Environment Canada's Water Quality Monitoring Programs and the National Automated Monitoring Network

The National Automated Water Quality Monitoring Team
Water Quality Monitoring and Surveillance Division
Environment Canada

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Real-time Water Quality Monitoring Workshop
Newfoundland and Labrador Department of Environment and Conservation,
Water Resources Management Division
June 4 & 5, 2007
St. John's, NL

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Outline

1. National Water Quality Monitoring Programs
2. National Automated Monitoring Network
   - Background
3. Integration between 1 & 2
4. Future direction of Automated Network

National Water Quality Monitoring Programs

- Automated Water Quality Monitoring Network
- Partner surface water Networks (Prov/Terr/Fed) for Status and Trend monitoring
- Monitoring on Federal lands (e.g. National Parks) and transboundary waters
- Partner in the CESI WQI Program
- National Surveillance Studies:
    - Pesticide Science Fund (PSF)
    - Waterborne pathogens, pesticides, and nutrients (partner in the NAESI program)
- First Nations Water Management Strategy (partner with INAC)
- Water Quality Sampling Manual and Training
- National Data Comparability and Interoperability
- Canadian Aquatic Biomonitoring Network (CABIN)

Automated Monitoring:
Environment Canada perspective

Why automated monitoring?

- To gather a time series of representative water quality data for trends, baseline, and early warning

- To use latest monitoring technologies available

- To employ near real-time communication capabilities for providing water quality information to managers and the public on the web

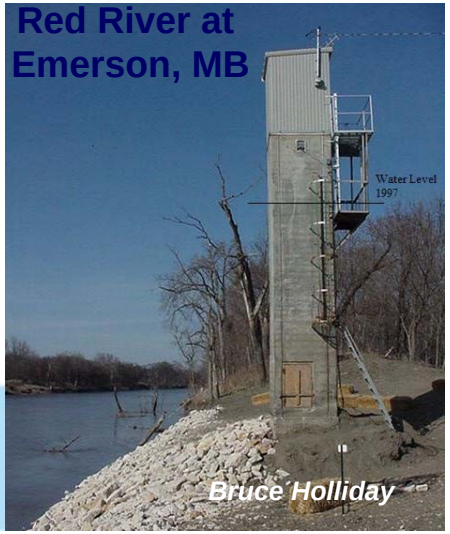
National Automated Water Quality Monitoring Network

Objectives

- Have continuous water quality information to better describe water quality in Canadian rivers
- Provide data for 1) background, 2) trends, 3) emerging issues, 4) site characterization
- Compliment other Water Quality Monitoring programs

The National Automated Network: Background

- Initiated in 2005 to bring together existing EC and partner sites into a national network and expand water quality monitoring across Canada
- To share expertise, knowledge, and data within the network and learn from other experts
- Currently in ‘set-up’ stage
  - Identify sites
  - Create partnerships and share information
  - Acquire and work with new equipment
  - Understand and develop information management system



The Network in 2007

- Environment Canada Water Quality Monitoring team across Canada and provincial, territorial, federal, municipal, and industry partners
- Most sites co-located and implemented in close partnership with the Water Survey of Canada (EC-WSC) at hydrometric stations to share infrastructure and integrate data
- 2007 – plan for up to 45 sites in network including sites in partner networks

- Sites co-located with:
  - Water Filtration Plants
  - 'Grab' sampling, industrial monitoring, and international/ trans-boundary monitoring sites
  - Pesticide and benthic invertebrate (CABIN) monitoring sites

