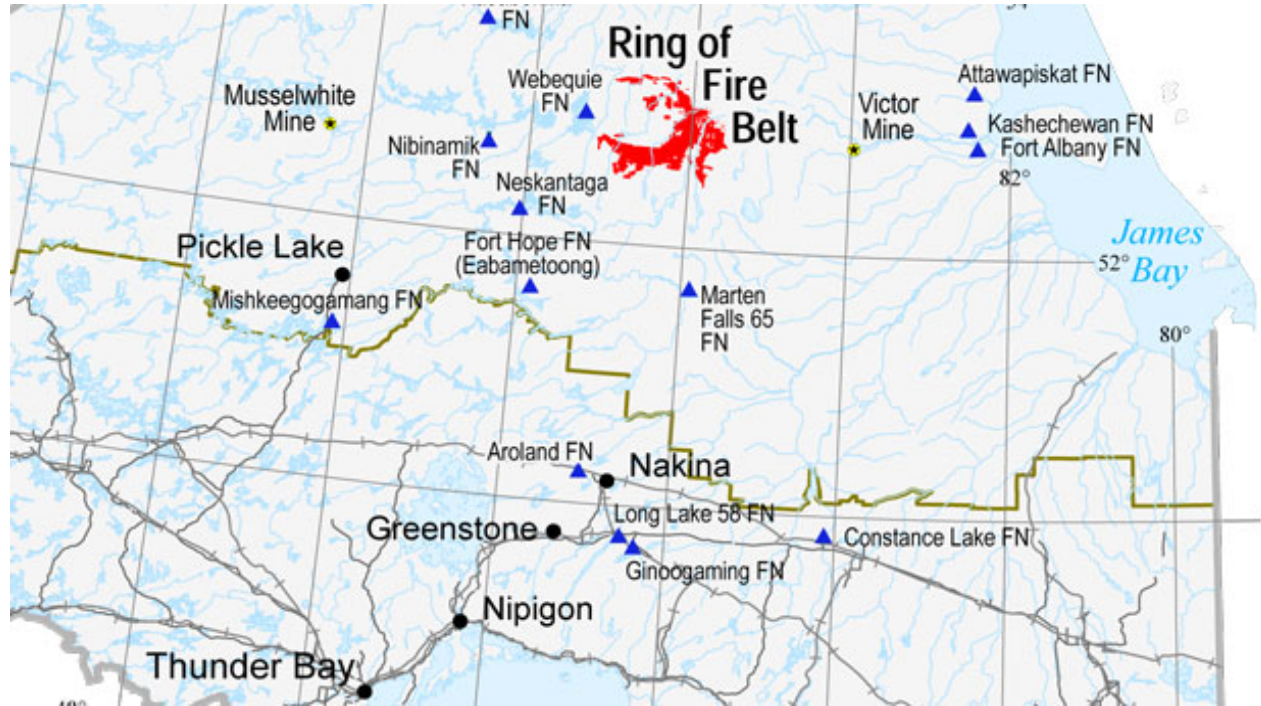


Agenda

- ▶ Field Trip
 - ▶ Water Treatment Plant (Drinking or Waste)
 - ▶ Water in the News

