



Water Resources
Management
Division

Department of
Environment &
Conservation

2001-2011 Ten Years of Real Time in Newfoundland and Labrador

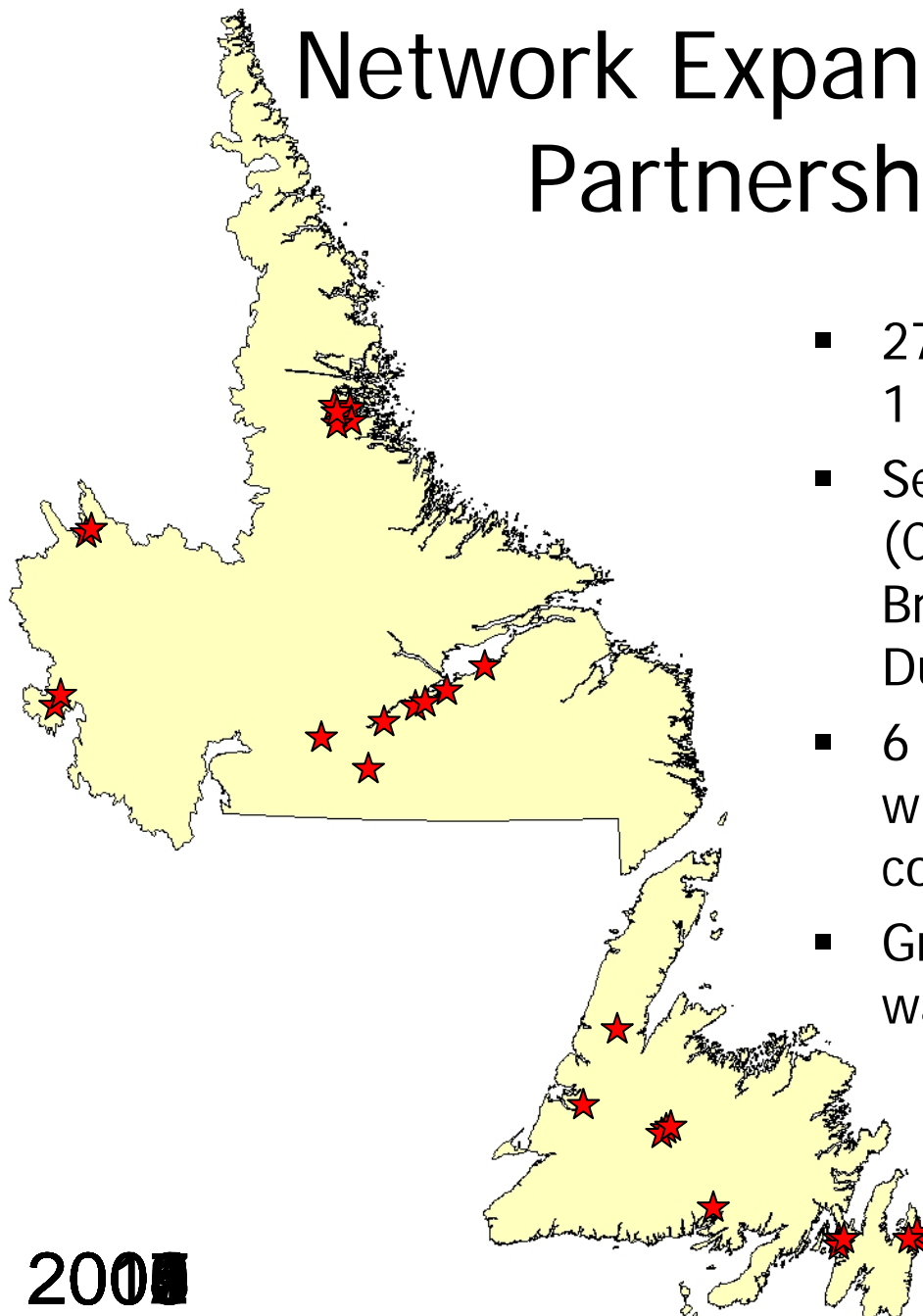
Presented by Grace Gillis
Environmental Scientist – Labrador Region

Real Time Water Quality Monitoring Workshop
June 7-8, 2011, St. John's, NL

A Decade of Real Time

- Network expansion and partnerships
- Operations efficiency increased
- Technology improvements and diversity
- Data management upgrades
- Data Correction
- Results!
- International recognition

Network Expansion and Partnerships



- 27 real time stations and 1 mobile platform
- Several local networks (Churchill River, Rattling Brook, Voisey's Bay and Duck Pond)
- 6 Industrial Partnerships with mining and energy companies
- Groundwater and surface water stations

2008

Operations Efficiency

- Calibration and Maintenance
- QAQC procedures and protocols established
 - Grab samples
 - Side by side readings
 - Comparison rankings
- Effective use of log files to fill data gaps
- Deployment techniques

Practice makes perfect!





