



NWT Water Stewardship Strategy Implementation Workshop

February 4-5, 2015

Yellowknife, NT

Summary Report



Introduction

Government of the Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR) gathered water partners and other interested organizations to discuss the implementation of *Northern Voices, Northern Waters: NWT Water Stewardship Strategy* (Water Strategy) and *NWT Water Stewardship: A Plan for Action 2011-2015* (Action Plan) at the 5th Water Strategy Implementation Workshop in Yellowknife on February 4-5, 2015.

The Water Strategy Implementation Workshop provides an opportunity for water partners to discuss implementation activities and progress to date (Key to Success 1.1 F). To view previous workshop reports on the development and implementation of the Water Strategy, visit:

www.nwtwaterstewardship.ca/?q=publications

Workshop Objectives

The objectives of the workshop were to:

- Review implementation of the Water Strategy, including updates on:
 - community-based monitoring initiatives
 - source water protection
 - regulatory activities
 - public education
 - negotiation of Transboundary Water Management Agreements
- Provide water-related research and monitoring updates
- Discuss the independent evaluation and core components for developing the next Action Plan to ensure water partners' involvement in the next implementation phase
- Set priorities and targets for 2015 implementation activities

Participants

Water partners attending the implementation workshop represented a number of organizations involved in water management in the NWT, including Aboriginal governments and organizations, territorial and federal departments, non-governmental organizations, academic institutions, environmental science consulting firms, industry representatives, regulatory and renewable resource boards. The Aboriginal Steering Committee also attended the workshop, representing their respective Aboriginal Governments.

To see the full list of participants and agenda, see Appendix A.

Workshop Summary

The workshop report is divided into four main sections:

- *Update on Water Strategy Implementation;*
- *Updates on Water-related Research and Monitoring in the NWT;*
- *Evaluating the Water Strategy; and*
- *Moving Forward in 2015.*

Presentations from the workshop can be accessed online at:

<http://www.nwtwaterstewardship.ca/node/113> or copies can be requested through ENR.

The workshop was facilitated by Stephanie Yuill from ENR.

The day started with welcoming remarks from Shannon Cummings (Assistant Deputy Minister, ENR).

I. Update on Water Strategy Implementation

Community-based Monitoring

Katherine Trembath and Ryan Gregory from ENR Water Resources Division and Diane Betsina from Yellowknives Dene First Nation provided an update on community-based monitoring implementation. An important part of implementing the Water Strategy is to build capacity within NWT communities to fully participate in aquatic research and monitoring. It is essential that community members have the ability and opportunity to participate in meaningful initiatives that can address identified community questions and concerns about the local watershed.

The *NWT-wide Community-based Water Quality Program* works toward building this capacity in involved community organizations and answering these community questions related to water quality. The program has been running since 2012 and currently water quality is monitored in 21 communities, from Fort Smith in the south to Inuvik in the north. ENR coordinates the program, which is implemented through a partnership between ENR, NWT communities and various water partners.

Water quality is monitored using four different sampling devices/methods.

- **YSI Sonde 6600:** measures temperature, conductivity, pH, oxidation/reduction potential, dissolved oxygen, turbidity, chlorophyll
- **Polyethylene Membrane Device (PMDs):** measures dissolved oil and gas chemicals.
- **Diffusion Gradient in Thin Films (DGTs):** measures the toxic forms of dissolved metals.
- **Grab Water Samples:** measure 77 parameters including basic parameters, ions, nutrients and dissolved and particulate elements/ metals.

The results from the monitoring program have been provided in different formats including a booklet, a calendar, power point presentations and teleconferences. A poster with 2013 monitoring results will soon be finalized and provided to involved communities.

Diane Betsina is a water monitor representing the Yellowknives Dene First Nation. She has been involved in the program since 2013 and monitors the Yellowknife River. Diane talked about the importance of traditional knowledge and the long history of her people. Many are concerned about the water and the fish. Diane discussed about her involvement in the program and how this has provided a great opportunity to learn how to monitor the water quality. She feels proud to be a water monitor and she hopes that others in the community will be inspired to become more involved in these types of projects. She added that it has been good to have consistency with the people participating from the Yellowknives Dene, and emphasized that community members are very interested to hear about the monitoring results, as they have concerns about the water quality.

Diane's presentation highlighted the importance of keeping the monitors well informed about monitoring results as these are key individuals that link with community members and can act as information channels.

Source Water Protection

Blair Carter (Ecology North) and Jennifer Fresque-Baxter (ENR Water Resources Division) provided an update on Source Water Protection initiatives. Source water protection is identified in the Action Plan and relates to capacity building and partnerships to develop and implement community source water protection plans.

Currently, Smbaa K'e Dene Band, Ecology North, and ENR are piloting a partnership approach to source water protection planning and implementation. The partnership is guided by a common vision for source water protection, which has been crucial for the success of the project. The project was the first attempt at using the Source Water Assessment and Protection Guidance Document and Workbook released by ENR in 2012

(<http://www.nwtwaterstewardship.ca/swprotection>). The initial project plan was to follow the guidance document step-by-step, while recognizing that some aspects would likely have to be adapted to accommodate the needs and context of the community of Trout Lake.

Jessica Jumbo (Smbaa K'e Dene Band) and Blair Carter coordinate the source water protection work in Trout Lake. The community is located in the southwest corner of the NWT in the Dehcho Region and has a population of approximately 100 people.

The first step of the project was to establish a local working group in Trout Lake. Although the guidance document specifically calls for a steering committee with a broad range of stakeholders that is governed by a set of operating rules, a decision was made to form a less formal local working group. This approach made the group very open and attracted Elders, chief and council, community development corporation members, water treatment operator, and other members of the community.

Although not mentioned in the guidance document, the group also opted to develop a technical advisory group comprised of various experts to help inform the project. This group was a very effective complement to the local working group and it added a valuable perspective to the project. The function of the technical group was primarily to review documents and address specific questions or information requests from the working group.

The second step was to conduct a source water assessment. The purpose of the assessment was to identify potential source water contaminants in Trout Lake and conduct a risk assessment for the identified contaminants. The local working group spearheaded the development of the report, with input and oversight from the technical advisory group. In early December 2014, the first meeting was held to map all the known potential source water contaminants in the Trout Lake watershed and assess the risk of these contaminants.

The main addition that was made during this second step was to use visual scales to guide the risk assessment process during the meeting. These scales were well received by the working group and were effective during the meeting. After that, the technical advisory group was consulted on the identified contaminants.

The last step for the project is to work with the local working group to identify management actions that the community recommends for each identified contaminant source. Examples of management actions include waste separation, monitoring, improved signage, and public education. The report is to be finalized in 2015 and a summary report will be available to the public.

ENR has also worked with Yellowknives Dene First Nation to discuss source water protection. A number of planning meetings and a workshop took place in 2013 and 2014.

Regulatory Overview

A regulatory overview was provided by Nathen Richea from ENR Water Resources Division. As of April 1, 2014 the responsibilities related to water and land management were transferred from Aboriginal Affairs and Northern Development Canada to the GNWT. Among other things, this transfer includes the responsibility for approval of Type A water licences issued by the various land and water boards throughout the NWT. Nathen explained that Type A licences are required for larger scale development projects as specified in the water regulations, while Type B water licences are required for smaller scale development projects as specified in the water regulations. The use of water and the deposit of waste must follow the conditions specified in any issued water licence in accordance with the legislation (*Waters Act* and *Water Regulations*). Various plans and reports need to be submitted to the land and water boards by water licence holders to ensure that the development is being conducted in a proper and protective manner, as per the terms of the water licence. An example given at the workshop was the aquatic effects monitoring plan that is associated with a Type A licence. These plans require ongoing review and monitoring to ensure that the effluent discharge from the project is not causing undue harm to the aquatic ecosystem (the receiving environment).

ENR reviews and provides comments on the plans and reports that are submitted by water licence holders to the respective land and water boards. Over the months leading up to the workshop there had been over 40 regulatory reviews of plans and submissions. The reviews are conducted by ENR while considering the vision and goals of the Water Strategy, including:

- ensuring that proper water and waste management practices are utilized by developers in the NWT to protect water;
- ensuring that mitigation measures are implemented to protect water quantity (water recycling) and quality (waste disposal); and
- ensuring that proper monitoring and assessment of the development occur and that aquatic resources are protected.