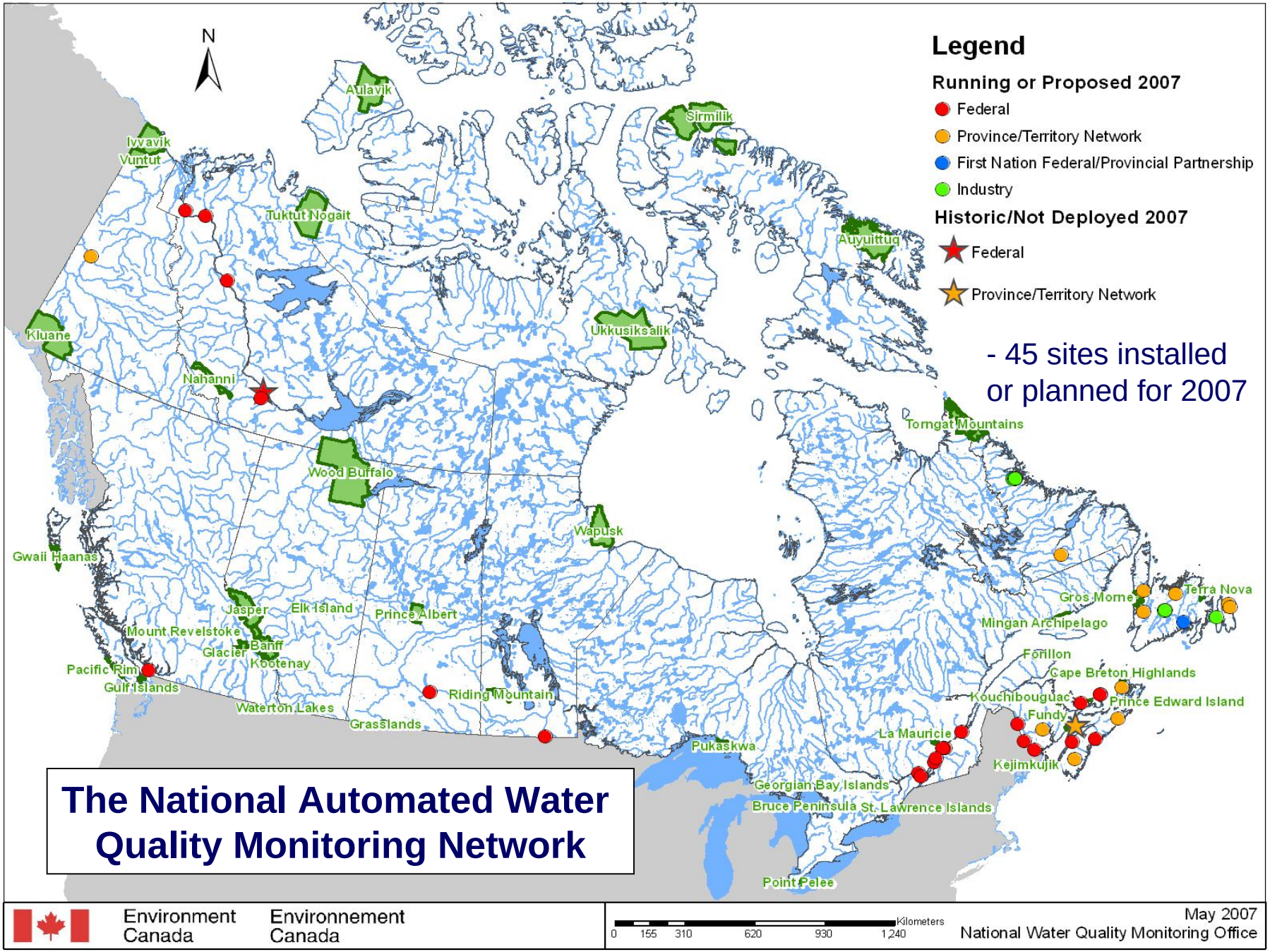
Water Filtration Plant, QC

Equipment & Parameters

Water Quality Sensors	- Multiprobes: Hydrolab (4x, 5x) YSI (600R, 6600) - Single sensors by WTW, Quadroline.
Dataloggers – some provided by Water Survey of Canada (WSC - Environment Canada)	- VEDAS, Sutron, CR510
Communication	- GOES transmitters, landline, CDMA, InmarSat D+
Water sample collector	-ISCO, Infiltrex
Software	- Hydras, Ecowatch, Aquarius, MS Excel

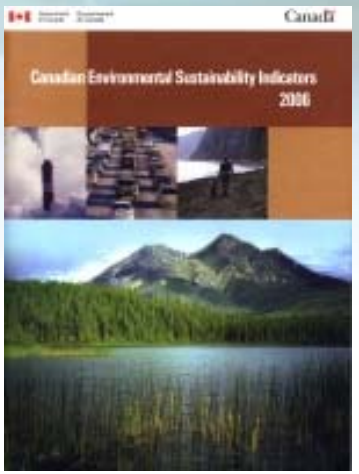
Parameters:

- pH
- Conductivity
- Turbidity
- Dissolved Oxygen
- Temperature
- Nitrate


N
Legend
Running or Proposed 2007
Federal
Province/Territory Network
First Nation Federal/Provincial Partnership
Industry
Historic/Not Deployed 2007
Federal
Province/Territory Network
- 45 sites installed or planned for 2007
Aulavik
Sirmilik
Ivvavik
Vuntut
Tuktut Nogait
Auyuittuq
Kluane
Ukkusiksalik
Nahanni
Torngat Mountains
Wood Buffalo
Wapusk
Gwaii Haanas
Gros Morne
Terra Nova
Jasper
Elk Island
Prince Albert
Mingan Archipelago
Mount Revelstoke
Glacier
Banff
Kootenay
Forillon
Pacific Rim
Gulf Islands
Cape Breton Highlands
Kouchibouguac
Prince Edward Island
Riding Mountain
Waterton Lakes
Fundy
Grasslands
La Mauricie
Pukaskwa
Kejimkujik
Georgian Bay Islands
Bruce Peninsula
St. Lawrence Islands
Point Pelee
The National Automated Water Quality Monitoring Network
Environment Canada
Environnement Canada
Kilometers
0 155 310 620 930 1,240
May 2007
National Water Quality Monitoring Office

Automated Monitoring and the CESI WQI Program

- Canadian Environmental Sustainability Indicators (CESI) to report on Air, Greenhouse Gas, and Freshwater Quality
- CESI Water Quality Indicator (WQI) uses a *Water Quality Index* to report the status of surface water quality at selected sites across Canada with federal, provincial, and territorial partners
- More than 12 automated stations co-located at WQI sites
- Continuous monitoring data used to:
    - Better characterise and understand WQI sites
    - Identify future WQI sites
    - Supplement data for WQI calculations



Automated Monitoring and CABIN: La Mauricie National Park, QC

- The 'Canadian Aquatic Biomonitoring Network' (CABIN) – a national biomonitoring program that assesses water quality using benthic macroinvertebrate communities
- New CABIN sites across country being established at automated monitoring stations to benefit from site characterisation and trend data

Example: La Mauricie National Park, QC

- 'Pristine' (best available condition) location
- CABIN 'reference' site for benthic invertebrate communities and automated monitoring site for background data

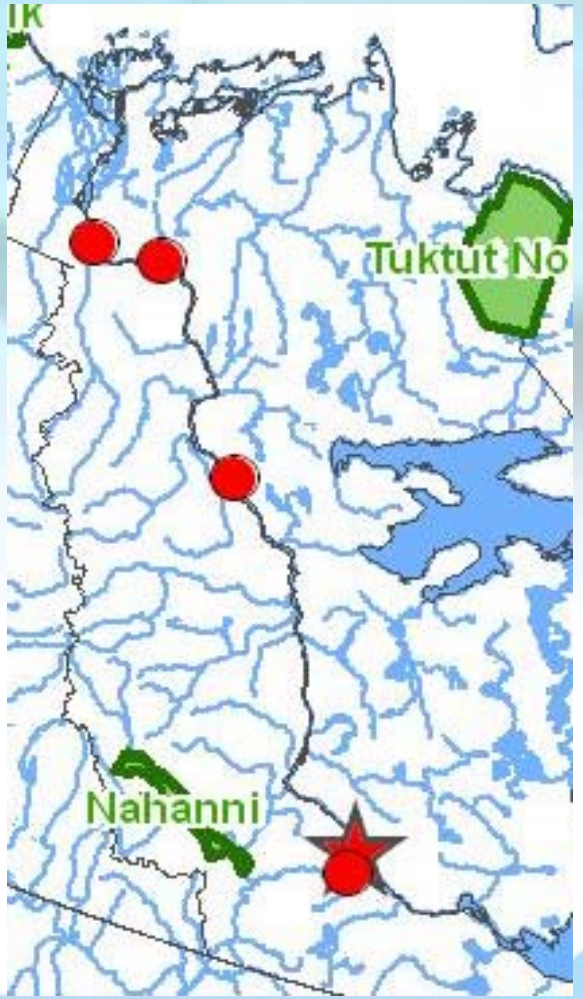
Visit CABIN:
http://cabin.cciw.ca/Main/cabin_about.asp?Lang=en-ca