Technology Improvements and Diversity

- Instrumentation
 - Evolution of Datasonde series
 - Testing and comparison of different manufacturers
 - Sensors



Technological Improvements and Diversity

- Data Loggers and Communications
 - MEMP equipped with satellite and cellular capabilities
 - Iridium base station at Howley building
 - First stand alone station at Paddy's Pond
 - Ironed out programming technicalities with EC data loggers
- Camera technology




Data Management Upgrades

- Functionality of ADRS greatly improved over last 10 years
- Automated Field Sheets replaced complicated & numerous spreadsheets

	A	B	C	D	E	F	G	H	I	
1	03NE002 - Camp Pond Brook									
2	Local/DAT	Stags	Temp. Water	Temp. QA/QC	pH	pH QA/QC	Conductance	Cond. QA/QC	Dis Solids	TDS
3	7/16/03 9:44	1.565	15.14		6.67		15.49			0.029
4	7/17/03 9:44	1.567	15.44		6.76		18.5			0.011
5	7/17/03 10:44	1.554	15.43		6.719		18.39			0.011
6	7/17/03 11:44	1.555	15.39		6.719		18.39			0.011
7	7/17/03 12:44	1.554	15.35		6.75		18.2			0.011
8										
9	8/11/03 9:44	1.389	19.81		6.989		22.1			0.014
10	8/11/03 10:44	1.388	19.72		7.039		21.6			0.013
11	8/11/03 11:44	1.386	19.72		7.07		21.5			0.013
12	8/11/03 12:44	1.386	19.73		7.09		21.5			0.013
13	8/11/03 13:44	1.386	20.03		7.099		21.7			0.013
14	8/11/03 14:44	1.383		20.09		6.88		23		0.013
15	8/13/03 14:44	1.376		16.74		6.49		22		0.013
16	8/13/03 15:44	1.38	16.96		6.789		20.19			0.012
17	8/13/03 16:44	1.378	17.15		6.76		20.09			0.012
18	8/13/03 17:44	1.379	17.14		6.739		20.19			0.013
19	8/13/03 18:44	1.379	17.04		6.71		20.19			0.012
20	8/13/03 19:44	1.379	16.93		6.67		20.49			0.013
21										
22	9/22/03 10:44	1.391	9		6.699		22.2			0.014
23	9/22/03 11:44	1.391	9.399		6.69		22			0.014
24	9/22/03 12:44	1.391	9.97		6.719		21.9			0.014
25	9/22/03 13:44	1.389	10.54		6.739		21.79			0.013
26	9/22/03 14:44	1.389		10.73		6.56		22.2		0.013
27	9/23/03 9:44	1.389		9.63		6.45		22.6		0.013

	A	B	C	D	E	F	G	H	I	J	K	
1	03NE002 - Camp Pond Brook											
2												
3			Temp				pH					
4	Date	Removal/Installation	Field Reading	Probe Reading	Difference/ % Difference	Rating	Field Reading	Probe Reading	Difference/ % Difference	Rating	Field Reading	
5	11/06/03 14:44	removal	20.09	20.03	0.06	Excellent	6.88	7.099	0.219	Good	23	
6	13/06/03 14:44	installation	16.74	16.96	0.22	Good	6.49	6.789	0.299	Good	22	
7	22/09/03 14:44	removal	10.73	10.54	0.19	Excellent	6.56	6.739	0.179	Excellent	22.2	
8	23/09/03 9:44	installation	9.63	9.71	0.08	Excellent	6.45	6.809	0.359	Good	22.6	
9	11/11/03 1:44 PM	removal	Error	9	NA	NA	Error	Error	NA	NA	15.3	
10	6/13/04 11:44 AM	installation	3.77	6	1.23	Poor	6.93	6.78	0.85	Marginal	20	
11	8/10/04 11:44 AM	removal	13.38	12.93	0.45	Good	6.88	6.23	0.65	Fair	24.6	
12	8/12/04 4:44 PM	installation	12.29	12.36	0.07	Excellent	6.83	6.99	0.16	Excellent	25.4	
13	9/23/04 2:44 PM	removal	8.38	8.2	0.18	Excellent	6.46	7.24	0.78	Fair	27	
14	9/24/04 8:44 AM	installation		7.93	7.93	NA		6.93	NA	NA		
15	10/16/04 12:44 PM	removal		2.71	2.71	NA		7.39	NA	NA		
16												
17												