Current and upcoming initiatives related to the regulatory regime and the Water Strategy include the development of additional guidelines, such as a site-specific water quality objective framework for the NWT.

Water Education

Tasha Stephenson (ENR) and Rose Jackson (Ecology North) presented a summary of public education activities related to water stewardship. Since the inception of the Water Strategy, Ecology North and ENR have collaborated on a variety of water-related activities geared towards education for school-aged children. To celebrate Canada Water Week and World Water Day (March 22) past activities included: school activities, outdoor activities at the Snow Castle in Yellowknife with fish fry and theater play, and evening events for adults in different communities around the NWT. For the 2015 Canada Water Week, Ecology North discussed its plans to travel to all regions to lead school activities and also do film screenings. Last year (2014), the documentary *Cold Amazon* was screened in many communities (<http://gordonfoundation.ca/water/mackenzie-river-basin-initiative/cold-amazon>).

As a result of the collaboration between ENR and Ecology North a number of educational resource and products are available to NWT schools, water partners and the public. These include (as of March 2015):

- School curriculum on Bottled Water and the drinking water in the NWT.
- *Teacher's Resource Guide: Get to Know Your Watershed!*
- *Pepper and the Mighty Mackenzie* – an activity book about the Mackenzie River.

These resources can be found on the NWT water stewardship website and paper copies can be sent upon request.

For Rivers to Oceans day in June 2014, Ecology North collaborated with Yellowknives Dene First Nation to develop an “On the River” program (an educational program about water). Ecology North also provided programming to day camps and after school programs to try to connect kids with the water. Rivers to Oceans Day highlights that we are all connected to oceans because of our rivers draining into the oceans. In Yellowknife, a variety of partners set up a number of interactive water-related stations in which students from grades 1 and 5 to participate.

ENR Public education is involved in many educational activities every year including an annual a “pond study”, organized for school children in Yellowknife. Public Education also coordinates a 10-day on the land camp every summer called Tundra Science Camp, which is hosted at a real research station on the tundra at Daring Lake (for more information, go to:

<http://www.enr.gov.nt.ca/programs/tundra-ecosystem-research-station/tundra-science-and-culture-camp>).

Project Wet training is available to water partners to educate staff on activities to teach about water concepts. The activities are designed for school-aged children but can also be useful for other settings and age groups (<http://www.projectwet.org/>).

The Aboriginal Youth Water Leadership Program took place in 2013-2014 and was hosted by the Centre for Indigenous Environmental Resources. Public Education was heavily involved and worked with 16 youth from four different watersheds in Canada, including youth from Fort Smith. The youth were tasked to develop a community project. The youth from Fort Smith decided to do *Stream of Dreams* in a school in Fort Smith. Stream of Dreams program has previously been reported on at the last implementation workshop. It is a watershed stewardship program for schools with the key message that “*all drains lead to streams*”. For more information on water education, go to: <http://www.nwtwaterstewardship.ca/commoutreach>.

Mackenzie Data Management System

Carolyn Dubois from the Walter and Duncan Gordon Foundation provided a brief presentation on the *Mackenzie Data Management System* pilot project. This private foundation has invested substantially in the north. The Mackenzie River Basin initiative intends to support communities and their engagement in water management. Previous projects under this initiative include the documentary *Cold Amazon*. (For more information about the initiative, go to:

<http://gordonfoundation.ca/water/mackenzie-river-basin-initiative/cold-amazon>).

The Mackenzie Data Management System focuses on improving access to water-related data for decision makers. Data are critical and a precursor for good water management. The foundation is trying to see where they could have a role in this – and is now working closely with ENR. The long-term vision is to bring water quality information from across the Mackenzie River Basin together and make it available through an online tool. In the future, this tool can be used by communities and decision makers across the basin. The first stage is to incorporate the data set from *the NWT-wide Community-based Water Quality Monitoring Program*. The foundation is hoping to launch the pilot project in September 2015. After the pilot project, the system will expand and include data sets from other monitoring programs. At this stage, the structure of the data management system is being developed. The Mackenzie Data Management System was further discussed at a session the following evening, however results from that session are not included in this workshop report.

A question was raised about how long the turnaround is from sampling until the data become available. As the data needs to be verified to ensure quality assurance and quality control, the approximate turnaround is a year.

Another comment was to broaden the scope to include Pine Point Mine (an abandoned mine in the South Slave region) and potential related impacts on the local water system. A lot of people bring up concerns about Pine Point, but very little has been done.

ENR coordinates the *NWT-wide Community-based Water Quality Monitoring Program* and works with NWT communities to identify priority areas. So far the priorities identified by the local groups in that area have been the Hay River and the Slave River. If Pine Point is an issue of concern, ENR is open to discussing this further with community organization(s).

II. Updates on Water-related Research and Monitoring in the NWT;

After the implementation update, a number of water partners presented on specific research and monitoring initiatives relevant to the implementation of the Water Strategy.

Wilfrid Laurier University (WLU) Water Research Initiatives

Mike English (WLU) provided an overview of the university's current research projects initiated through the WLU-GNWT partnership agreement signed in 2010 (<http://nwtwlu.com/>). There are multiple projects taking place under this agreement, including:

- Trail Valley Creek – Changing Hydrology in the Mackenzie Delta Region (lead by Philip Marsh),
- Scotty Creek – how landscape change influences water quantity and quality (led by Bill Quinton and Jenn Baltzer)
- Tathlina Lake and Slave River – impact of environmental change on health and reproduction of fish (led by Deb MacLatchy and Andrea Lister)
- Slave River Delta – contaminant deposition from periods of flooding (led by Brent Wolfe and Roland Hall)
- Marion Lake Watershed – establishing reference baseline data for metals using sediment cores (led by Brent Wolfe)
- Wekweètì – Influence of changes to the annual snowpack on the Bathurst and Bluenose East caribou herds (lead by Mike English)
- Kakisa and Ka'a'gee Tu First Nation – Exploration of Climate Change, Food Security and Health (led by Andrew Spring)
- Thor Lake – Rare earth metals, bioavailability, toxicity, mobility and modeling of data (led by Jim McGeer and Scott Smith)
- Acute short-term sublethal impacts of sediment loading and water chemistry changes on fish (led by Steve Kokelj and Jim McGeer. Lab-based study)

A Science Committee guides the partnership between the GNWT and WLU. The chair of the committee is David Livingstone and the project liaison for the agreement is Bruce Hanna (ENR, Field Support Unit).

Mike English referred to the report "*The State of Northern Knowledge in Canada*" (by Canadian Polar Commission), which identifies environmental knowledge gaps. The report states that

significant environmental changes driven by complex environmental factors are taking place in the North. The research needs to reflect this complexity to better address the challenges facing the North. Research in the North should be coordinated to better obtain the specific end results, the ability to model systems should be improved, and good monitoring should be in place.

Assessing the Potential Impact of Changes in the Annual Snowpack to the Bathurst and Bluenose East Caribou Herds

This project was presented by Mike English from WLU. The objective of this research is to determine if structural changes in the snowpack play a role in increasing stress on caribou. Several large caribou herds in northern Canada and in other countries are in serious decline and this study's objective is to better understand these declines in relation to the changing climate. The Bathurst herd has dramatically decreased in numbers since 1986 from more than 400,000 to approximately 17,000 in 2014. The caribou herds are also impacted by wolf predation, hunting, disease and forest fires. These stressors are interlinked with climate patterns and directly or indirectly related to the annual snowpack.

This research uses satellite data which provides daily snowpack water equivalent (SWE) data for specific areas of the Earth's surface. These georeferenced areas of the Earth are referred to as pixels. Each pixel measures 25km x 25km and twice a day the satellite receives data from pixels covering the entire northern hemisphere. The satellite is equipped with instruments which detect, from each pixel, passive microwave radiation in selected wave lengths. For the purposes of determining SWE two wavelengths are detected, one with a longer wave length (19GHz) and one with a shorter wavelength (37GHz). As the snowpack builds up the snow crystals attenuate or deflect the shorter wavelengths while the longer wavelengths are not affected by the snow. As such, the ratio between the longer and the shorter wavelengths changes with increases in SWE. Environment Canada has formulated mathematical equations relating the changes in this ratio to SWE. It is still important to use data derived from the field to check if the equation is relevant. An added benefit of using satellite data is that it can reveal if ice lenses have formed in the snowpack. Ice lenses can increase the energy expenditure of caribou attempting to access food. This work is being done in collaboration with Dr. Libo Wang and Chris Derksen from Environment Canada.