Automated Monitoring and the Pesticide Science Fund (PSF) 2007 Study: Little Sackville River, NS

- In 2007, the EC PSF study is focused on surveying presence and levels of acid herbicides and glyphosate in urban streams
- Established automated monitoring station at Little Sackville River, NS, in 2006
- Continuous data to supplement PSF pesticide monitoring at this site in 2007
- Future WQI station

Automated Monitoring in the North: Integrated Stations

- Monitoring for water quality baseline and possible changes due to pipeline crossing and activities related to Mackenzie Gas Project
- Sites co-located with WSC hydrometric stations – integral partnership for installation, maintenance, and data transmission.
- Physical/chemical, continuous automated, and benthic invertebrate (CABIN) monitoring
- Future WQI stations after 3-years of data collection



Automated Water Sampling: Ottawa River, QC


Ottawa River, QC
Bernard Rondeau

- Automated since 2004 at Hydro Quebec dam
- Monitoring Ottawa River input into the St. Lawrence River


Don Andersen


Bernard Rondeau

- Submersed electric pump to draw to shelter
- Heating cable runs length of tubing to keep from freezing in winter
- Composite water samples
- Continuous data collection

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Buoy System: Fraser River, BC

- Unique deployment of a water quality sonde in the network
- Array of sensory and communication equipment
- Data will compliment the PSF and the WQI programs currently underway at this location.

Trial Sites & Challenges: Northern example

Liard River, NT

- Installed for 2006 open water season
- Part of 'Northern Mackenzie Gas Project' to monitor water quality impacts by pipeline related activities (e.g. slumping at crossings, large camps, fuel spills)

Challenges:

- Huge river with steep banks – placement issues
- Remote location - Lack of structures (bridges) for deployment
- Highly sediment laden river = frequent maintenance

Network Components in progress:

1. **Standardized QAQC protocol**

- Investigating methods used by other networks (e.g. BC, NFLD&L, NS, AB, ON, GRCA, USGS)
- Harmonizing and documenting sampling, maintenance, and QAQC methods used in national network

2. **Planning and site implementation**

- Installation and maintenance of sites
- Setting up communication infrastructure at non-hydrometric sites
- Working with new equipment (e.g. buoy system)
- Learning from other networks at Workshops

Network Components in progress:

3. Data & Information Management

- Build national data and information management system for raw and corrected data with QAQC tools for network users
- National team of experts managing EC data (physical, chemical, continuous, biological) in an integrated manner

4. Web tools and Reporting mechanisms

- Develop web services for network and partners to use for near real-time web reporting of data
- Quarterly and annual reports

Near real-time on 'Water web'

- Current display of water quality information for selected sites on *internal* Water Survey of Canada (WSC) 'Water Web' site
- Goal to eventually have data reporting on a public website

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Future Direction of the Network

- Focus on developing "data and information management" system, web services and tools for the network and partners to utilise and to report data on the web
- Expand network by implementing new sites and partnering with other networks
- Integrate data into the WQI program
- Explore new technologies. E.g. potential project with NL to look at new scanning instrumentation that will allow system to detect presence/absence of various compounds (e.g. oils, benzene).

Canada

Thank you!

Thanks to the Newfoundland and Labrador Department of Environment and Conservation, Water Resources Management Division!

Thanks to our Network Partners:

- **Water Survey of Canada, EC**
- **Province of Newfoundland & Labrador**
- **Province of Nova Scotia**
- **Province of New Brunswick**
- **Province of British Columbia**
- **Province of Saskatchewan**
- **Province of Prince Edward Island**
- **Yukon Government**
- **Parks Canada Agency**
- **Conne River First Nation**
- **Industry partners**
- **Sackville River Association (SAR)**
- **The Clean Annapolis River Project (CARP)**

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