Real-Time Water Quality Network
Maintenance and Calibration Field Sheet

Deployment

Date: 2010-09-21 14:00
Time Zone: ADT (yyyy-mm-dd hh:mm)

Location	Cherhill River above Muckart Falls
Staff on site	GG and EW
Weather Observations	cloudy, windy, 10°C
Aquatic Conditions	
Additional Observations	traces to high to find on psd

Parameter	Field Swade S/N: 45042	QA/QC Swade S/N: 41582
Temperature (°C)	12.66	12.30
pH	6.42	6.36
Specific Conductivity (µS/cm)	23.0	21.2
TDS (µM)	0.0000	0.0137
DO % Sat	96.3	95.0
DO mg/l	10.28	10.04
Turbidity (NTU)	24.8	19.4

QA/QC Grab Sample

Grab Sample ID: 2010-610-01-SP

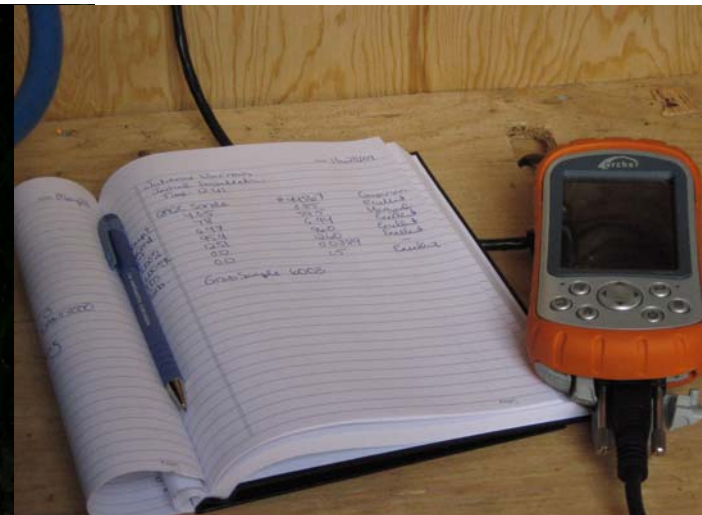
Grab Sample Results

Parameter	Value
pH	7.14
Specific Conductivity (µS/cm)	24.0
Turbidity (NTU)	21.7

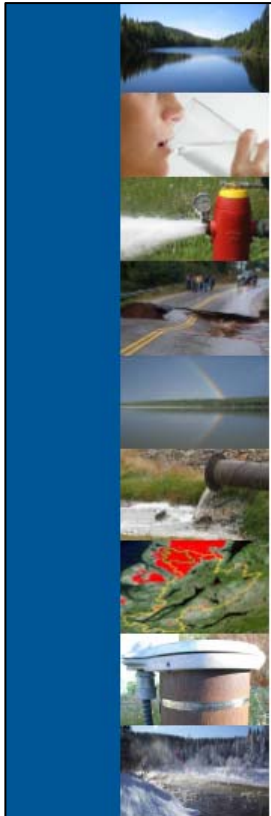
Parameter	Rank				
	Excellent	Good	Fair	Marginal	Poor
Temperature (°C)	± 0.2	± 0.2 - 0.5	± 0.5 - 0.8	± 0.8 - 1.0	± 1.0
pH (unit)	± 0.2	± 0.2 - 0.3	± 0.3 - 0.5	± 0.5 - 1.0	± 1.0
Specific Conductivity (µS)	± 3	± 3 - 10	± 10 - 15	± 15 - 20	± 20
Dissolved Oxygen (mg/l)	± 0.3	± 0.3 - 0.5	± 0.5 - 0.8	± 0.8 - 1.0	± 1.0
Turbidity (NTU)	± 5	± 5 - 10	± 10 - 15	± 15 - 20	± 20

Data Management Upgrades

- Keeping better records
 - Field data and procedures
 - Calibrations
 - Inventory and purchasing
 - Increasing accountability