 - ▶ **WATER SUPPLY AND WATER QUALITY**
- 

Water . . . in the news



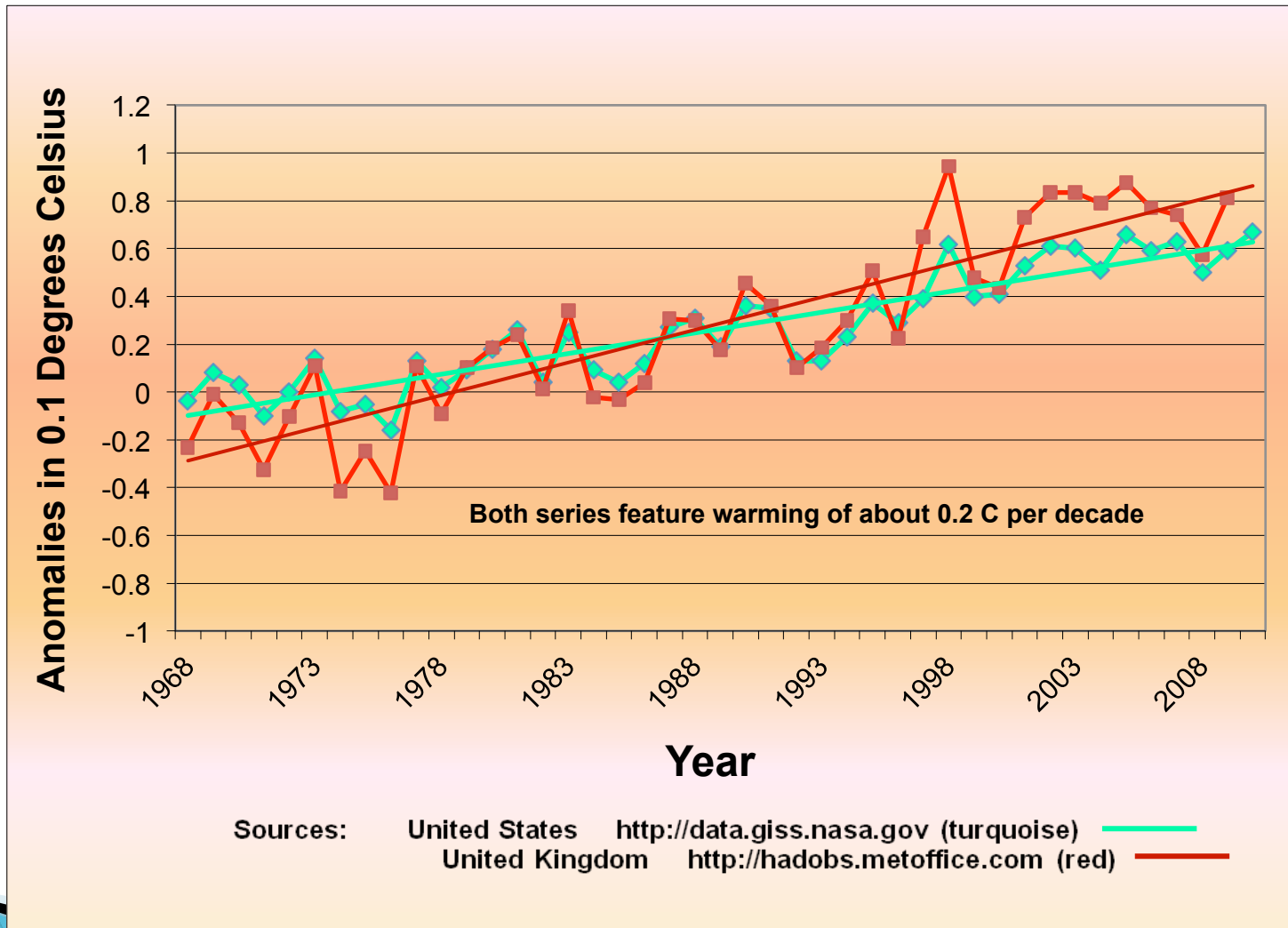
Neskantaga First Nation has been on a boil water advisory since 1995