Changes in climate, even very short unexpected events like rainfall in winter can impact wildlife. Approximately 20,000 muskoxen died on Banks Island in 2003 after a period of rainfall occurred during early winter. The rain infiltrated the snowpack and froze on the ground effectively covering the ground vegetation and preventing muskox from accessing their normal diet.

In order to understand how changes in climate are impacting the snow cover for an area the size of the NWT, utilizing satellite is essential. The cost of getting an equivalent data set that the satellite provides would be prohibitive. Using satellite data provides the necessary temporal and spatial information necessary to understand how climate is impacting this very important portion of annual precipitation. With increases in air temperature over the past couple of decades, satellite data has revealed that the spatial coverage of snowcover in the northern hemisphere has decreased. Importantly it is essential to understand not only the spatial changes but perhaps more importantly understand the changes in SWE.

In 2003, researchers discovered what appears to be a new atmospheric teleconnection in high latitudes that has resulted in accelerating incoming heat sources to the arctic. This system is referred to as the Arctic Dipole and it is poorly understood. First of all it does not occur each year but the frequency of occurrence is increasing. When the Arctic Dipole forms a large high pressure system over the Canadian high arctic matched by a large low pressure system over the Russian high arctic, the system effectively draws warmer air into the arctic from the north Pacific thus accelerating warming.

Resources to Support Climate Change Decision Making

Brian Sieben, Climate Change Adaptation Specialist at ENR explained that the Climate Change group at ENR provides information to decision makers on climate change and has a broader mandate to support everyone in the NWT. ENR is responsible for a greenhouse gas strategy and a NWT emissions inventory. Brian discussed several initiatives that ENR is involved in.

The Cold Regions Hydrologic Model was developed by the University of Saskatchewan. The model is geared towards physical processes in cold regions in small- to medium-sized catchments. Some of the physical processes that can be modelled include snow precipitation, water flow and the infiltration of water to the ground through permafrost. The model can be used to examine potential stream discharge under climate change scenarios. It is a free application and no calibration is needed for using the model. To run the model data on land cover, elevation data are required. ENR will work with WLU to provide model training workshops. To access more information about the model, go to: <http://www.usask.ca/hydrology/CRHM.php>

Another climate change project is the development of a RADARSAT Digital Elevation Model that is being completed in collaboration with AANDC and GNWT, NWT Centre for Geomatics. Better high resolution elevation data are needed in the NWT and this project will generate useful information for climate change models.

Climate change scenarios of monthly temperature and precipitation have been generated for all NWT communities for time periods until 2099. Higher resolutions of the scenarios are currently being developed in collaboration with the University of Alaska Fairbanks. For more information on the community climate change scenarios, please go to: https://www.snap.uaf.edu/sites/all/modules/snap_community_charts/charts.php#baseline=cru32&community=35&dataset=1&scenario=rcp60&units=standard&variability=0

Another project that is related to climate change is the NWT hazard identification and risk assessment. The assessment looks at all potential hazards, including hazards caused by climate change. A report is available for download from the Department of Municipal and Community Affairs (MACA) website (<http://www.maca.gov.nt.ca/hira/>).

The Canadian Council of Ministers of the Environment (CCME) has done lots of work on climate change and has reports on tools for conducting a climate change vulnerability assessment in watersheds. One of the newer projects is a CCME guidance document on drought.

For more climate change resources please visit www.nwtclimatechange.ca or contact CLIMATECHANGE@gov.nt.ca

Understanding cumulative impacts of environmental change and human development in the Tathlina watershed

The presentation was provided by Mike Palmer from ENR's Cumulative Impact Monitoring Program (CIMP). This research project is coordinated by Ka'a'gee Tu First Nation and is a partnership between academic, government and community partners. Ka'a'gee Tu First Nation is the lead for developing the research questions, providing local support and knowledge, and for providing field assistance. CIMP is the scientific lead and acts as a liaison between researchers and the community. The project takes place in the Kakisa watershed, which is an ecologically diverse region. There are multiple potential stressors in the watershed including climate change and oil and gas development.

The community questions in regards to potential impacts from different stressors and the health of the fish and the water were developed by community members in Kakisa. There is lots of oral history and local knowledge that have been invaluable for the design of the program. The community questions were transformed into a format that could be answered by academic partners.

In the southwest portion of the NWT the average annual air temperature is rising. Land users observe that the landscape is changing. Permafrost supported peatlands are turning into wetlands. There has been quite a lot of research done on this in the Scotty Creek area by researchers from Wilfrid Laurier University. In this project historical aerial photos and sediment cores were used to study the impact of landscape change on the limnology of two small lakes to the east of Tathlina Lake. The analyses indicate a substantial increase in landscape disturbance for both catchments in the last 50 years. To better understand the impact of landscape change on lake conditions in the two lakes, diatom compositions in sediment cores were studied. At this point, one conclusion is that there is now greater input of terrestrial organic material into one of the lakes.

There is now a full time monitor in Kakisa, who she has capacity to run and coordinate these programs on her own along with a crew to offer support to ensure success of this program. The program will continue working with partners to build capacity and address community questions.

Delta Dialogue Network

Jennifer Fresque-Baxter from ENR Water Resources Division provided the presentation on the Delta Dialogue Network on behalf of the Slave River and Delta Partnership (SRDP) and the University of Saskatchewan.

The SRDP consists of community, governmental (Aboriginal, federal and territorial), and academic partners. The SRDP is driven by community concerns related to the health of Slave

River and the Slave River Delta. There are three guiding questions that the partnership aims to answer: Can we drink the water? Can we eat the fish? Is the ecosystem healthy?

The SRDP is a key partner in the Delta Dialogue Network research project. Research related to knowledge mobilization (how we learn and share information) is taking place in three Canadian inland deltas: Saskatchewan River and Delta, Peace-Athabasca Delta, and Slave River and Delta.

All inland deltas are experiencing similar challenges – climate change, regional upstream development (e.g., there is hydro development on all rivers). Consequently, community concerns are similar among the different groups living in delta areas. This research project provides an opportunity to come together across three deltas to share experiences and come up with ways to get information to the people in useful and meaningful formats.

The Delta Dialogue network received funding in March 2014 and consists of three main projects:

- a) Evaluate existing knowledge sharing efforts in the Slave River Delta;
- b) Sharing knowledge with managers and policy-makers in the Peace-Athabasca Delta (Master's student Sarah Baines); and
- c) Sharing different perspectives on water quantity in the Saskatchewan River and Delta (Master's student Evan Andrews).

In December 2014, the project's website was launched, <http://www.usask.ca/research-groups/ddn/>. In January 2015, researchers from the Delta Dialogue Network participated in research open houses in Fort Smith and Fort Resolution and provided updates to the communities.

Lunch- Film Screening

At lunch Jeremy Flatt (Ecology North) and Christine Wenman (independent consultant) presented and screened *The Permafrost of the Peel River Plateau*. For more information regarding the film, contact Ecology North's office in Yellowknife at (867) 873-6019.

The impacts of Permafrost Degradation on Aquatic Health in the Peel Plateau

Following the film screening, Krista Chin from ENR, NWT CIMP, provided a presentation on a research project examining the impacts of permafrost degradation on the health of streams in the Peel Plateau. Permafrost thaw, due to climate change, is causing the development of retrogressive thaw slumps. This has resulted in large volumes of melted ground ice that contribute vast amounts of debris into the surrounding aquatic environment. This study is funded by CIMP and looks at the impact of slumps on streams. The questions that the research team are attempting to answer are: What are the impacts of slumps on the benthic macroinvertebrate community? Are shifts in invertebrate abundance or community structure associated with physical or chemical stressors contributed by slumps?

Benthic macroinvertebrates were used to study the impacts of slumps on streams for many reasons but mostly because compared to solely collecting water samples, which represents a snapshot of what was in the water at the particular moment in time when the sample was collected, the benthic invertebrate community that lives at a particular site reflects the cumulative impacts that they have been exposed to over time, providing a better overall indication of the condition in the stream.

The study followed the sampling methods of the Canadian Aquatic Biomonitoring Network (CABIN; Environment Canada) protocol. Streams that were undisturbed, moderately disturbed and highly disturbed by slumps were sampled.

