

Agenda

Water in the News

- ▶ Shuniah landfill site
- ▶ Thunder Bay harbour

- ▶ **As of October 31, 2016, there were 133 Drinking Water Advisories in effect in 90 First Nations communities (Health Canada)**

Lecture: WATER SUPPLY AND WATER QUALITY



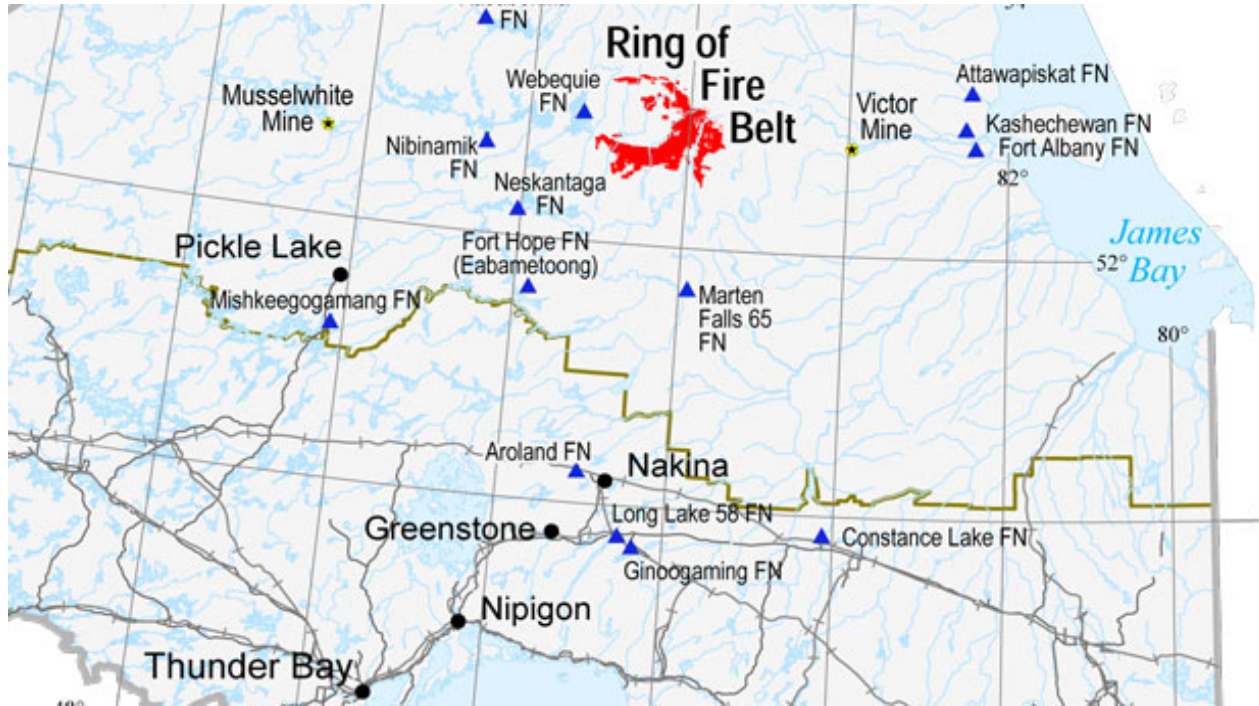
Water . . . in the news



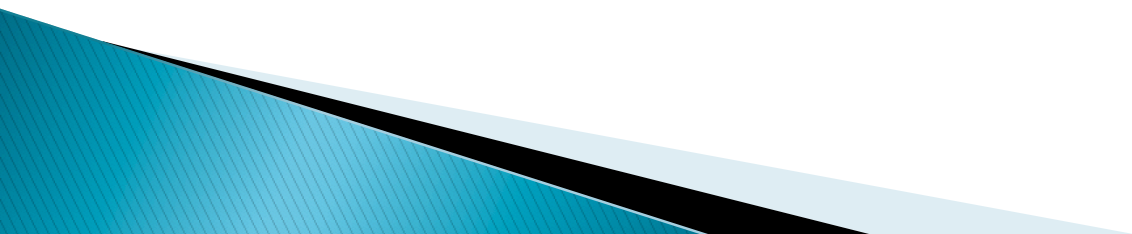
After completing substantial research, organizations involved in the Thunder Bay harbour cleanup are recommending that

"Birds of Annual Determination of Reproduction Problems" be removed from the list of local concerns. Thunder Bay's harbour was one of over forty environmental "Areas of Concern" around the Great Lakes in 1987.

