s:can, a Newfoundland and Labrador experience

Michael Colbert
Water Resources Management Division
Department of Environment and Conservation
Government of Newfoundland & Labrador

June, 2009
RT Purpose

- to meet objectives of the RTWQM program and the WRMD regulatory mandate
  - Must maintain, upgrade and add to tools used in RTWQ monitoring
  - NL is innovative, research and test new technologies
- presentation on our experiences with s::can
Perspective based on what you see.
With the ability to see more...
Your perspective broadens!
s::can instrument

- Data logger/management:
  - Windows platform
  - Highly functional

- Water-quality probe:
  - In situ spectrometer
  - UV (220-390nm)
  - or UV/VIS (220-720nm)
  - up to 8 parameters
1. Send: xenon flashlight
2. Measure: dual-beam
3. Receive: Detector-splits light wavelengths measured by 256 photodiodes

s::can probe, spectro::lyser
Measurement

- Principles of spectroscopy
  - Based on parameters unique light absorption, known parameters in library
  - Light absorption over UV and VIS wavelength is a fingerprint of the water
  - More light absorption means greater parameter concentration

![Fingerprint](image)
# Parameters

<table>
<thead>
<tr>
<th>Parameter\Probe</th>
<th>UV-VIS</th>
<th>UV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>NO3</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>NO2</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>TOC</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>DOC</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

- Possible to create algorithms for additional spectral parameters
- Non spectral-parameter probes also available
Calibration

- **Global calibration**
  - Parameters quantified using algorithms of known parameter absorptions

- **Local Calibration**
  - To make connection between global calibration parameter and lab result based on grab samples
Cleaning

- Compressed air released over sensors at regular intervals
- In situ cleaning on monthly basis
- Regular reference checks to ensure quality of readings
Communication

On-site communication
USB Port → to jump drive
LAN Port → to PC
RS 485 → to probe

Remote communication
USB to modem
- Dial-up
- GSM
- CDMA
- Iridium

file transfer protocol
On-site Communication

- RS485 port
- LAN port
- USB port
- GSM modem
Dial-up Connection

- Communicate via analog modem with USB port
- Requires telephone line
- FTP to Con::stat from office and retrieve data
Cellular Connection

- Communicate via on-board GSM modem on the Con::stat or USB port to external cellular modem
- Requires cellular access and subscription
- FTP to Con::stat from office and retrieve data
Iridium Connection

- Communicate via external Iridium modem
- Requires Iridium subscription
- FTP to Con::stat from office and retrieve data
Deployment

- Leary’s Brook
- Site preparation
- Regular site visits:
  - Calibration - can input on site
  - Cleaning - manual and reference checks
  - Communication - ensure all data is retrieved
2008 Trends

- Turbidity
- Dissolved Organic Carbon
- Total Organic Carbon
- Nitrate
- Temperature
Turbidity

S::Can Data  Lab values

cleaning installed
cleaning failure
cleaning ok
Total Organic Carbon

mg/L

TOCeq [mg/l] - Lab values
Summary

- Compact and rugged
- Real-time
- Precise readings
- Multi-parameters
- Calibration on-site, no solutions
- Automatic cleaning
- In-situ maintenance
- Communication options
- Data validity
Path Forward

- Transition from research to deployment
- Integrate into RTWQ network
- Expansion into other water quality applications