When comparing macroinvertebrate abundance in the different streams, there was a significant difference in the number of benthic invertebrates found among all disturbance classes with undisturbed sites having the highest abundance and the highly disturbed sites having the lowest abundance. Further, there was a significant difference in the concentration of total suspended solids (TSS) found in each disturbance class, with undisturbed classes having the lowest concentration and the highly disturbed sites having the highest concentration of TSS. It was also found that there was a significant negative relationship between TSS concentration and macroinvertebrate abundance. Lastly, it was determined that the invertebrate community structure of undisturbed sites was more similar to other undisturbed sites than moderately or highly disturbed sites, and that highly disturbed sites were more similar to other highly disturbed sites compared to undisturbed and moderately disturbed sites.

From this work it is known that permafrost thawing in the form of slumps is a major stressor on aquatic ecosystems. This type of work is critical not only to have a better understanding of how these large scale disturbances influence the stream biota but because it redefines baseline conditions which is important when discerning between natural and anthropogenic changes in water quality indicators.

Tracking Change – Local and Traditional Knowledge in the Mackenzie River Basin

Brenda Parlee from University of Alberta talked about the role of Traditional Knowledge in Watershed Governance and a recent research proposal, *Tracking Change*.

Community-based monitoring is new lingo for a traditional practice for watching the land (tracking change) and involves the systematic tracking of key indicators. It is the ongoing process of learning from the land and learning from others in the community. This tracking of change has always been highly systematic and rigorous because it was the foundation for decision making and ultimately the survival of Aboriginal people.

Traditional Knowledge can play multiple roles in environmental monitoring. The knowledge stretches back from 100s-1000s of years and has a deep understanding about the changes in the

ecosystem. Aboriginal people depend on the health of the land and knowledge holders particularly attuned to ecosystem change.

Traditional knowledge can act as a filter for scientific information and make sure the information is relevant for local decision making. Community members sometime lack trust for scientists and information generated by scientific research and monitoring programs. Working with elders and other community members can act as information channels and can increase the trust for scientists.

An example of data in community-based monitoring can be harvest dates, harvest frequency and harvest areas that can indicate the health of the ecosystem.

The different values of community-based monitoring include:

- deep and rich understanding of ecosystems and ecosystem change;
- facilitate social learning; and
- increase capacity within communities to cope with environmental, social, economic and ecological change.

A research proposal has been developed to determine and demonstrate the importance of local and traditional knowledge of social and ecological change in large water basins. The proposed study areas are Mackenzie River Basin, Lower Amazon Basin and Mekong River Basin. A proposal has been submitted to the Social Sciences and Humanities Research Council. This project would contribute to regional, territorial/provincial and federal decisions about its continued sustainability and provide an opportunity for knowledge holders in the different basins to learn from each other.

The proposed objectives of the project are to:

- discover how traditional knowledge from different communities across the basin is interconnected;
- develop methods and insights about how community-based monitoring works at larger scales; and
- define how to meaningfully store, share and protect knowledge for future generations (including interconnections between many database systems);

Note: The proposal has been approved and work will begin in 2015/2016.

Tłı̨ch̨o Aquatic Ecosystem Monitoring Program

An overview and update on the Tłı̨ch̨o Aquatic Ecosystem Monitoring Program were provided by Boyan Tracz and Susan Beaumont from the Wek'èezhìi Renewable Resource Board. The

program has been running since 2010 and is funded, supported and implemented by a number of organizations. Water quality and fish health (e.g. mercury concentration in fish) are important to the Tłıchq̓ people. The community questions and concerns relate to past, current and future activities, and the program aims to determine whether fish condition, water and sediment quality are changing over time, and if fish and water can safely be consumed. The program gathers information in water bodies around the Tłıchq̓ communities and an on the land 5-day camp is organized around one community per year. During the camp there are educational opportunities for youth and learning opportunities between scientists, Tłıchq̓ knowledge holders, and between generations and people from different cultures.

The involved communities receive the monitoring results first. The monitoring results from Whati in 2014 will be presented in February, 2015. Boyan displayed a fish camp video that is part of the process of providing results to the communities. <http://www.wrrb.ca/content/new-what-i-fish-camp-video-ready-viewing>

The results from 2013 (results from Gamètì) indicated that the fish health is good, water quality is good, and the sediment quality is good. The data is determined to be good when it is within historical variation (expected) and there are no health concerns.

Key lessons learnt from running the program since 2010 are to start the process of organizing the camp early on in the year and always maintain the long-term view. It is important to be adaptive, keep an open mind and learn from each other. Good communication is crucial to building relationships between the different groups involved and between individuals.

Susan Beaumont provided additional context on communication opportunities and tools within the monitoring program. With so many partners and different individuals, it is important to make sure that everyone understands the expectations and everybody's role in the program, and that all have the respect for the culture and follow proper behaviours.

A successful communication product generated by the program is the fish guide "*Common Fish in the Tłıchq̓ region*" (http://wrrb.ca/sites/default/files/fish_guide_2014_4.pdf)

Meetings have been used to share results and discuss and determine locations where monitoring data will be gathered. Websites and Facebook are used to announce meetings and provide updates on the program. For 2015, the Wek'èezhì Renewable Resource Board has developed a calendar to provide information about the monitoring program and other projects along with photographs of people and places in Wek'èezhì, and Tłıchq̓ language names for the months and the days of the week.

III. Current Remote Sensing Initiatives in the NWT

A number of initiatives are taking place in the NWT that are generating water-related information using remote sensing. Three presentations focused on remote sensing initiatives and were followed by a panel discussion.

Water Ecosystem Monitoring Using Earth Observations - Slave River and Delta

Joseph Chamberland from the non-profit organization, C-CORE, presented on a collaborative project among GNWT, C-CORE, University of Saskatchewan and the Canadian Space Agency that is developing monitoring indicators to measure specific aspects of aquatic health using remote sensing.

Remote sensing is the science (and, to some extent, the art) of acquiring information about the earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information. There are different types of remote sensing.

Passive sensing: The remote sensing sensor (which is satellite based) receives reflected energy and can only be used when the energy source is available (i.e., clear sky during daytime).

Active sensing (radar): The sensor transmits and receives a signal. Measurements are possible at all times. Examples of active sensing are SAR and LIDAR.

This project uses both active and passive sensing to develop methods for monitoring water indicators. The indicators were developed based on the monitoring and research priorities, which were determined by the SRDP and listed in a vulnerability assessment. The project's study areas are located along the Slave River and Delta. Project funding was awarded by the Canadian Space Agency in 2014 and will continue until 2016.

Indicators that were selected for the project include:

- water extent and flooding
- river ice formation and thaw
- water temperature changes
- water sediment changes

There is still work to be done to validate the methodological approaches for remotely monitoring the indicators. Once the approaches are validated, the next step for the study is to deliver these products in an accessible way to communities and researchers and to transfer (in 2016) the information to the GNWT where it can be maintained so that indicators can continue to be monitored. The information can be provided to the communities and the general public in

multiple ways. Currently the preferred options are through web-based tools or/and technology transfer. Examples of community/science web-portals include the floe edge service (www.ccore.ca/floeedge)

Using Remote Sensing Data to Support Cumulative Impact Monitoring of Water Resources in the NWT

Oliver Tsui from Hatfield Consultants presented the results from a project designed to develop the long-term application of earth observations (remote sensing) as part of cumulative impact monitoring of water bodies in the NWT. The Cumulative Impact Monitoring Program (CIMP) funded the project.

This completed study developed remote sensing products that can support existing water management methods and procedures as well as promote and support data management and information delivery. The products that were generated under this project include:

- lake ice characteristics;
- water body extent (lake size);
- wetland type information; and
- submerged vegetation.

The project areas were the Central Mackenzie Valley and the North Slave. These areas have different landscape features and water bodies but both have resource development taking place: surface mining in the North Slave, and oil and gas development in the Canol Shale deposit in the Central Mackenzie Valley.

Field data were gathered during the winter of 2014. In the North Slave area, 37 sites were sampled for ice thickness through manual drilling. Ice thickness profiles were determined with a ground-penetrating Radar unit.

Field data were also gathered in the Central Mackenzie Valley area but during the summer. 3,200 geo-coded photographs of various land cover types were taken. These downward-looking photos were collected from a helicopter using an air-photo toolkit.

Radarsat-2 and RapidEye were used to retrieve remote sensing imagery.