Four main global surface temperature measurement datasets

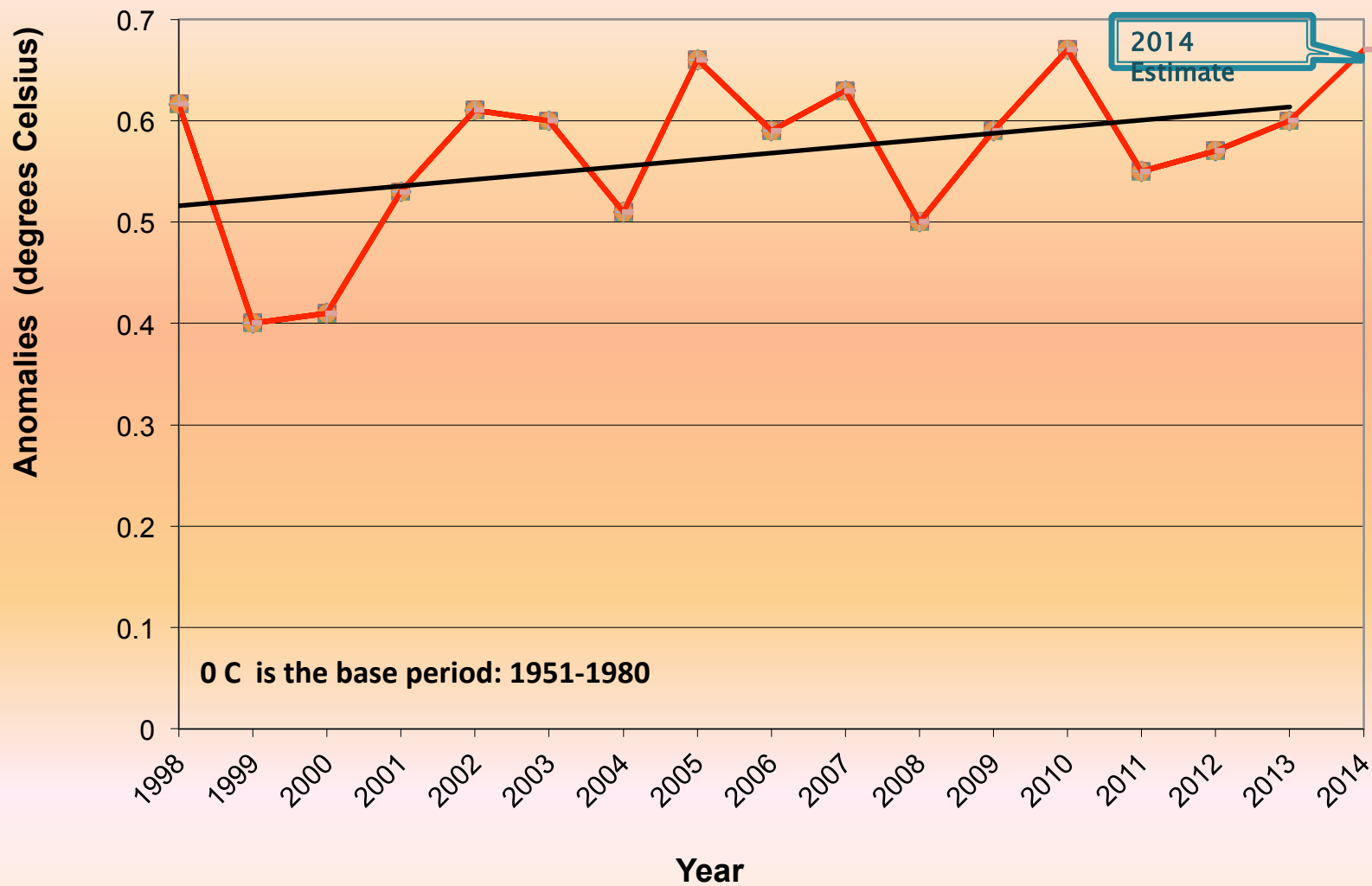
- ▶ HadCRUT4 86 per cent coverage
- ▶ NCDC 90
- ▶ GISTEMP 99
- ▶ JMA 85
- ▶ Satellite: University of Alabama

