—the majority was returned back to the environment after use.

The main water user in 2013 was the electric power generation, transmission and distribution industry (68%), followed by manufacturing (10%), households (9%), agriculture (5%) and mining and oil and gas extraction (3%).

Chart 2
Water use by sector, 2013



Note(s): Water use by the electric power generation, transmission and distribution industry does not include water use for hydro-electric power generation. Water use estimates for the natural gas distribution water, sewage and other systems industries include water loss and leakages through water treatment and distribution systems. Mining, quarrying and oil and gas extraction includes the coal mining, metal ore mining, non-metallic mineral mining and quarrying, oil and gas extraction and support activities for mining and oil and gas extraction industries.

Source(s): Statistics Canada, CANSIM Table 153-0116 (accessed February 9, 2017).

Total household water use was 3.2 km³ in 2013, down 16% compared with 3.9 km³ in 2005. On a per capita basis, water use has fallen from approximately 330 litres each day in 2005 to 250 litres each day in 2013, in part due to improvements in the water efficiency of toilets and appliances.

Tracking water use related to the production of goods and services through to the end-user shows that households were responsible for 53% of total water use in 2013, followed by the production of goods and services for export at 30%.

Power generation drives intake

Surface freshwater intake was highest (23.5 km³) in the Great Lakes drainage region—these withdrawals accounted for 70% of the Canada total in 2013 and were mostly due to water intake for thermal-electric power production. Surface freshwater intake totalled 2.0 km³ in the St. Lawrence, 1.9 km³ in the North Saskatchewan and 1.5 km³ in the South Saskatchewan drainage regions.

Challenges in balancing water demand to water supply tend to peak in late summer. The highest surface water intake to water yield ratios for August 2013 occurred in the Assiniboine–Red and in the Great Lakes drainage regions, followed by the South Saskatchewan and Okanagan–Similkameen. Higher intake to yield ratios point to a higher possibility for water shortages, conflicts between competing uses, and the potential for insufficient instream flows for ecosystem requirements.

Links to climate

Canada's freshwater supply is affected by ongoing changes in precipitation and temperature patterns associated with climate change. For example, average annual temperature increased 2.6°C in the Mackenzie and 1.9°C in the Northwestern Forest climate regions in northern Canada from 1948 to 2015, causing some permafrost thawing and thereby modifying the hydrology of these areas.

Note to readers

This edition of [Human Activity and the Environment](#) provides updated statistics on freshwater supply and demand. The report also includes highlights, maps, charts and tables for each of Canada's 25 drainage regions.

Water yield is an estimate of freshwater runoff into streams and rivers and provides information on Canada's renewable freshwater supply. These estimates are derived from data on the monthly volume of unregulated flows in Canada's rivers and streams. Note that this estimate of renewable freshwater can include some non-renewable water (for example, melt-water from receding glaciers).

These estimates provide measures of the stock of renewable freshwater in Canada, a useful denominator against which to analyse the flows of water to and from the economy such as intake and discharge by industry and households.

Because there are fewer stations in northern Canada, only the long-term average annual water yield is publishable for these regions—data quality was insufficient to derive the monthly water yield or the change over time. Users should be aware of data limitations in instances where finer resolution or more precise data may be required. For more information see "[The water yield for Canada as a 30-year average \(1971 to 2000\): Concepts, methodology and initial results](#)," (16-001-M, no. 7).

Water use estimates exclude water used for hydro-electric power generation. Water use by final demand attributes water use related to the production of goods and services to the end-user of that product rather than to the producer.

Surface freshwater intake estimates cover thermal-electric power plants, manufacturing, mining, drinking water plants and irrigation. They exclude the oil and gas industry and withdrawals from groundwater and marine waters.

These data are part of the Environmental Accounting Program, which follows the United Nation's statistical standard System of Environmental–Economic Accounting.

Geography

Drainage regions are a variant of Statistics Canada's [Standard Drainage Area Classification 2003](#). This classification groups 974 sub-sub-drainage areas representing all land and interior freshwater bodies into 25 drainage regions. These drainage regions can be further grouped according to their outflow into one of five ocean drainage areas: the Pacific Ocean, Arctic Ocean, Gulf of Mexico, Hudson Bay or Atlantic Ocean.

Southern Canada is a statistical area delineated by a [boundary](#) separating the northern from the southern portion of the country.

Chat with an expert

The public is also invited to [chat with an expert](#) about this release, on Friday, March 24, 2017, from 2:00 to 3:00 p.m., Eastern Time.

The study "Freshwater in Canada " is now available in *Human Activity and the Environment, 2016 (16-201-X)*.

Spatial data files for the average runoff in Canada and drainage region boundaries can be downloaded from the article and are also accessible from the [Geographic products](#) page of our website. They can also be accessed as web services on the Government of Canada web site [Open Maps](#). See: [Average annual runoff in Canada](#) and [Drainage regions of Canada](#).

For analytical information or to enquire about the concepts, methods or data quality of this release, contact François Soulard (613-882-8603, francois.soulard@canada.ca) or Jennie Wang (604-362-8125; jennie.wang@canada.ca), Environment, Energy and Transportation Statistics Division.

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