Water . . . in the news



Neskantaga First Nation has been on a boil water advisory since 1995



WATER SUPPLY AND WATER QUALITY

1. Water Supply Management
2. Water Quality Management
3. Municipal Water Quality
4. Walkerton and related threats
5. Concerns and Threats to Drinking Water

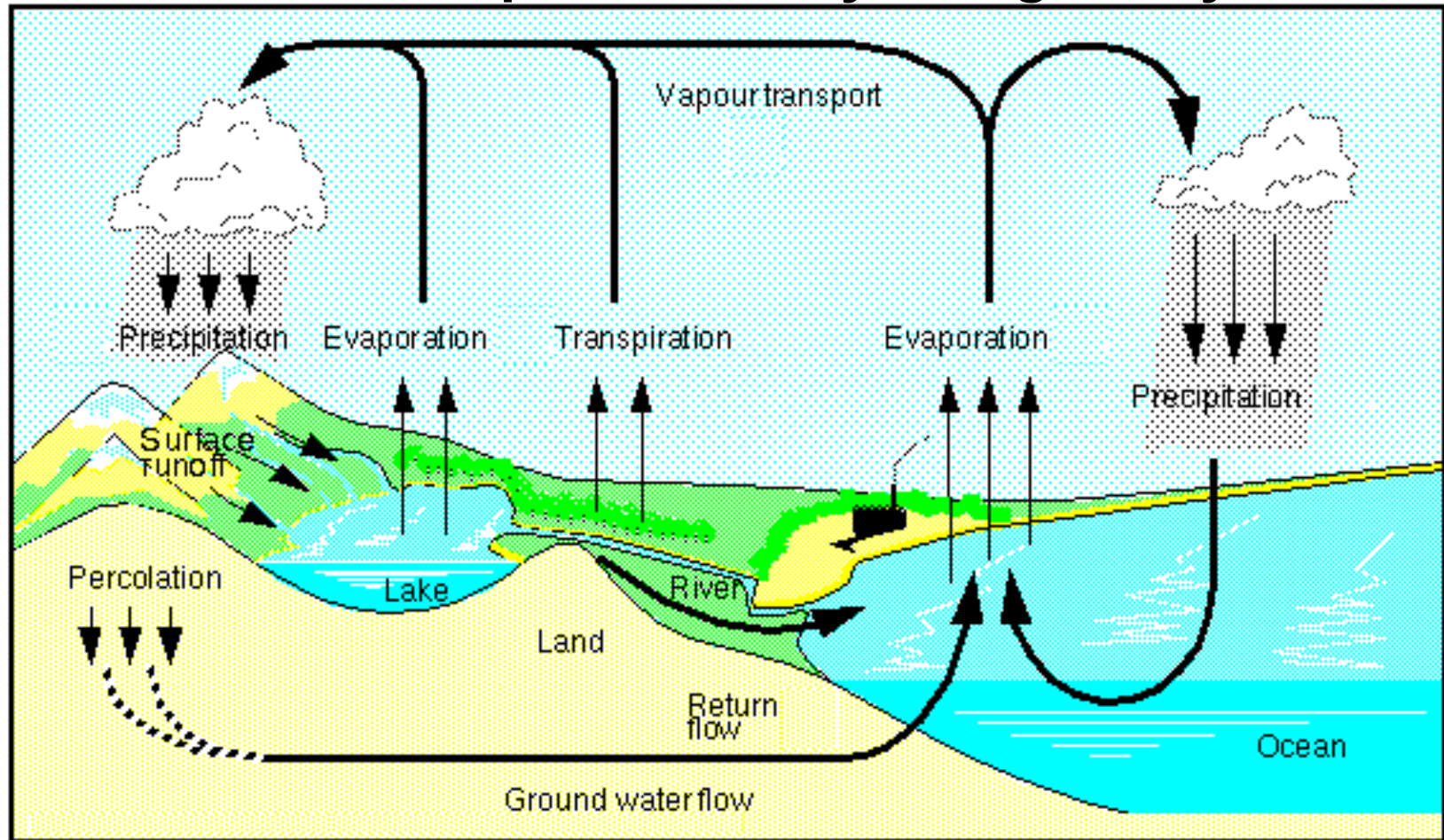
1. WATER SUPPLY MANAGEMENT

Water supply is the provision of water for different types of human use, such as drinking, domestic use, irrigation and urban-industrial supply.

Two basic issues are related to the balance between demand and availability and the quality of water:

- Supply is dependent on the physical principles of the hydrologic cycle
- Demand is related to
 - density of population
 - type of usage.

