



Environmental Trends

Canadian Environmental Sustainability Indicators Newsletter

Attention: The Canadian Environmental Sustainability Indicators (CESI) initiative is transitioning to Environment Canada's new subscription service. If you would like to continue your subscription to the CESI newsletter or would like to become a new subscriber, please **click here**.

Research Corner

Environment Canada releases new water levels indicator

Water levels vary from year to year, based on location and weather conditions. Some areas of Canada have been drenched in water with prolonged rains this year, while other areas have experienced dry conditions. Headlines such as "Alberta floods force evacuations, close road" and, after a dry period, "Water levels return to normal (Ontario)" paint completely different pictures of the state of Canada's freshwater levels.

To shed some light on the state of water in Canada, Environment Canada's (EC) [Canadian Environmental Sustainability Indicators](http://www.ec.gc.ca/indicateurs-indicators) (CESI) initiative has developed a new [water levels indicator](http://www.ec.gc.ca/indicateurs-indicators). This indicator provides a regional, national, and international perspective on how much freshwater Canada has.

Tracking water levels

The new indicator reports on water levels in Canada's drainage regions (comprising 25 of Canada's major rivers). The indicator classifies water levels as **low**, **normal**, or **high**, by comparing levels observed in 2007 and over the past 10 years (1998–2007) with levels observed over the past 30 years (1978–2007), using percentiles¹.

A low rating applies to readings below the 25th percentile. Normal ratings are those in the 25th to 75th percentiles, and high ratings are anything above the 75th percentile, relative to the 30-year average. In other words, if the average readings are in the 25th percentile, then the rating is low.

¹ Percentiles can be explained as the value of a variable below which a certain percentage of observations (in this instance, water-level observations) falls.



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Water is a basic necessity of life, not only for people but for every type of plant and animal. EC's CESI indicators report on the state of water in Canada

Visit our website at
www.ec.gc.ca/indicateurs-indicators.

In 2007, water levels were normal in 17 of 21 drainage regions (see map) and high in four regions: Churchill, Lower Mackenzie, Lower Saskatchewan–Nelson and North Saskatchewan.

Although most regions had overall normal readings in 2007, there was still variability for individual stations in those areas (see Figure 1 for percentage monitoring stations by drainage region). Lower-than-normal water level conditions were observed at some monitoring stations in 15 drainage regions. The Great Lakes, St. Lawrence, and Winnipeg regions recorded generally low water levels at more than 25% of the monitoring stations (see Figure 1).

Data between 1998 and 2007 show largely normal water levels in most drainage regions compared with water levels over the past 30 years (1978–2007), see Figure 2. Regions with high water levels exceeded those with low water levels, except in 2001 and 2003.