- ▶ Kriging: **Can we really extrapolate temperatures?**

Comparison of HadCRUT4 and GISTEMP



Global temperature anomalies: 1998-2014



Source: <http://data.giss.nasa.gov>

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

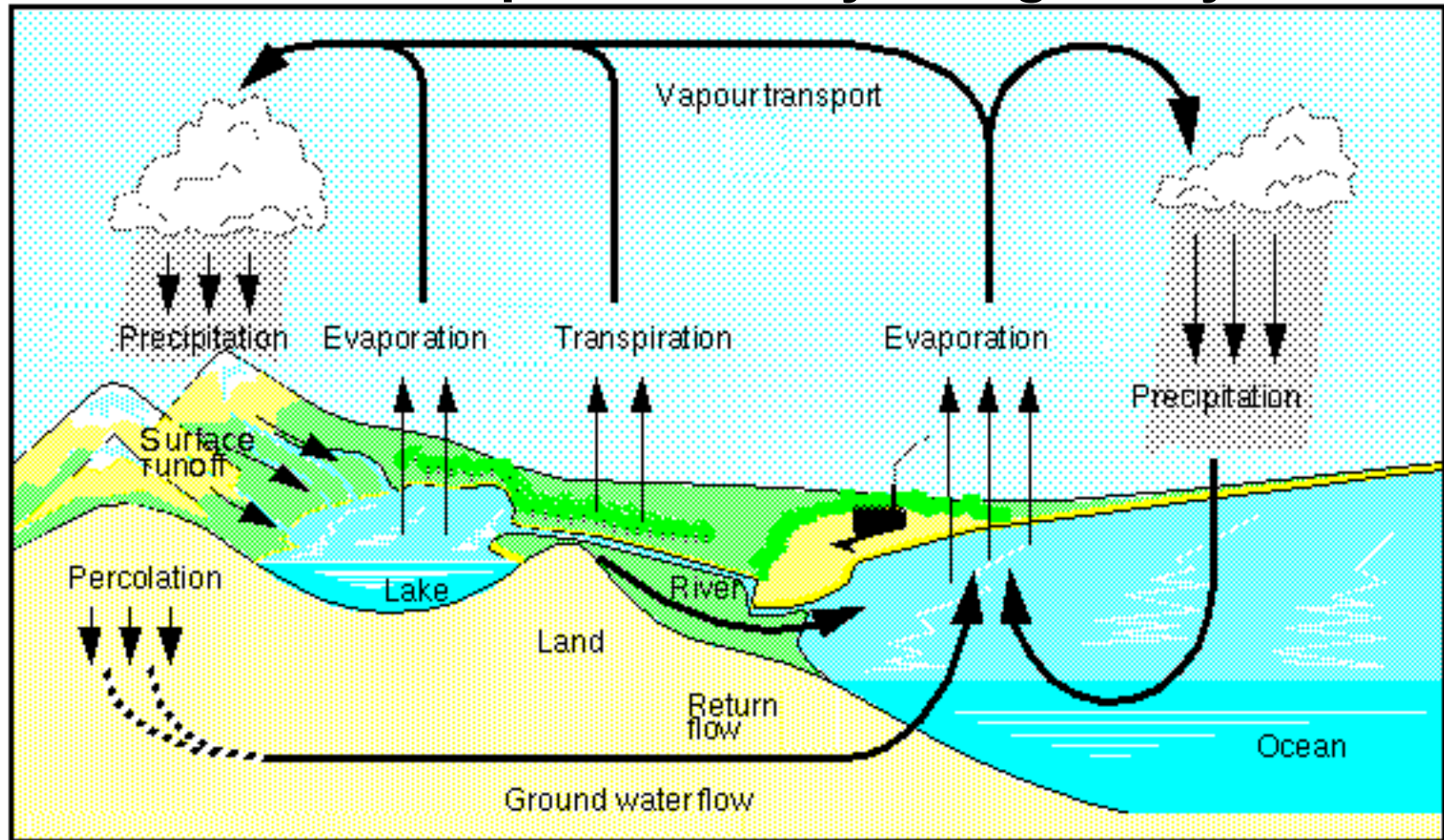
1. WATER SUPPLY MANAGEMENT

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:

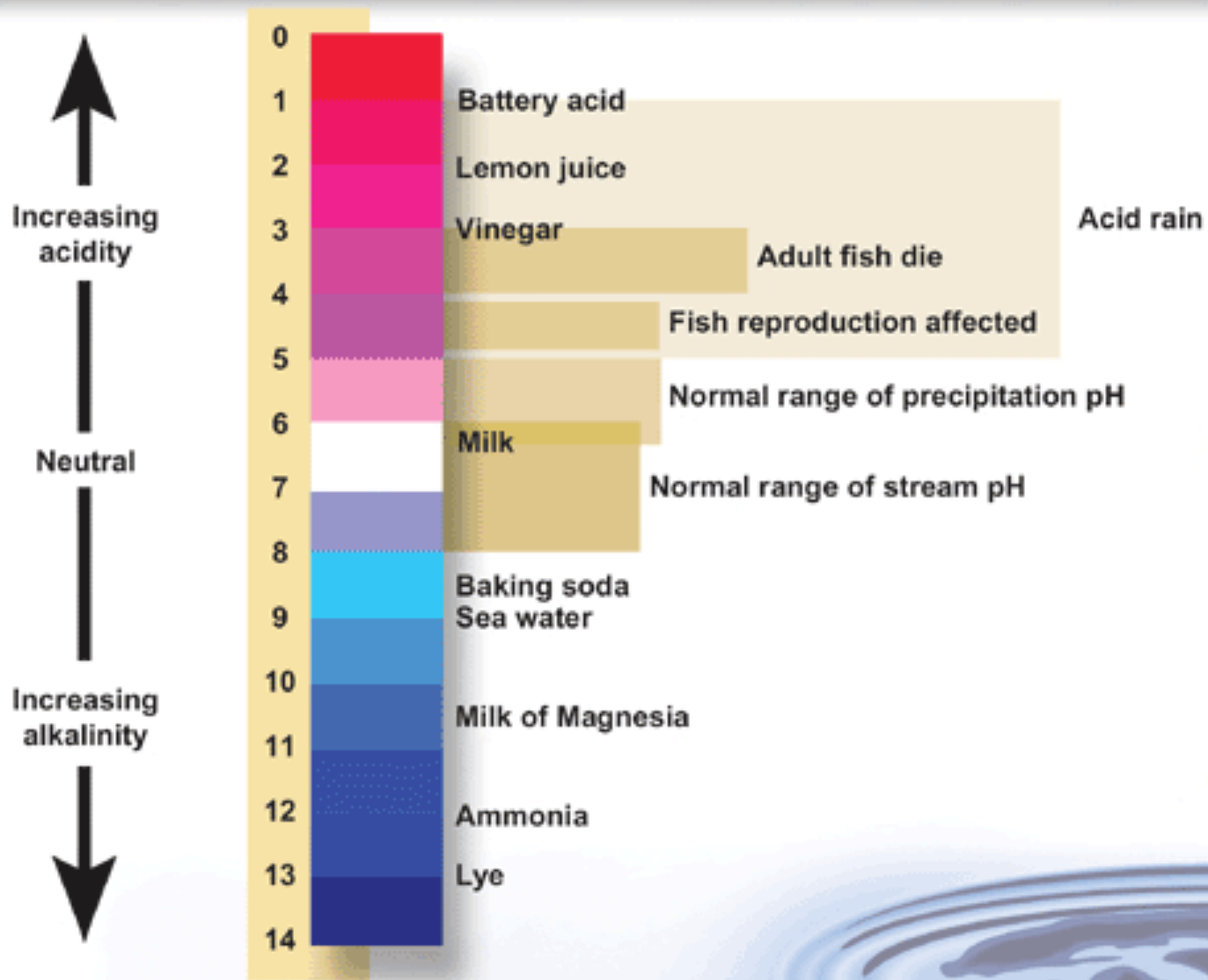
- bicarbonates
- sulphates
- sodium
- chlorides
- calcium
- magnesium
- potassium