Products for Industry Partners



**Real Time Water Quality
Procedures and Protocols
for Industry**

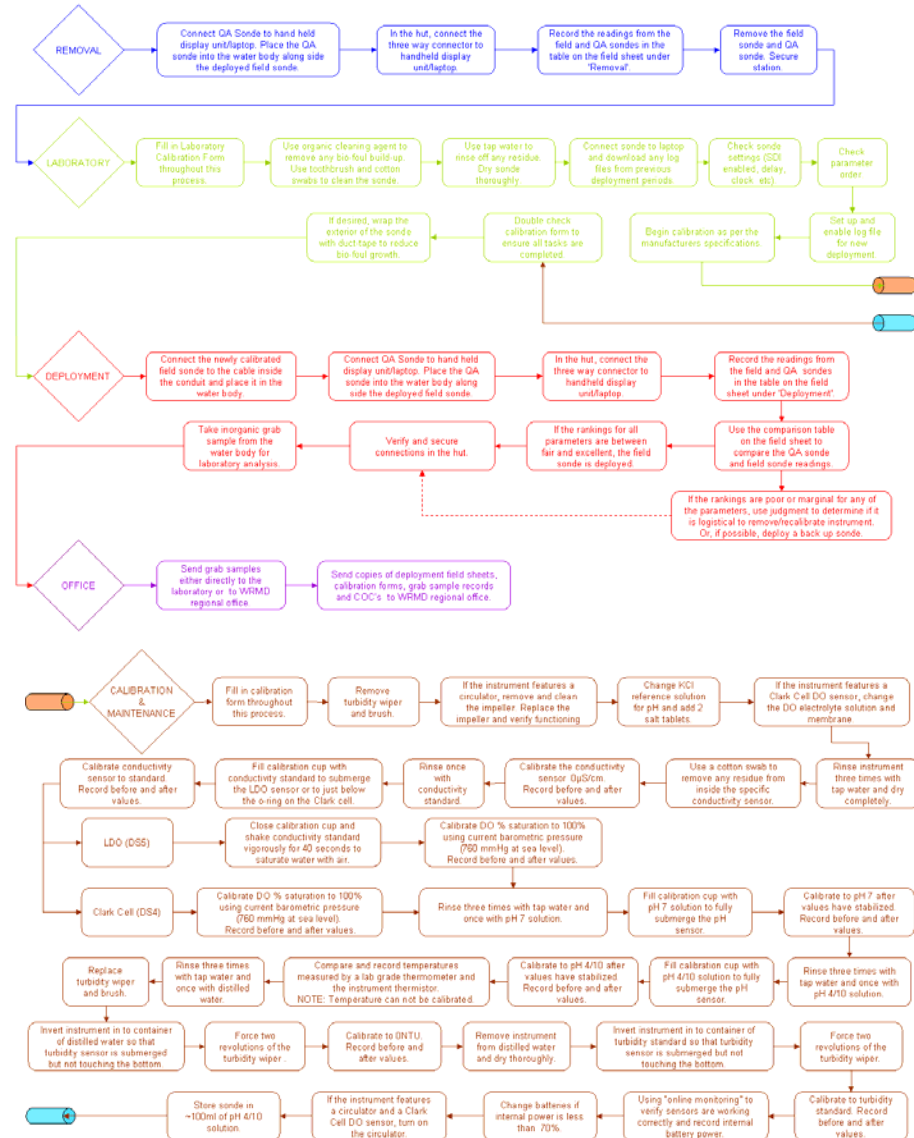
May 2011

Newfoundland
Labrador

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

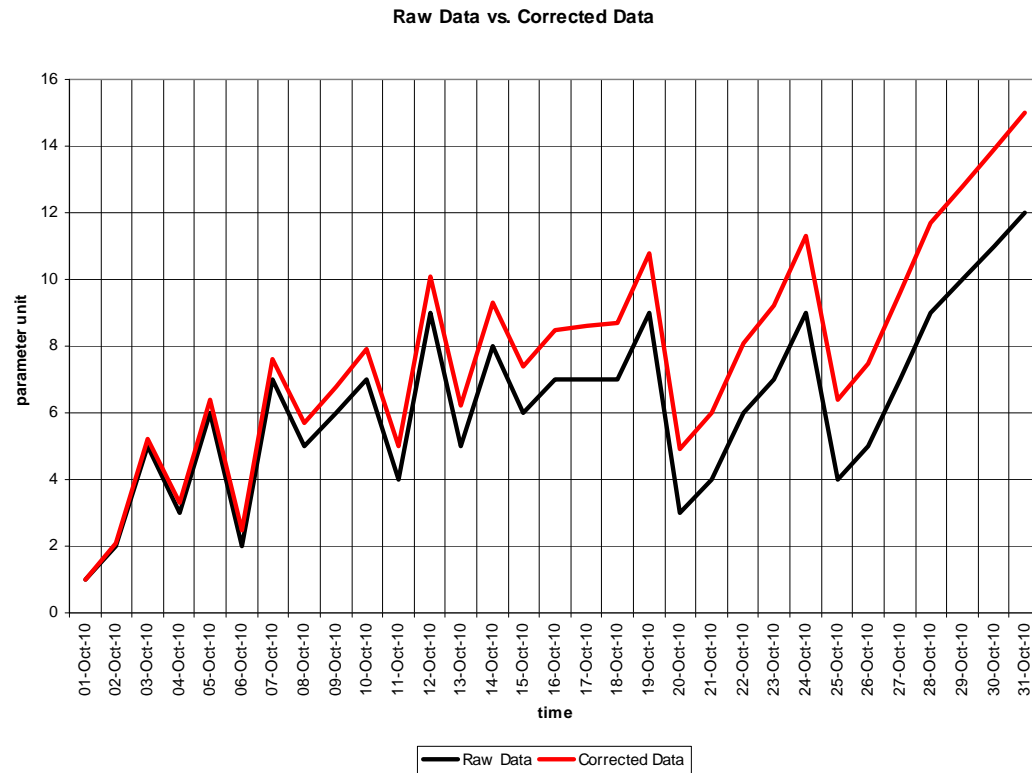
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Data Correction

- Questioned various protocols for post processing real time data
- In 2010, WRMD implemented detailed procedures and protocols to help quantify bio fouling and calibration drift in order to accurately correct data.