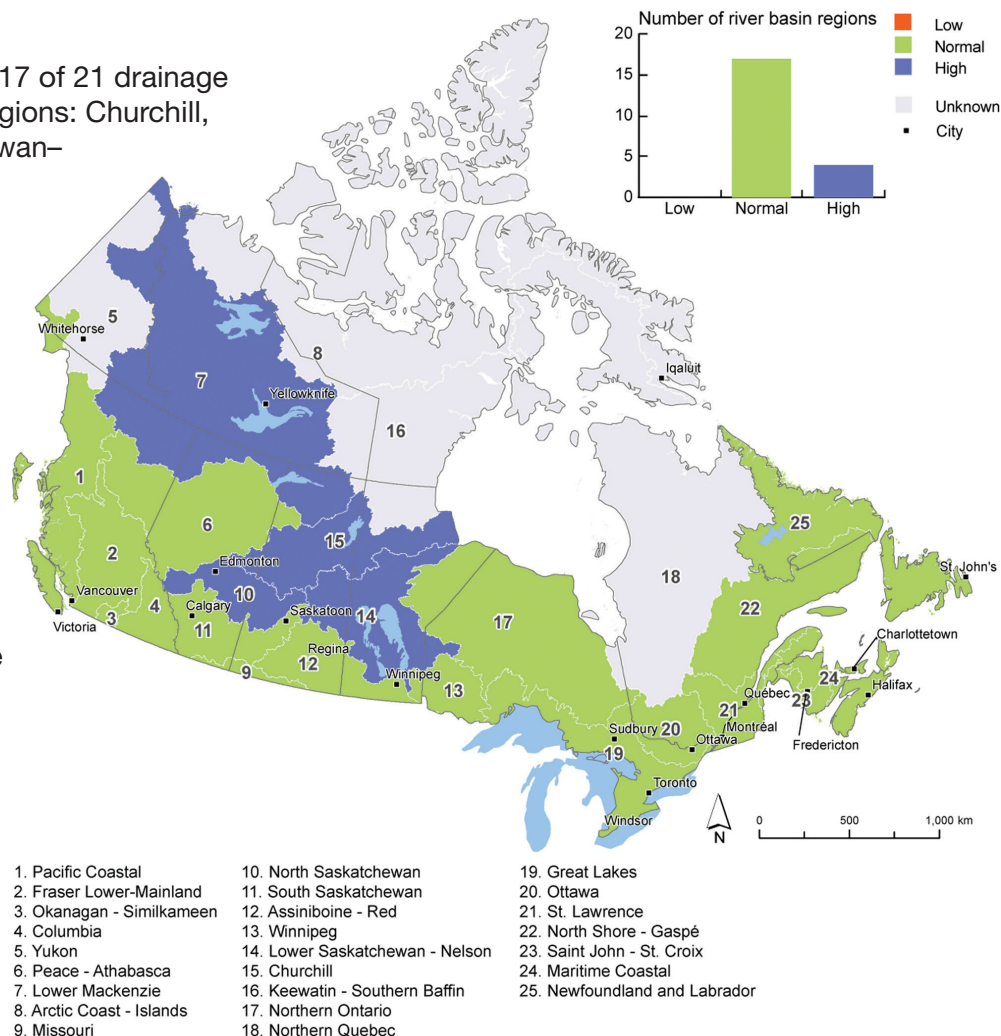


Figure 1 Monitoring Stations By Drainage Region.

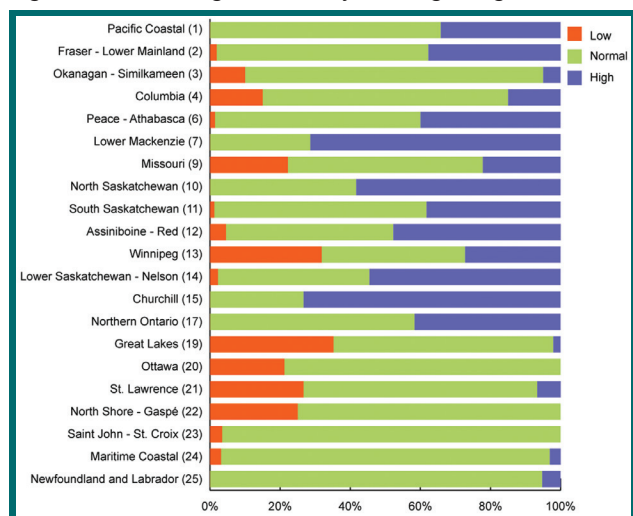
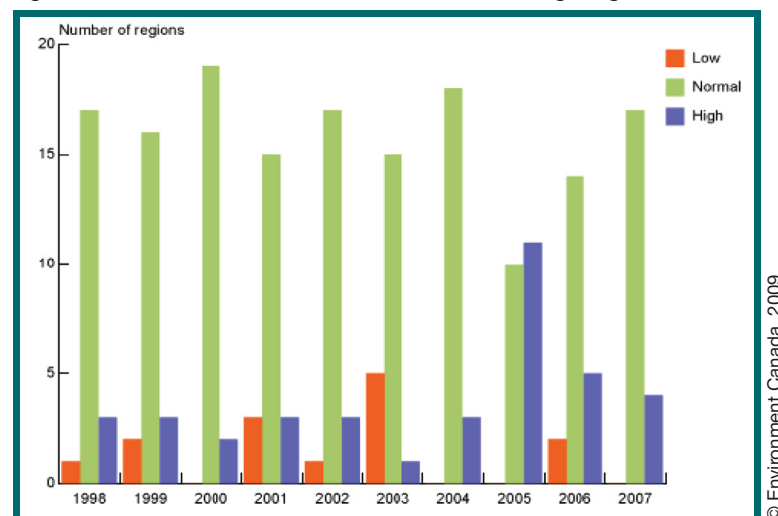


Figure 2. Water level conditions of Canada's drainage regions, 1998–2007.



Fast Facts

- The CESI initiative has a new water levels indicator.
- Water levels from 1998 to 2007 were normal in most of Canada's 25 drainage regions compared with water levels over the past 30 years.
- Canada ranks second among industrialized nations for total amount of renewable water and first for amount of renewable water per person.

Water usage within Canada

Canada, the second-largest country among the ten leading industrialized nations examined, has the second-highest total amount of renewable water and the highest amount of renewable water per person.

About 44 billion cubic metres of water are withdrawn each year from Canada's lakes, rivers and groundwater sources. Of this amount, almost 5.5 billion (5500 million) cubic metres are not returned to their lake or river of origin. The power-generation industry, including nuclear and coal-fuelled electricity generating stations, withdrew the most water, at about 63%, but it returned all but 3% of the freshwater it took from the environment.

The agriculture sector withdrew about 10%, low compared with other sectors but consumed close to 3.5 billion (3542 million) cubic metres, or 74% of the water withdrawn, most of it for irrigation. Irrigation is used in food producing regions where precipitation is low or highly variable.^{2,3}

For more detailed information on water levels, go to www.ec.gc.ca/indicateurs-indicators/

Measuring Canada's water levels

Did you ever wonder how Environment Canada (EC) gets the data it uses to produce environmental indicators? Data used to develop the new Water Levels Indicator (WLI) are generated from water monitoring stations across the country. Digital recorders are installed alongside rivers and lakes, and each station

uses sensors to detect water levels, which are recorded using data loggers.