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



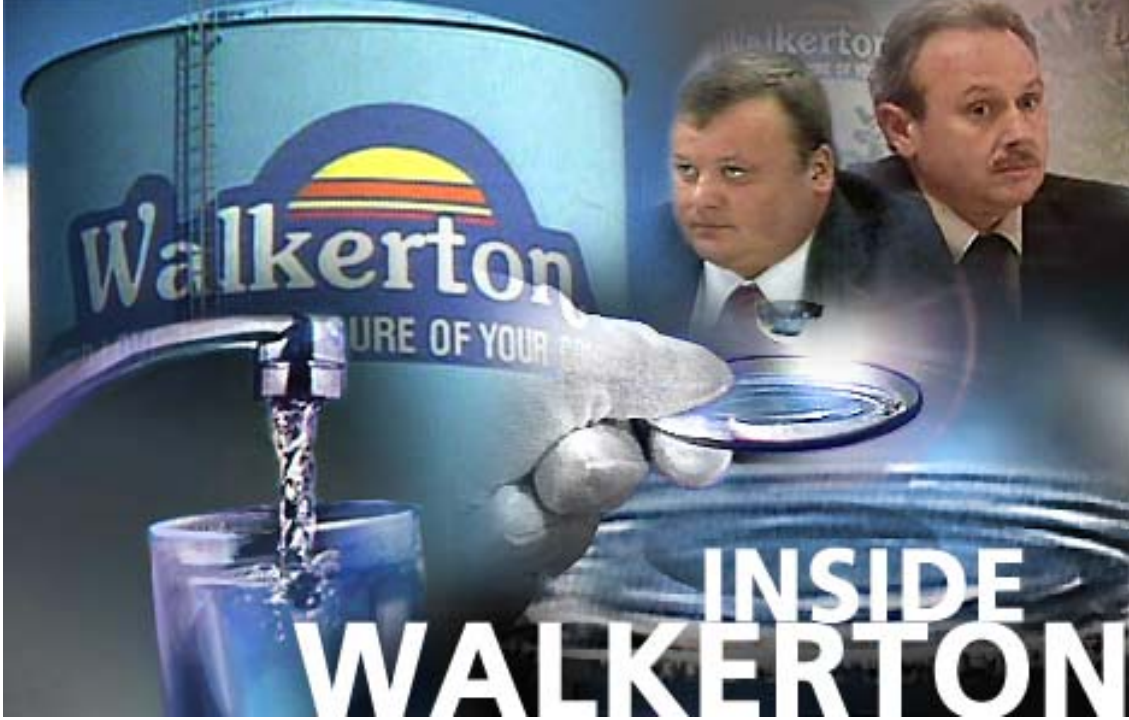
A sampling of water quality information

- Approximately 57% of Canadians are served by wastewater treatment plants, compared with 74% of Americans, 86.5% of Germans, and 99% of Swedes. •
- In developing nations, 80% of diseases are water-related.
- Of all Canadians, 26% 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