Bio-Fouling Drift: Field Cleaning

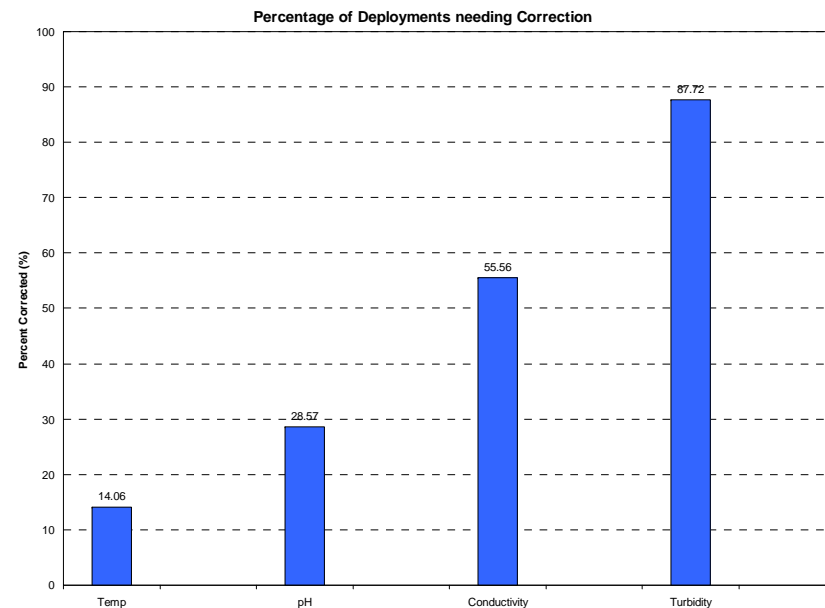


Calibration Drift: Post Field Calibration



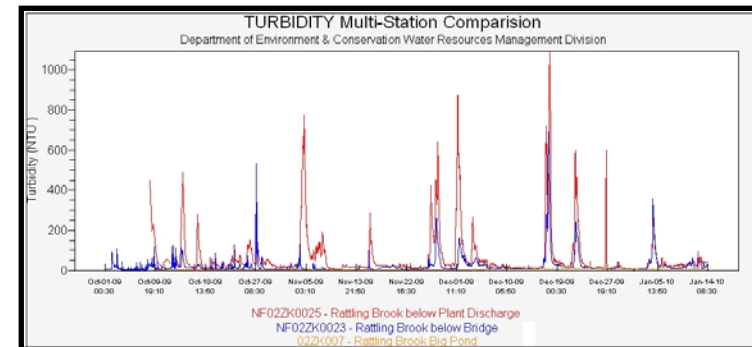
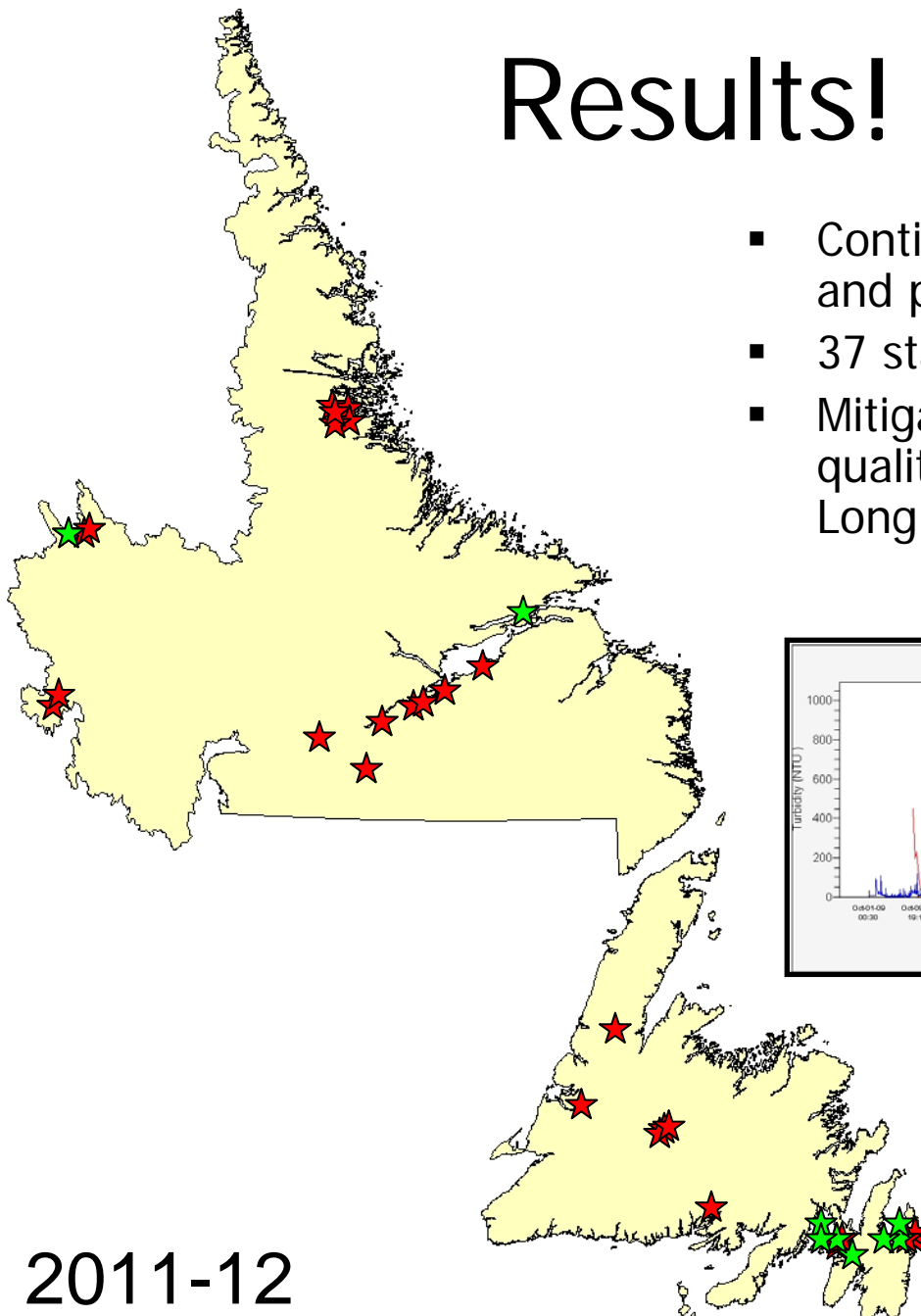
Results and Conclusions from Study on Data Correction

- Examined frequency and magnitude of corrections required for each parameter based on total error
- Investigated validity of qualitative comparisons between field sonde and grab samples
- Concluded that corrections not necessary in order to meet mandate of the RT program in NL
- Long term monitoring and event detection is not affected by fouling in significant quantities to warrant additional procedures and protocols on a regular basis
- Effort remains with QAQC, data flagging, and 30 day maintenance schedule



Results!

- Continuing network expansion and partnership development
- 37 stations
- Mitigation response to water quality events at Voisey's Bay, Long Harbor, Duck Pond



International Recognition

- Hosted 2 Real Time Workshops (2007, 2009) and the 3rd to be held in June 2011
- RT projects in Egypt, Russia, Jordan
- Conferences (NWQMC)
- Professional Engineers and Geoscientists of Newfoundland and Labrador Environmental Award for 2011