Potential applications in the NWT for these products include:

- use within water licence processes by providing regulators and developers with pre-screening of proposed water sources for water withdrawals.
- monitoring of water levels and water body extent;

- field surveys to help regulators and developers prioritize surveys (i.e., bathymetry, water quality, etc.); and
- use in a future NWT Water Classification System¹.

NWT Centre for Geomatics

Jurjen van der Sluijs, representing the NWT Centre for Geomatics, GNWT, talked about the mandate and services of the Centre along with its current water-related projects. The Centre is part of the Informatics Shared Services. Its mandate is to provide Geomatics services to the GNWT departments. Responsibilities of the Centre include:

- provide access to geospatial data: The Centre hosts large amount of spatial data. For more information on download options, web map services and viewers, go to: <http://www.geomatics.gov.nt.ca/data.aspx?node=data>;
- conduct mapping/analysis projects: Mapping information and layers for analysis include land-cover, landscape change and 3D terrain modelling;
- support the different departments in data management and approaches for storing and archiving different types of data;
- establish information systems; and
- provide training, resources, and advice.

Current remote sensing projects include a study on landscape change looking at Landsat imagery from 1984-2014. The landscape changes include lake drainage, wetness conditions, permafrost slumps and erosion. Future works includes expanding the coverage of the landscape change analysis and integrating the landscape information with the *Inventory of Landscape Change* developed by NWT CIMP.

Panel Discussion – How can remote sensing fill information gaps and advance water-related research and monitoring?

The panel consisted of:

- Claude Duguay – University of Waterloo
- Joseph Chamberland – C-CORE
- Oliver Tsui – Hatfield Consultants
- Julian Kanigan – NWT CIMP, ENR
- Jurjen van der Sluijs – NWT Centre for Geomatics, GNWT

¹ Water Resources Division, ENR, has undertaken some preliminary work towards the development of an NWT Receiving Water Classification System that takes into account various factors, including spiritual and cultural values, to determine the level of protection that would be appropriate for various receiving water bodies within the NWT. The NWT Water Classification System falls under the site-specific water quality objective framework mentioned on page 6 in this summary report.

The guiding questions for the panel were:

1. What are some of the applications of remote sensing that you think can advance water-related monitoring / research?
2. How do these applications link to the information gaps identified by users in the NWT (e.g., regulators, NWT communities)?
3. What type of information is needed to validate the data generated from remote sensing imagery?
4. How can remote sensing be used in conjunction with other information sources (e.g., to assess cumulative impacts?)

Overall participants found the information presented to be very informative and were pleased to learn about remote sensing capabilities and their growing use in conjunction with traditional water monitoring and other information sources.

IV. Transboundary Water Management Agreements

The second day of the workshop started with an update by Dr. Erin Kelly, Associate Assistant Deputy Minister, ENR, on the negotiations of the transboundary water management agreements.

Negotiation of transboundary water management agreements within the Mackenzie River Basin (MRB) is Key to Success 1.4 of the Water Strategy Action Plan. In 1997, Alberta, British Columbia, Saskatchewan, Yukon, NWT and Canada signed the MRB Transboundary Waters Master Agreement.

The main objectives of the Master Agreement are to:

- facilitate the management of water resources in the Mackenzie River Basin in a manner consistent with the maintenance of the ecological integrity of the aquatic ecosystem; and
- make provision to create Bilateral Water Management Agreements.

Erin shared that the only agreement currently in place is between the NWT and the Yukon (signed in 2002) and negotiations are currently taking place with Alberta (final stages²), British Columbia³ and Saskatchewan to establish transboundary water agreements. Discussions are also taking place with the Yukon to re-negotiate the existing agreement.

² The Mackenzie River Basin Bilateral Water Management Agreement between NWT and Alberta was signed in March 2015.

³ The Mackenzie River Basin Bilateral Water Management Agreement between NWT and British Columbia was signed in October 2015.

Communication and engagement with Aboriginal governments and the public about water started before the development of the Water Strategy. Engagement on the transboundary water agreements began in March 2012 with Aboriginal governments and the public, inviting comments and input on NWT negotiation principles and interests. Aboriginal consultation on the development of negotiation positions for the NWT-Alberta agreement began in August 2012.

The vision and goals of the Water Strategy provide the fundamental mandate for the NWT negotiation team. Through the interest-based negotiating process, the negotiation teams shared interests and discussed options to protect those interests. Examples of identified NWT interests include:

- people can drink the water and remain healthy;
- people can eat the fish, wildlife and vegetation and remain healthy;
- ecosystem degradation is avoided; and
- there is equitable sharing of water.

Consultation on the NWT-Alberta and NWT-British Columbia Transboundary Water Management Agreement Intentions Documents has taken place with the Aboriginal governments in the NWT. Key attributes of the Intentions Documents include:

- respect Aboriginal and treaty rights;
- ensure clean and abundant water for people and aquatic life;
- contain clear principles to protect the ecological integrity of the aquatic ecosystem;
- ensure a balance between development and protection of northern waters;
- set out clear prior consultation and notification mechanisms;
- provide steps for adaptive management to new information and changing conditions; and
- establish enforcement mechanisms and a dispute resolution process.

The Aboriginal Steering Committee for the Water Strategy is regularly updated on the progress of the negotiations and provides guidance on an ongoing basis. The next step for consultation will be consultation on the NWT-Yukon and NWT-Saskatchewan Intentions Documents. This consultation will inform each of the final agreements.

Erin also provided some examples of what the agreements will not be able to do, including preventing industrial development to take place, addressing water-related issues within the jurisdictions or directly dealing with climate change. The agreements however will be able ensure that upstream jurisdictions consider downstream effects when making decisions about industrial development, contribute in a meaningful way to sustain ecological integrity of the entire basin, and be proactive and adaptive to new information and changing conditions.

The agreements will have provisions for surface water quality and quantity, groundwater, as well as the biological component. Biological indicators will be used as an early warning system to

detect changes in the aquatic ecosystem that may be occurring and prevent the movement of invasive species into, out of and within the MRB. If unacceptable changes are detected, management actions will be implemented to protect indicators.

The appropriate management response to change may vary. In some cases it may be appropriate to set or adjust a water quality objective; in another it may be appropriate to set or adjust a biological objective.

For each established transboundary water management agreement, a Bilateral Management Committee will be established to:

- administer the agreement;
- monitor and review data;
- classify transboundary waters;
- establish learning plans and transboundary objectives;
- provide a mechanism for information sharing, notification and consultation; and
- establish a dispute resolution process.

Most of the negotiations between the NWT and neighbouring Mackenzie River Basin provinces and territories are anticipated to be complete in 2015. Keys to Success and Action Items for the upcoming Action Plan 2016-2020 will likely focus on implementation of the Transboundary Water Agreements.

V. Water Monitoring Updates

Updates on water monitoring included presentations from Environment Canada, GNWT and Summit Environmental Consulting on the current water quality and quantity monitoring efforts in the NWT.

Water Monitoring Programs - Water Resources Division (ENR)

Juanetta Sanderson provided information and an update on the existing monitoring programs implemented by the Water Resources Division, which was formed through implementation of the Lands and Resources Devolution Agreement. The division has about 40 staff and includes four different sections:

- Watershed Programs and Partnerships;
- Water Regulatory;
- Taiga Environmental Laboratory; and
- Water Research and Studies.

The Water Research and Studies group fills multiple functions at ENR, including:

- develops and manages water quality and quantity programs;
- conducts aquatic ecosystem studies;
- implements/ supports research partnerships;
- conducts transboundary river monitoring;
- conducts long-term network monitoring;
- conducts analysis of scientific data; and
- provides advice on regulatory and environmental issues.