Basic Principles of the Hydrological Cycle



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

Total amount of runoff = a crude estimate per capita population

2. Water Quality Management

What determines water quality?

The water of even the healthiest rivers and lakes is not absolutely pure. All water (even if distilled) contains many naturally occurring substances:

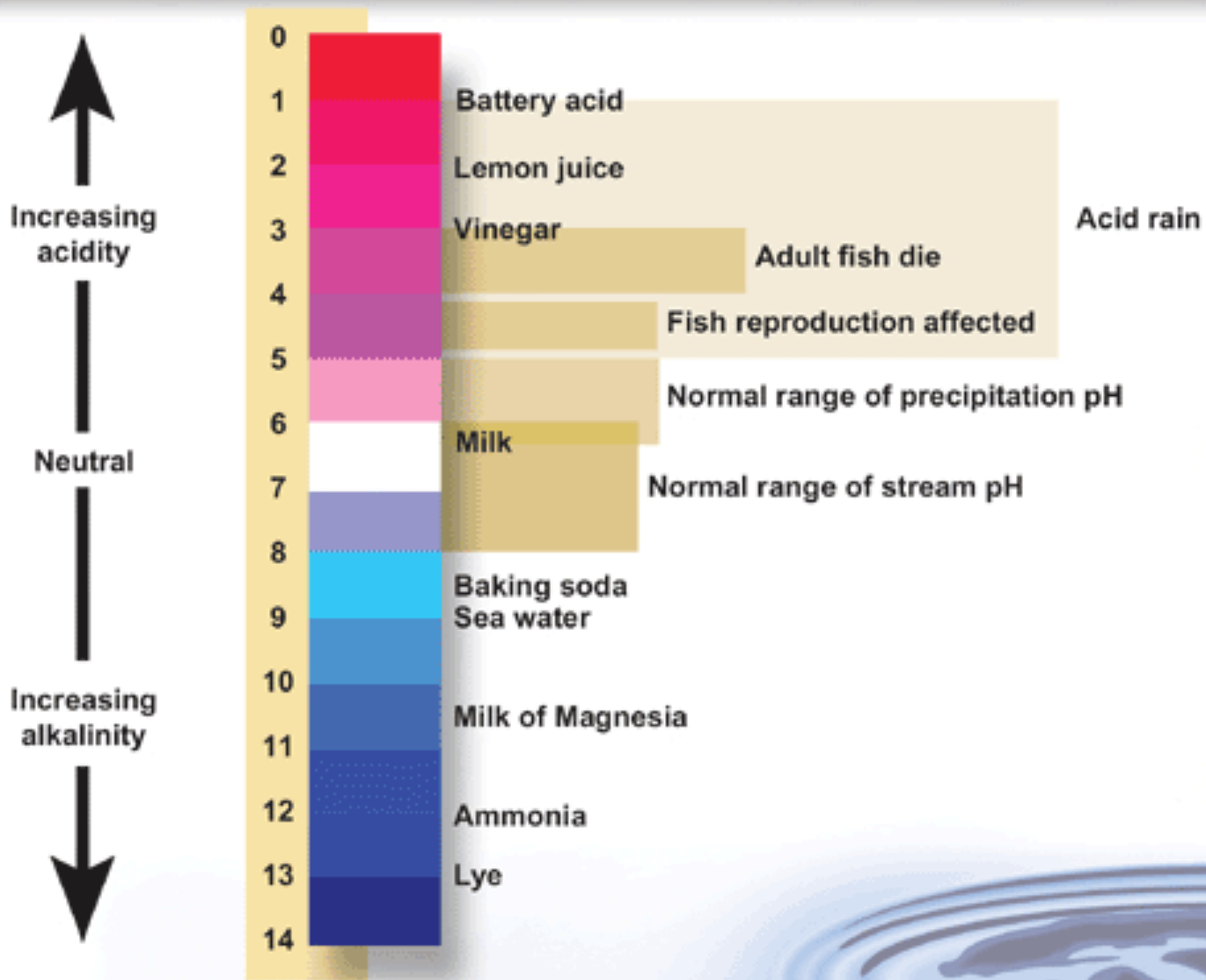
- bicarbonates
- sulphates
- sodium
- chlorides
- calcium
- magnesium
- potassium

How do we measure water quality?

Collect samples of the water, of living organisms, and of suspended and bottom sediments.