At more than 2700 sites across the country, sensors in the water take daily readings of water levels. Some sites are seasonal and operate only part of the year, but most operate year-round, even in cold climates. The recorders can function in temperatures of -40°C.

Once the digital recorders capture the water-level readings, data are sent by satellite, telephone line, or direct download to the Water Survey of Canada (WSC). Technicians regularly visit the water-monitoring stations to check that equipment is running properly in the appropriate location. They visit monthly to semi-annually to maintain equipment and measure water flow.

Real-time technology has helped to improve operating efficiency through the continuous monitoring of the sensors at remote stations. It has also allowed for efficient scheduling of repair and maintenance visits.

Demand for real-time hydrometric data is growing. Daily decisions involving dam and reservoir operations depend on real-time data. These decisions are taken to manage water quality and water supply in the many towns and cities that depend on surface water sources. Flood forecasting centres and hydropower companies rely on such data to prepare accurate and up-to-date forecasts.⁴

Technicians frequently verify data for accuracy. To do this, safety-trained technicians wade into the water body, hang over a bridge or work from a boat to measure a



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Canada has only 0.5% of the world's population, but its rivers and lakes account for 7% of the world's renewable freshwater.

direct water level, to confirm that the loggers are taking accurate readings. Manual readings are also used during winter for locations where water in rivers or lakes freezes. In these cases, holes are drilled in the ice to obtain measurements.

Digital recorders do more than measure water levels. At the 2700 sites, they are also used to measure other useful indicators such as air and water temperature, water velocity, and the amount of precipitation.

The data from all 2700 sites is stored in a database and "verified" to remove data entry errors. CESI works with WSC to select verified sites and compile data that represents how water is distributed across Canada. The result is 878 sites are chosen across Canada, from the Pacific to the Arctic to the Maritime coast. Coverage is greater in southern Canada where the majority of the population lives. The WSC also has extensive data for Nunavut,

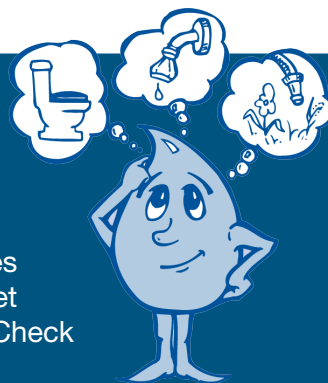
² Environment Canada, Threats to Water Availability in Canada Report

³ Beaulieu et al, 2007

⁴ Environment Canada. The Hydrometric Network. August 24, 2010. www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=E228B6E8-1

Fun Facts

- Toilets are the single greatest water users in Canadian households.
- Replacing an old toilet that uses 18 litres per flush with an ultra-low-volume (ULV) model that uses six litres per flush can cut indoor water use by 30%. Eighteen litres per flush, assuming four flushes per person per day, translates into nearly 30 000 litres of clean freshwater used per year. A 6-litre flush toilet uses only 10 000 litres to do the same task and produces less wastewater. Check EC's **Wise Water Use** page for more tips.
- More than half the water applied to lawns and gardens is lost from evaporation or run-off caused by overwatering. As a rule, most lawns and gardens only need about 2 to 3 centimetres (1 inch) of water per week.
- Did you ever wonder how much water you use? Find out using **EC's Water Use Calculator!**



the Northwest Territories and Yukon (check out www.wateroffice.ec.gc.ca for all the WSC's data).

Calculating water levels

Data for the 878 sites are grouped by drainage regions, which essentially represent the country's 25 biggest river basins.

CESI calculates water levels in three ways:

- Daily water level readings at individual stations are compared to historical readings for this particular calendar day over the past 30 years. For example, January 1, 2007 is compared to all January 1 dates between 1978-2007. The daily water level is then classified as low, normal, or high based on the water level percentile.

- Annual water levels are determined by reviewing the daily classifications (low, normal or

high) and assigning the site the classification most often observed throughout the year.

- Water level categories for each drainage region are determined by adding the number of stations within each category (low, normal or high). Again, the most observed category defines the category for the river basin region.

Your feedback is important to us!

Send us your feedback on the CESI initiative. We also welcome your input on topics you'd like us to cover in future issues of this newsletter.

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Freshwater lakes and rivers, ice and snow, and underground aquifers hold only 2.5% of the world's water. By comparison, saltwater oceans and seas contain 97.5% of the world's water supply.

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CESI was launched in 2004, in response to the recommendation made by the National Round Table on the Environment and the Economy in 2003 that the federal government establish a core set of environmental and sustainable development indicators to track key factors of importance to Canadians. Environment Canada, Statistics Canada and Health Canada work together to develop and communicate these indicators and to present related information on society and the economy to policy makers and the Canadian public, in collaboration with provincial and territorial partners.

For more information about CESI indicators, go to www.ec.gc.ca/indicateurs-indicators or Contact: indicateurs-indicators@ec.gc.ca.