Juanetta elaborated on the current monitoring programs that are being maintained/ supported by the division:

- **National Hydrometric Network, Water Survey Canada:** This network is run by Environment Canada but Water Resources Division is involved and financially supports the network. The network includes 93 stations across the NWT that collect water level and stream flow data.
- **Snow Survey Network:** This monitoring program holds records from 1968 to present and includes 46 active stations. Application of the data includes, spring freshet-flood predictions, analysis of spatial/temporal trends, and forecasting/planning for hydropower capacity. <http://www.enr.gov.nt.ca/programs/snow-surveys>
- **Weather/Climate Network:** There is one evaporation site at Pocket Lake (close to Giant Mine in Yellowknife), and there are weather stations across the NWT (e.g., Baker Creek, Tibbitt Lake, Daring Lake and Tuktoyaktuk). Application of the data includes monitoring of precipitation and evaporation rates, understanding interactions of weather/climate; and forecasting risk of drought and fire, frequency of flooding, and ice jam modelling.
- **Water Quality Network:** This network includes monitoring of Yellowknife River, Cameron River, Marian River, Upper Coppermine River Basin, Upper Lockhart River Basin and water bodies in the South Slave Region. Surface water is sampled and analyzed for metals, major ions, nutrients, physicals, bacteriological, and ultralow mercury. In the South Slave Region, there is a water quality monitoring network of 10 sites which have been sampled twice a year since 1982. A hydrolab is deployed in the town of Fort Smith's pump house year round and data are being collected hourly. The water quality data from these sites have been useful for the transboundary agreements.
- **Transboundary River Monitoring:** The monitoring of transboundary rivers began in 1990 with the Slave River in response to concerns about upstream development raised by communities in the area. The program has since expanded and now includes Liard River, Hay River and Peel River. Fish were collected on the Slave and Liard Rivers in the initial studies. The focus of the program is to provide information on the water and suspended sediment quality conditions of transboundary rivers. Water quality samples are collected 3 times per year and analyzed for a large number of parameters including organic compounds associated with pulp and paper mills and oil and gas developments.

Application of the data includes development of site-specific water quality objectives for inclusion in transboundary agreements, and addressing community and local concerns related to potential contaminants in the rivers.

- **Lodestar Database:** This database used by the Water Resources Division provides a consistent approach to environmental data management across the NWT. Currently water, soil, sediment and air data can be entered into the database and plans are underway to allow for the inclusion of fish, permafrost, and vegetation data. Lodestar allows for lab data to be automatically uploaded and it has rigorous data validation procedures built in.

The Water Research and Studies group also partners with community groups, Aboriginal governments and researchers on a variety of programs. Some examples of collaborations and research partnerships are:

- Hay River Ice Jam Flood Forecasting Model;
- Changing Hydrology in the Taiga Shield – Baker Creek; and
- Marian River Watershed Community Based Aquatic Effects Monitoring Program.

Some identified spatial and temporal data gaps in the current monitoring include the following areas:

- Great Slave Lake;
- Great Bear Lake;
- more sites / frequency for Coppermine and Lockhart downstream of diamond mines;
- groundwater monitoring in the Sahtu; and
- small basins (fire impacts / permafrost degradation).

Environment Canada – Water Monitoring Activities in the NWT

Anita Gue from Environment Canada provided an overview of the water quality monitoring and surveillance division activities in Yellowknife and the various monitoring activities undertaken by Environment Canada in the North. On a national level, monitoring of water quality and aquatic ecosystem health is conducted in order to:

- meet domestic and international commitments and legislative requirements (e.g., *Canada Water Act*, *CEPA*, and *International Boundary Waters Treaty Act*)
- inform the development of regulations, enforcement, policies and programs; and
- deliver on government priorities (e.g., the Clean Water initiatives in Lake Winnipeg, Great Lakes, St Lawrence and Lake Simcoe).

The specific objectives with the Long-term Monitoring Network include:

- monitor baseline status and trends in northern rivers;

- assess ecosystem health; and
- assess the impacts of anthropogenic activities and climate change on northern river systems.

The long-term water quality sites in the North include 11 sites in the Yukon, 22 sites in the NWT, 10 sites in Nunavut and 3 sites in northern Alberta. In the NWT some of these sites are located in national parks (13 sites out of 22) and some sites are transboundary sites (4 out of 22). The following parameters are measured: physicals (e.g., turbidity), major ions, nutrients, total and dissolved metals, and occasionally PAHs and pesticides. The samples are sent to Taiga Environmental Lab (GNWT) and National Lab for Environmental Testing (Environment Canada).

The data generated from the monitoring network are used to:

- measure the natural changes and conditions of northern water quality;
- determine changes in water contaminants and/or threats over time;
- identify emerging issues and threats;
- track the results of remedial measures and regulatory decisions;
- provide data to partners and clients (e.g., researchers in academia, public, other government departments, and review boards); and
- support development of science-based guidelines for water, fish, and sediment.

Anita also provided an overview of the Canadian Aquatic Biomonitoring Network program (CABIN) (also described by Krista Chin on the first day of the workshop). The program is a national initiative developed and coordinated by Environment Canada that focuses on the collection of freshwater benthic invertebrates as an indicator of ecosystem health. The program has standardized data collection methods, a national database of benthic data, and enables users to create a reference condition approach model for potentially impacted sites to assess aquatic health. Many departments/organizations have done training and participated in sampling for the program in the NWT, and there are opportunities for collaboration and community involvement. There are plans to expand and establish more sites in the NWT and Nunavut. Environment Canada provides training to interested organizations participating in and contributing to the *Canadian Aquatic Biomonitoring Network* sites in the north.

A suite of risk-based and statistical analysis tools have been developed to guide the review of the national monitoring network and to ensure all activities are scientifically robust, prioritized and optimized.

At a site-level, there are two analytical tools that can be used.

1. Power analysis – the ability to detect trends at current and alternate sampling frequencies.
2. Site-level Risk-Based Approach – identify existing and potential risks to water quality and watershed vulnerabilities in the sub-basins where federal sites are located.

When compared with actual monitoring locations, this analysis gives a spatial gap analysis of areas where risks may be but no monitoring station exists.

Gap analysis of water quality monitoring in the NWT

Ruari Carthew from Summit Environmental Consultants Inc. (Summit) presented the results of a recent evaluation of the NWT's Water Quality Monitoring Network conducted on behalf of the GNWT. The evaluation was commissioned in anticipation of devolution and the transfer of responsibility of water resource management to the GNWT. In January 2014, a workshop was held with water resource management agencies to guide and provide information relevant to the evaluation. The key evaluation question that emerged was: Are monitoring locations, sampling frequency, and parameters sufficient to detect change in NWT waters, respecting existing and future anticipated stressors on water resources? The evaluation focused on three types of monitoring:

1. **Trend Monitoring:** Detecting changes in water quality over time in response to current and projected environmental stressors, including climate change.
2. **Status Monitoring:** Characterizing spatial variations in water quality as compared to water quality guidelines to assess existing conditions and quality.
3. **Impact Assessment Monitoring:** Assessing the cumulative effects of natural resources development on water quality at the watershed and regional scales.

The presentation focused on knowledge gaps and recommendations from Summit's evaluation. The data analysis found roughly 240 unique water quality monitoring sites in the NWT (active and inactive). These sites are managed and monitored by numerous agencies, each with its own objectives and goals. This uncoordinated approach to water quality monitoring is a common issue across Canada, ultimately resulting in decreased efficiency and increased effort/cost. The evaluation found that the ability to detect trends in water quality in the NWT is currently limited by program independence, program (statistical) design, data management and coordination, and spatial representation.

Summit provided 20 recommendations to the GNWT to improve the ability of the water quality monitoring network to detect change. The main recommendations include:

- develop a Long-term Monitoring Framework, with appropriate water resource management partners, that provides a shared set of objectives and goals for all water quality monitoring programs;
- fill the 27 (prioritized) spatial gaps identified;
- use Power Analyses (a statistical tool) to optimize sample size;
- incorporate data from mining and community water quality monitoring to expand the network;

- increase monitoring of lakes, which are under-represented;
- improve the frequency and scheduling of sampling; and
- establish core parameters at all sites (augmented by stressor-specific parameters).

Key outcomes of the evaluation included:

- a comprehensive evaluation report of the existing NWT Water Quality Monitoring Network;
- an updated and comprehensive excel database containing all known monitoring programs and parameters; and
- an interactive map of existing sites in the current network that provides a valuable visual tool for decision-making.

Panel Discussion – Potential approaches to fill identified water monitoring gaps in the NWT

The panel consisted of:

- Anita Gue – Environment Canada
- Robert Jenkins – ENR
- Erin Kelly – ENR
- Michael Low – Aboriginal Aquatic Resource and Oceans Management Program
- Heather Scott – Mackenzie Valley Land and Water Board

The guiding questions for the panel were:

1. From your organization’s perspective, what is critical information for decision-making related to water?
2. Where are the major information gaps?
3. What are the risks or consequences if these gaps remain?
4. What potential partnerships could fill these gaps?