- pH
- temperature
- dissolved oxygen
- turbidity
- conductivity

The pH scale



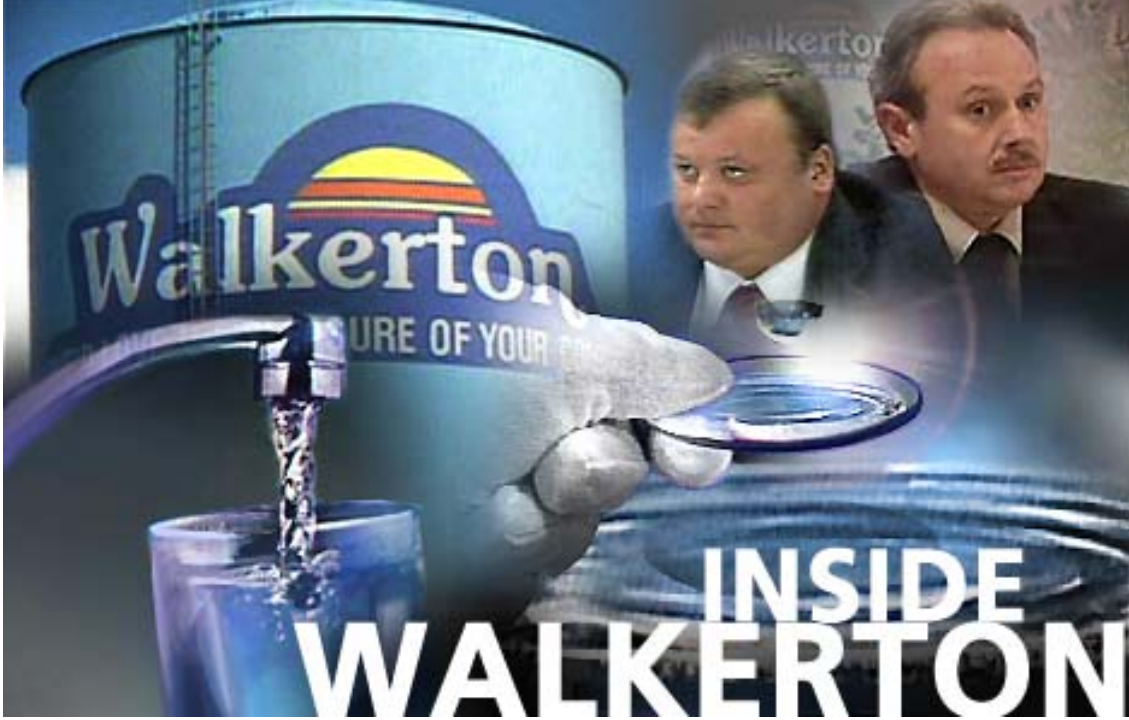
A sampling of water quality information

- Canadians with secondary treatment or better has improved from 40% in 1983 to 69% in 2009
- compared with 76% of Americans, 89% of Germans, and 99% of Swedes. •
- In developing nations, 80% of diseases are water-related.
- Of all Canadians, 31% rely on groundwater for domestic use.
- One drop of oil can render up to 25 litres of water unfit for drinking
- One gram of 2,4-D (a common household herbicide) can contaminate ten million litres of drinking water.
- One gram of PCBs can make up to one billion litres of water unsuitable for freshwater aquatic life.
- One gram of lead in 20,000 litres of water makes it unfit for drinking. Older homes often contain plumbing made of lead or soldered in lead, which can then leach into water
- The nitrates in fertilizers promote excessive growth of algae and larger aquatic plants, causing offensive algal blooms and driving out sport fish.
- Methane gas can often be seen bubbling up from the bottom of ponds; it is produced by the decomposition of dead plants and animals in the mud.

3. Municipal Water Quality

Three major issues of municipal water supply are:

1. drinking water quality
2. wastewater treatment improve quality
3. water demand management

