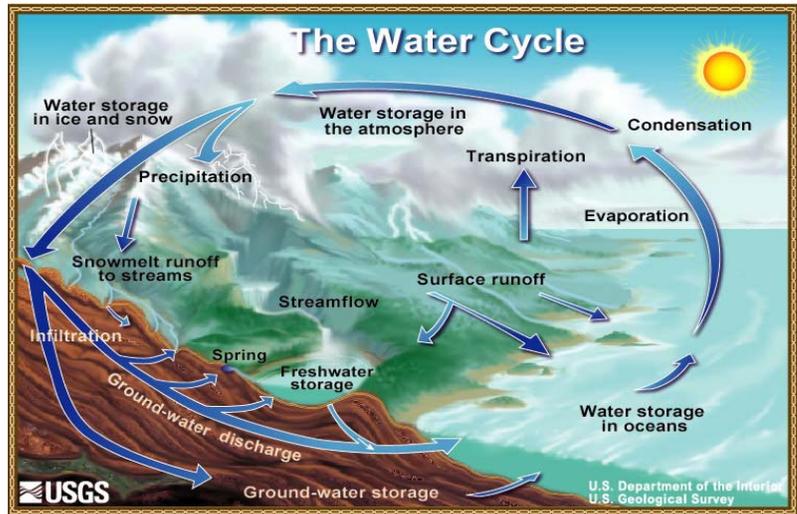


Sustainable Water Resources

Clean water is one of the world's most precious resources. Even in Canada, bottled water sells for more than gasoline. As a resource, water is increasingly threatened by pollutants and irrigation. As a global commodity, what most Canadians take for granted is hotly disputed and increasingly rare.

Understanding "sustainable" water requires an understanding of the water cycle and the maintenance of the integrity of each of the components which contribute to sustaining the water quality required for a healthy global ecosystem:

- Freshwater components
 - surface freshwater (ponds, lakes, rivers, dams, etc.)
 - groundwater the elements/process of sustainable recharging
 - rain water quality/quantity affected by healthy land cover and atmospheric constituents
 - ice fields which release and distribute freshwater slowly
- Sustainable utilization of oceans
 - Reduce toxic marine dumping and spills.
 - Sustain natural near shore vegetation to prevent shore line erosion and water quality for marine inhabitants
 - Reduce noise pollution affecting marine mammal communications
- Impacts of human activity
 - Reduced wasteful utilization practices
 - Reducing waste impacts in recycling process (human, farming, industry)
 - Maintain healthy land cover/wetlands water cleansing
 - Maintain healthy forests for atmosphere cleansing (clean rain, reduce Climate change impacts on weather)
 - Clean smokestack outputs to reduce acid rain related ecosystem impacts
 - Reduce green house gas emissions (automobiles, factories, farms, etc.)



Overview of the Water Cycle <http://ga.water.usgs.gov/edu/watercyclegraphichi.html>

"Hot" Issues:

- Maintaining the healthy quality and adequate quantity of Potable Water for growing population across Canada
- Maintaining the health quality and adequate quantity of Potable Water for growing farm animal production across Canada
- Maintaining an adequate quantity of water for increased renewable hydroelectric energy production to meet the demands of a growing population across Canada
- Implementing secondary and tertiary waste water treatments in towns, cities and on factory farming operations
- Evaluation of quality and quantity of ground water sources across Canada
- Maintaining wetlands and forest areas critical to ground water replenishment
- Maintaining lake and river water quality across Canada
- Implementing potable water services in First Nations Communities
- Cleanup of buried waste and hydrocarbon carrying infrastructure and removal of abandoned facilities

Key players:

- Environment Canada is responsible for the National Water Research Institute (<http://www.nwri.ca>), Canada's preeminent and largest freshwater research facility which has two key centres: the Canada Centre for Inland Waters (CCIW, <http://www.nwri.ca/cciwdesc-e.html>) in Burlington, Ontario and the National Hydrology Research Centre (NHRC, <http://www.nwri.ca/nhrdesc-e.html>) in Saskatoon, Saskatchewan;
- Parks Canada are responsible for managing large bodies of water found in Canada's National Parks: <http://www.pc.gc.ca/>;
- Indian Affairs and Northern Canada are responsible for managing large tracts of Northern Canada where most water resources are found: <http://www.ainc-inac.gc.ca>;
- International Joint Commission (IJC) is responsible for waters that straddle the Canada-US border, particularly the Great Lakes and upper St-Lawrence www.ijc.org/en/home/main_accueil.htm;
- Provincial Government Natural Resources Ministries are responsible for managing resources under Canada's constitution, particularly rivers, lakes and forests; one example can be found in Manitoba, which has adopted a provincial water strategy: <http://www.gov.mb.ca/waterstewardship/waterstrategy>;
- Provinces in some cases cooperate closely with municipal organisations for water conservation. In Ontario, a network of 36 Conservation Authorities form the only community-based environmental protection agencies in the province. They have also served as a model for other provinces: Conservation Ontario <http://www.conservation-ontario.on.ca/projects/projects.htm>;
- NGOs (Ducks Unlimited, Fish & Game Associations, etc.) are increasingly active in protecting natural areas from pollution and development, in particular wetlands, which play a critical role as natural water filters;
 - Ducks Unlimited (Wildlife and habitat conservation NGO): <http://www.ducks.ca/>
 - Manitoba Water and Wastewater Association (water conservation NGO): <http://www.mwwa.net/>;
 - Alberta Fish and Game Association: <http://www.afga.org/>;
 - Ontario Federation of Anglers and Hunters: <http://www.ofah.org/index.cfm>;
- Provincial hydroelectric power corporations are responsible for managing water quantity and distribution by setting lake levels and managing river flows through private and publicly-owned dams:
 - Hydro Québec: <http://www.hydroquebec.com/>;
 - Ontario Power Generation: <http://www.opg.com/default3.asp>;
 - BC Hydro: <http://www.bchydro.com>;
- First Nations have outstanding claims to water rights and increasingly seek to have a voice in water policy:
 - Cree/Hydro-Québec Feasibility Study Group http://www.hydroquebec.com/eastmain1a/en/groupe_etude.html
 - Albertan experience: <http://www3.gov.ab.ca/env/water/wmrc/aborig.html>

Space and Sustainable Water Resources:

Space based EO is a critical tool for understanding water resources, particularly for:

- Overviews of water quantity and quality;
- Understanding and monitoring the water cycle, particularly atmosphere-ocean interaction and phenomena such as global warming;
- Evolution in large areas (watersheds) over time;
- Tracking desertification in third world;
- Monitoring vegetation and land cover evolution (particularly wetlands) in sparsely populated areas (Canada, Russia, Brazil) or in areas with difficult access (Russia, China);
- Identifying pollution sources in foreign countries.

The example below shows how space can track detrimental environmental impacts on Earth. Excessive irrigation along tributary rivers in the former Soviet Union has led to a dramatic shrinking of the Aral Sea.



The Aral Sea seen from a NASA space shuttle mission in 1985. (Image courtesy NASA)



The Aral Sea seen from the European Space Agency's MERIS instrument aboard the Envisat satellite in July 2003. (Image courtesy of ESA)

Issues for the CSA:

- Satellite EO and Communications systems for monitoring and sustainable management of the environmental resources across Canada in support of local and regional watershed ecosystem management;
- Supporting the development of EO systems for NGOs and First Nations to access, analyse and integrate EO information in their decision making efforts for sustainable water management;
- Developing community, regional, provincial and national awareness of the capabilities of EO data gathering and utilization to enhance the management of Canadian water resources;
- Support the development and deployment of next generation EO information services to cost effectively utilize multispectral and hyperspectral sensing systems;
- Satellite monitoring of cross-border water resource monitoring and waste disposal management.

Related themes:

Great Lakes - St. Lawrence
Climate Change & Variability
Environmental Factors Affecting Health
Biodiversity and Ecosystem Conservation
Data policy

References:***Basic Information***

Simple overview of the water cycle: www.epa.gov/region07/kids/wtrcycle.htm

Where does drinking water come from? www.epa.gov/region07/kids/drnk_b.htm

UNEP Vital Water Graphics <http://www.unep.org/vitalwater/>

Environment Canada. 2004. *Threats to Water Availability in Canada*. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 3 and ACSD Science Assessment Series No. 1. 128p. <http://www.nwri.ca/threats2full/intro-e.html>

Latest Update

Environment Canada: http://www.ec.gc.ca/water/e_main.html

A closer look

Manitoba water management policy example <http://www.gov.mb.ca/waterstewardship/waterstrategy/>

Municipal conservation in Ontario: <http://www.conservation-ontario.on.ca/projects/projects.htm>

Environment Canada. 2001. *Threats to Sources of Drinking Water and Aquatic Ecosystem Health in Canada*. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 1. 72 p. <http://www.nwri.ca/threats/intro-e.html>