Participants emphasized the need to for coordinated access to monitoring results while continuing to build partnerships to facilitate the collection and dissemination of water monitoring data.

VI. Independent Evaluation and Intended Outcomes

In the afternoon on February 5, two evaluators, Donald Murray (Harry Cummings Associates) and Nichole Fraser Macdonald (Shared Value Solutions), provided a presentation about the independent evaluation of the Water Strategy and led a break-out session with the workshop participants.

The evaluators are independent and have not had previous engagement with the GNWT or other water management organizations in the NWT prior to the evaluation. Donald Murray has extensive knowledge in program evaluation and has worked directly in water resource projects, e.g., Economic Impact Study-Ontario Aquaculture Industry and Innisfil Creek Drought Management Plan Pilot Project. Nichole Fraser MacDonald is a social scientist with a land use planning background. She has lots of work experience within the realm of traditional knowledge and land use studies and interpreting traditional knowledge for environmental assessments.

The purpose of the independent evaluation of the Water Strategy is to:

- inform water partners about the implementation progress of the Water Strategy and Action Plan;
- assess the extent to which the work supports achieving the goals and vision of the Water Strategy;
- recommend how to address emerging challenges and build upon successes to guide water partners in the future; and
- ensure accountability.

The evaluators will be reaching out to water partners to seek advice and input. There is an Evaluation Committee established with representation from various groups. The Aboriginal Steering Committee will also serve as advisory committee.

The independent evaluation is designed to triangulate the results, so multiple sources of information are used to produce results and provide recommendations. If there are inconsistencies from the different sources of information, the evaluators need to understand if this is due to communication challenges or if it is because the partners are losing sight of what was committed to.

The independent evaluation is divided into three main phases:

1. developing an Evaluation Plan;
2. information gathering; and
3. preparing the evaluation report.

The overarching questions for the independent evaluation are:

1. What are the main inputs, outputs and outcomes within the implementation of each priority area?
2. What activities are taking place, where and by whom?
3. Are these outcomes different from what were desired by the water partners?
4. Are these outcomes contributing to the goals and vision of the Water Strategy?

5. What performance indicators could be developed to measure future progress?
6. What *Keys to Success* and associated action items are still priorities to work on and what are new areas recommended for inclusion in the next Action Plan?
7. What are the challenges for water partners to achieve the goals and the vision of the Water Strategy and the Action Plan?
8. How can water partners more effectively participate in implementing the Action Plan?

Following the presentation, Donald Murray and Nichole Fraser Macdonald led a break-out session to discuss challenges and achievements of the Water Strategy.

The discussion was organized into seven priority areas:

- transboundary water agreement negotiations;
- partnerships and water stewardship ;
- community-based monitoring to address local concerns and build local capacity;
- source water protection planning;
- long-term aquatic monitoring;
- regulatory processes; and
- municipal water licence compliance.

The results from the break-out groups are organized below according to the seven priority areas and list the respective challenges and opportunities.

Long-term monitoring

Challenges: Limited financial resources, access to the sampling sites and weather conditions can limit the monitoring activities. Challenges to understand baseline can be: seasonal changes, climate change, lack of unified methods and goals, changing technologies versus real change, and baseline changes (what is baseline with 10 years of development, or with impacts from climate change?). Other identified challenges were how to take into account traditional knowledge in the long-term monitoring programs, lack of human resources to do sampling and run database, and a lack of coordination between the different programs.

Opportunities/ Successes: Successes include the current reports identifying monitoring gaps. There is a lot of long-term monitoring data from the federal government. GNWT has done a good job engaging stakeholders and developing partnerships. The independent evaluation can provide accountability and see how things are being done and where there are weaknesses. There have been investments in people and equipment and there are initiatives aiming to make things more efficient (example the community-based monitoring and the data management system).

Partnerships and Water Stewardship

Challenges: Access to information and having data in one spot is a challenge for the various partnerships. There is a limited focus for water stewardship. It is mostly around Canada Water Week, and water stewardship activities could be broader and aim to bring more people/other groups together. There is a need for more public events. More work has to be done to overcome language barriers and more resources are needed for producing plain language products.

Opportunities/ Successes: The Water Strategy provides a solid platform for developing partnerships and strengthens the sharing of different knowledge types. Partners are kept informed about different initiatives. Access to data is often not restricted but there is a need to know who to contact. The water stewardship website is a good way to access information. Water stewards (e.g., water monitors in the communities) can be better supported to have more opportunities to get involved. There is a need to involve youth more (e.g., the messages from the curriculum about drinking water and bottled water will be provided to parents and other adults in their surrounding). Water educational capacity has been built (e.g., Project Wet); and Canada Water Week has had very successful events promoting water stewardship.

Regulatory Processes

Challenges: *Sometimes there is a disconnection between the goals of the Water Strategy and objectives from regulatory system. Different amount of resources going into the environmental assessment process and the transition to water licence or land use permit (a lot of energy spent on the environmental assessment, but little on the backend following up with outcomes of permit and licence conditions with the resource officers). There is a disconnection between cumulative effects, permafrost and climate change and translating into the regulatory process.*

Opportunities/ Successes: *The regulatory systems provide recognition of the importance of keeping water clean. Memorandums of understanding and agreements are being put in place (Inuvialuit Water Board, protocol between departments for officers). There has been an increase in the technical capacity so NWT doesn't have to rely as much on outside expertise (more officers being hired). Supporting guidelines have been developed. There is an interconnection between the regional regulatory boards. A draft strategic plan for CIMP 2016-2020 (expected to be finalized sometime during 2015). More data sets will be available for developers.*

Transboundary

Challenges: There could be challenges to allocate implementation funding for the agreements. It can be hard to address impacts from past development in transboundary agreements. The negotiations are going quickly, so communicating the information to communities can be a challenge. It will be important to have a science and monitoring committee for implementation of the agreements. Aboriginal government involvement needs to be increased in negotiations (and there needs to be more time for providing input) and consultation has to be meaningful.

Opportunities/ Successes: Getting British Columbia and Alberta onside at the table and completion of these agreements by end of fiscal year is a big success. The involvement of Aboriginal people (unlike other jurisdictions) in the negotiations has been successful. Negotiations are moving quickly and could be complete before more development can take place in the basin. The intention is to have agreements as similar as possible and have the agreements focus on the aquatic ecosystem as a whole.

Community-based Monitoring and Research

Challenges: There is a broad set of commitments. How are they coordinated and how is the information connected? A long-term plan for capacity building is needed. There is a lack of a plan for how to include traditional knowledge (without being too prescriptive). Who will be paying for the community-based monitoring if communities are doing the monitoring on their own? There is a challenge in dealing with shifting funding priorities or single year funding. Sometimes there is a lack of direction from the communities; and a lack of defined priorities and knowledge gaps.

Opportunities/ Successes: There has been an increase in the number of community-based monitoring initiatives. There is an increased interest and awareness about what it is and how people can be involved. The community-based initiatives enable exchange between different generations and knowledge holders. The initiatives results in partnership that contextualize the research and builds relationships. There is a cross pollination of projects and opportunity to involve youth. It is important to build on what already exists and work with complementary partners.

Municipal water licence compliance

Challenges: More education is needed around the structure and the tasks that need to be completed under the municipal water licence. Sometimes there are limitations in human resources and data availability. It is challenging to complete the plans in a timely manner. Community governments have the water licences but have less control over what is put in the water, unlike industry that has greater control about what goes in the water.

Opportunities/ Successes: The regional regulatory boards, community governments, non-government organizations, and territorial departments continue to work together to increase the number of communities with water licences and improve municipal water licence compliance through completion of reporting and monitoring requirements. Land and water board staff have worked internally and with other government agencies to create various tools for municipal water licences, including, but not limited to: reporting templates, templates for operation and maintenance and spill contingency plans, educational material, and municipal landfill guidelines. Conferences and training courses are good initiatives and community-based monitoring is a positive move towards informing communities and building capacity.

The potential amalgamation of the regional land and water boards was also discussed at the workshop.⁴

Source Water Protection

Challenges: The community context differs widely (wide variety of water sources) and could be challenging. There are different contaminant sources and a cookie cutter approach will not work. It is time consuming for each community to develop a plan and resources and capacity become issues. Some communities have to get water from other communities and therefore have less control over the water source (e.g., trucked water). The water source to tap can be a challenge because of the divided responsibility over drinking water. A better partnership needed with a plan in place to address all factors.