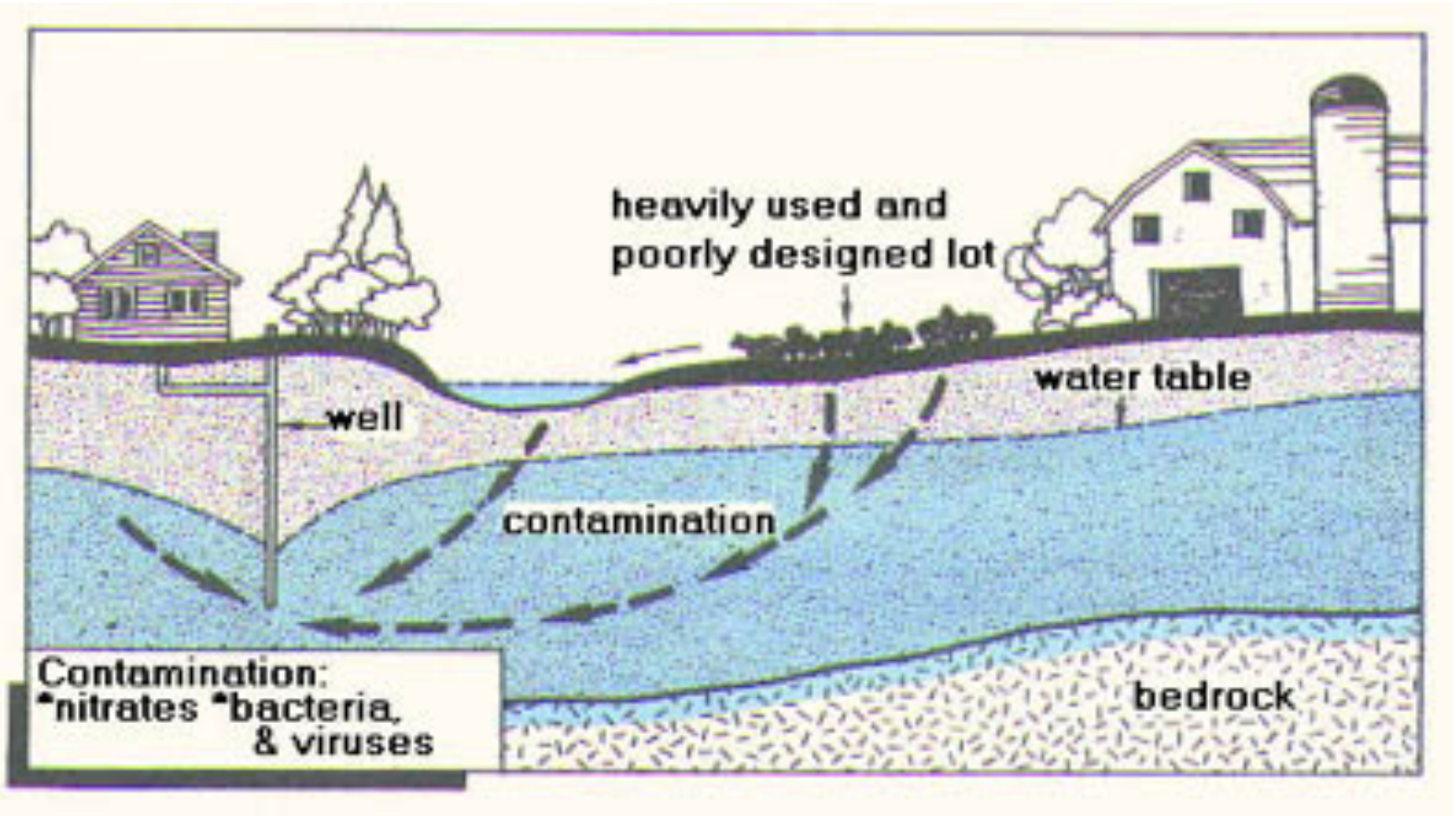


- Improper chlorine treatment
- Equipment being repaired
- Operators had insufficient training
- Private Co. falsified monitoring
- Provincial Monitoring inadequate