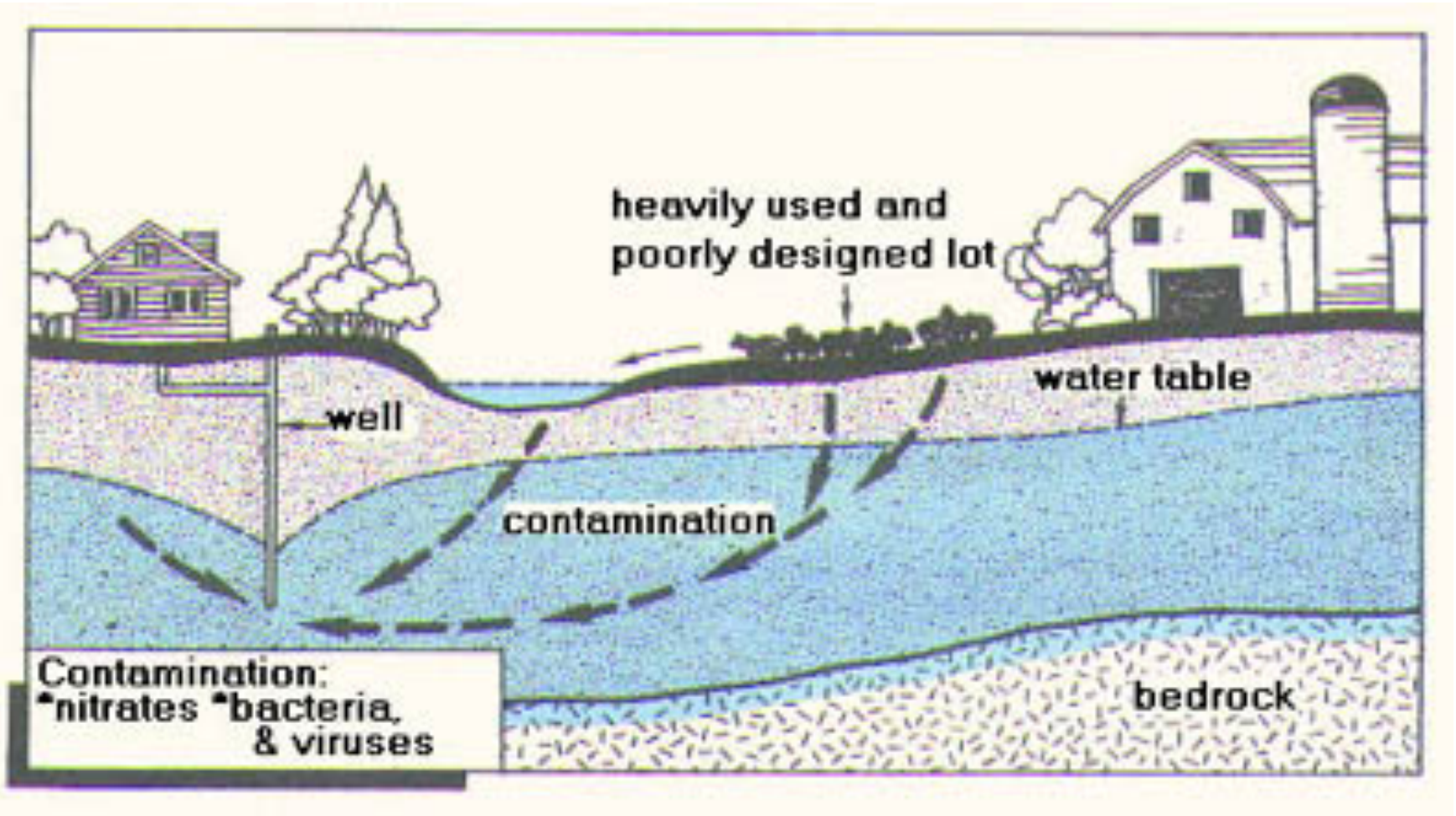


- Improper chlorine treatment
- Equipment being repaired
- Operators had insufficient training
- Private Co. falsified monitoring
- Provincial Monitoring inadequate

- May 2000
- Water supply contamination from E-Coli Bacteria
- 7 died and 2300 became ill
- E-Coli from manure on fields near water supply
- Shallow well and fractured bedrock
- Exacerbated by rainfall
- Farmer followed proper practices



ANIMAL LOTS



Water Quality Programs and the Multi-Barrier Approach

- Provincial governments have the primary responsibility for managing and protecting water quality, including the provision and regulation of drinking water and wastewater services
- The federal government is responsible for ensuring the safety of drinking water within areas of federal jurisdiction, such as national parks and Aboriginal reserves.
- The federal government also protects water quality by regulating toxic substances, conducting water quality research, and promoting pollution prevention.

A water system must be robust and resilient to change.

Multi-barrier Approach

1. Source: the best possible raw water quality should be maintained and protected
2. Treatment: effective treatment should be designed, operated and maintained
3. Distribution: secure storage and distribution of treated water should be provided
4. Monitoring: appropriate and effective monitoring should be performed
5. Response: appropriate and effective response to adverse monitoring or adverse circumstances are needed

Relationship of drinking water risk to water contamination challenge and treatments system resilience