- 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

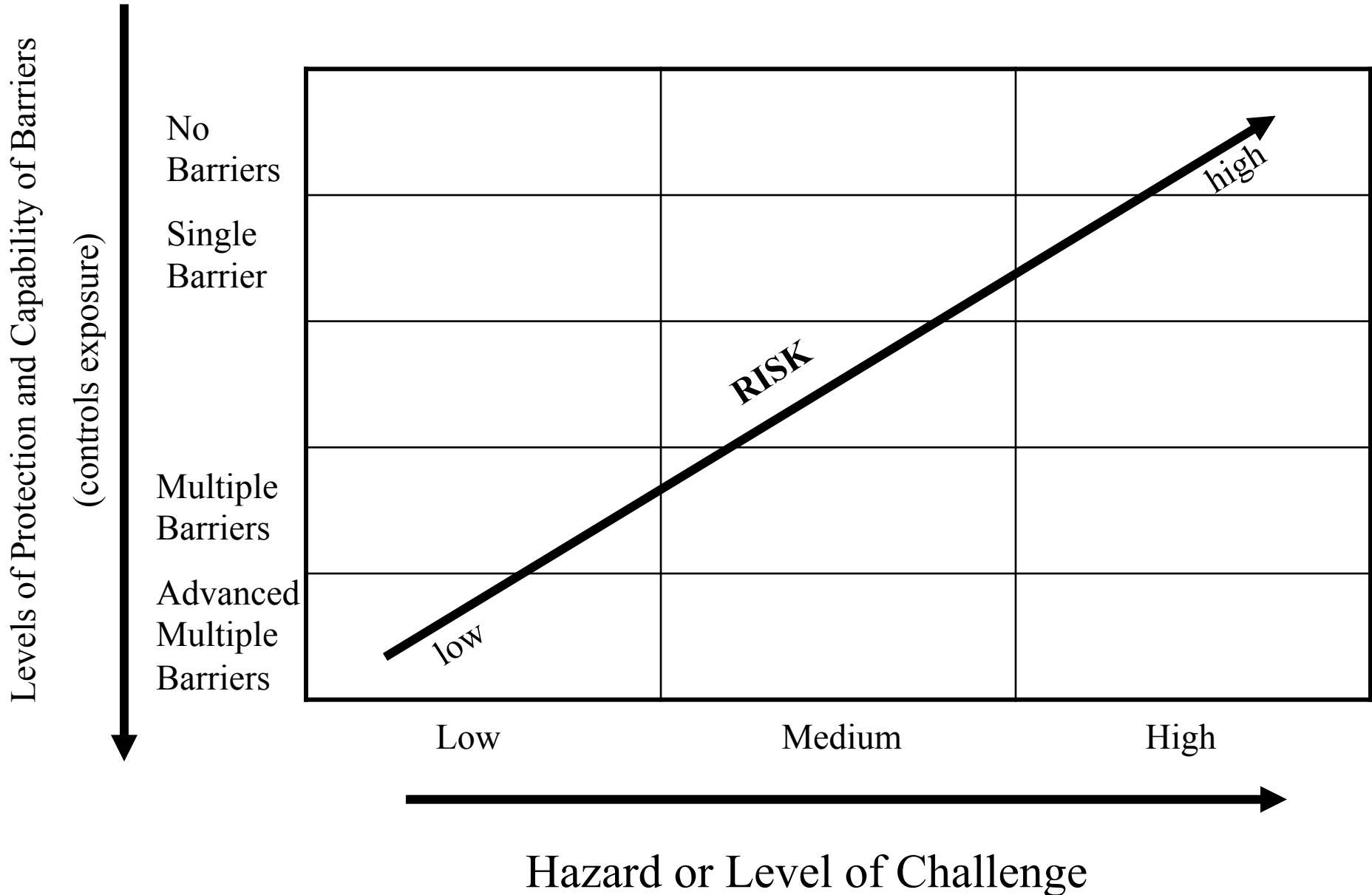
- Provincial governments have the primary responsibility for managing and protecting water quality, including the provision and regulation of drinking water and wastewater services
- The federal government is responsible for ensuring the safety of drinking water within areas of federal jurisdiction, 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



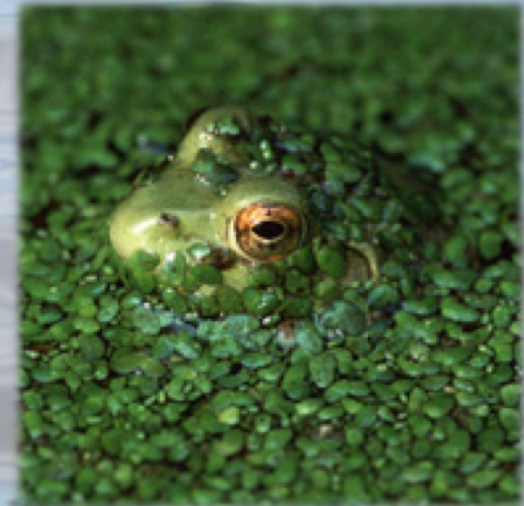
5. Concerns and Threats to Drinking Water

5. CONCERNS AND THREATS TO DRINKING WATER



Outline

- Introduction
- Pharmaceuticals and Personal Care Products
- Chlorine Byproducts (THMs)
- Waterborne Diseases
- Water Terrorism
- What Can We Do? / Future Outlook



Introduction

- Although Canadian water treatment and infrastructure is of the highest standards of the developed nations, they are not the only reliable safeguard to water quality.
- Many problems exist *within* and *beyond* the existing water management systems from a local, national and international scale.
- “Business As Usual” is not an option.
- Threats are still poorly addressed because of our common failure to understand the scope of the problem.