Opportunities/ Successes: There is active source water protection planning in Trout Lake taking place. There is a growing awareness resulting in changes in behaviour in the communities (once the paths of contaminants become more obvious). The planning process could generate greater confidence in the source water (relatively pristine water in most areas in the NWT). There is a growing sense of control and decision making, as well as an opportunity for capacity building and skills development. It was seen as an opportunity to link source water protection with municipal water licence process, which can serve to protect source water and ensure proper environmental management and monitoring of waste treatment systems in the local watershed. Other water licences (for industrial development) and land use permits also provide protection measures in the regional watershed.

In addition to the break-out session, attending workshop participants were asked to fill out contact forms to identify key personnel who the evaluators should speak to during the information gathering phase.

VII. Moving forward into 2015

Erin Kelly, Associate Assistant Deputy Minister of ENR, provided an overview of the 2014/2015 implementation priorities, as follows:

- transition of water management responsibilities in light of Devolution;
- continue to implement community-based monitoring;

⁴ As of September 2015, the outcome of the amalgamation has not been determined. Regional regulatory boards continue to work together to ensure continuity and streamlining within the regulatory processes.

- use community-based monitoring results to help inform decisions (e.g., in regulatory processes);
- complete transboundary negotiations with Alberta and British Columbia;
- assess Mackenzie River Basin-wide data/ information and develop common traditional knowledge indicators with water partners;
- continue to engage communities in Source Water Protection Planning; and
- ensure information/data are well managed, linked together and accessible.

One key priority for 2015/2016 is the development of a new Action Plan for the Water Strategy. It is important that all water partners think about what has been successful with the current Action Plan and how we all can improve the upcoming Action Plan.

The new priorities for 2015/2016 were discussed amongst workshop participants and were similar to previous years' priorities. Following are the identified priorities:

- work with interested NWT communities to develop community source water protection plans;
- establish and implement transboundary water management agreements;
- build capacity within interested NWT communities through monitoring activities like the NWT-wide Community-based Monitoring Program;
- continue strengthening the way water-related information is made available and distributed, including utilizing the NWT Discovery Portal and launching the Mackenzie Data Management System; and
- develop a new Action Plan for 2016-2020, which will provide a path forward for the implementation activities and build on existing successes. (Water partners gave direction to not spend financial resources in meetings and workshops and find alternative ways to gather the information.)

Please see Appendix B for the results of a survey which took place in May 2015 to confirm the discussed priorities with the Water Partners.

Appendix A: Workshop Participants and Agenda

Aboriginal Governments	
Leon Andrew	Sahtu Secretariat Inc.
Diane Betsina	Yellowknives Dene First Nation
Richard Binder	Inuvialuit Joint Secretariat
Tim Heron	Northwest Territory Métis Nation
David Krutko	Gwich'in Tribal Council
Cochise Paulette	Smith Landing First Nation
Peter Redvers	Kátł'odeeche First Nation
Robert Lamalice	Kátł'odeeche First Nation
Shin Shiga	North Slave Métis Alliance
Melaine Simba	Dehcho First Nations
Sjoerd van der Wielen	Tłı̨chǫ Government
Delores Tonka	Dehcho First Nations
Regulatory and Renewable Resources Boards	
Bijaya Adikari	Inuvialuit Water Board
Susan Beaumont	Wek'èezhii Renewable Resource Board
Jody Pellissey	Wek'èezhii Renewable Resource Board
Heather Scott	Mackenzie Valley Land and Water Board
Mardy Semmler	Inuvialuit Water Board
Boyan Tracz	Wek'èezhii Renewable Resource Board
Industry, Environmental Non-Government Organizations and Others	
Blair Carter	Ecology North
Ruari Carthew	Summit Environmental Consultants Inc.
Joseph Chamberland	C-Core
Simon Courtenay	Canadian Water Network
Carolyn Dubois	Walter and Duncan Gordon Foundation
Claude R. Duguay	University of Waterloo
Steve Ellis	Tides Canada
Mike English	Wilfrid Laurier University
Jeremy Flatt	Ecology North
Nichole Fraser Macdonald	Shared Value Solutions
Vanessa Gustaldo	Walter and Duncan Gordon Foundation
Jennifer Hickman	Wilfrid Laurier University
Rose Jackson	Ecology North
Mike Low	AAROM Dehcho
George Low	AAROM Dehcho
Shauna Morgan	Pembina Institute
Lara Mountain	Ducks Unlimited
Don Murray	Harry Cummings Associates
Brenda Parlee	University of Alberta
Peter Pulsifer	Walter Duncan and Gordon Foundation/ ELOKA
Craig Scott	Ecology North
Christina Sofo	Ducks Unlimited

Olivier Tsui	Hatfield Group
Christine Wenman	Independent Consultant
Government of the Northwest Territories	
Jeanne Arsenault	Water Resources Division - ENR
Meghan Beveridge	Water Resources Division - ENR
Katarina Carthew	Water Resources Division - ENR
Krista Chin	Conservation, Assessment and Monitoring - ENR
Shannon Cumming, Assistant Deputy Minister	Directorate- ENR
Nicole Dion	Water Resources Division - ENR
Jennifer Fresque-Baxter	Water Resources Division - ENR
Stefan Goodman	Water Resources Division - ENR
Ryan Gregory	Water Resources Division - ENR
Bruce Hanna	Field Support Unit - ENR
Mike Fournier	Policy and Strategic Planning - ENR
Francis Jackson	Water Resources Division -ENR
Robert Jenkins	Water Resources Division -ENR
Julian Kanigan	Conservation, Assessment and Monitoring - ENR
Erin Kelly, Associate Assistant Deputy Minister	Directorate - ENR
Evangelos Kirizopoulos	NWT Centre for Geomatics - Lands
Catherine Lafferty	Water Resources Division - ENR
Annie Levasseur	Water Resources Division - ENR
Tonya Makletzoff	Conservation, Assessment and Monitoring - ENR
Marcelle Marion	Policy and Strategic Planning - ENR
Emily Mahon	NWT Centre for Geomatics - Lands
Meg McCluskie	Water Resources Division - ENR
Mike Palmer	Conservation, Assessment and Monitoring- ENR
Nathen Richea	Water Resources Division - ENR
Sarah Rosolen	Aurora Research Institute
Juanetta Sanderson	Water Resources Division - ENR
Brian Sieben	Climate Change Programs - ENR
Jennifer Skelton	Land Use and Sustainability -Lands
Jurjen van der Sluijs	NWT Centre for Geomatics - Lands
Gila Somers	Water Resources Division - ENR
Kelly Stein	Conservation, Assessment and Monitoring - ENR
Tasha Stephenson	Field Support Unit -ENR
Katherine Trembath	Water Resources Division - ENR
Jennie Vandermeer	Water Resources Division - ENR
Stephanie Yuill	Field Support Unit –ENR
Federal Departments	
Mark D'Aguiar	Department of Fisheries and Oceans Canada
Anita Gue	Environment Canada
Kerry Pippy	Environment Canada



**NWT Water Stewardship Strategy
Implementation Workshop
February 4-5, 2015**

Tree of Peace Building, 5011 - 51 Street Yellowknife, NT

NWT water partners are invited to a two-day NWT Water Stewardship Strategy (Water Strategy) Implementation Workshop from February 4-5, 2015 at the Tree of Peace building in Yellowknife, NT. The workshop provides a platform to discuss how we can collaborate, prioritize and work together to protect the water in the NWT.

Water partners meet annually to discuss important water research and monitoring taking place in the NWT and how these activities inform NWT water management and Water Strategy implementation.

Participants

Water partners include representatives from federal, territorial, Aboriginal and municipal governments, the Water Strategy Aboriginal Steering Committee, northern regulatory boards and agencies, non-governmental organizations, industry, academia, and NWT communities. The Water Strategy broadly defines a water partner as anyone who has a role in water stewardship.

A Plan for Action

NWT Water Stewardship: A Plan for Action 2011-2015 was released in 2011 and provides a detailed plan for implementation. The annual workshop is part of our routine checks to make sure our achievements are contributing to progress towards the goals and the vision of the Water Strategy. Implementation of the Water Strategy is being independently evaluated. The outcomes of the evaluation will inform the next Action Plan, which will outline implementation activities for 2016-2020.

Objectives

Workshop objectives:

- **Review implementation of the Water Strategy:**
 - Provide brief updates on community-based monitoring initiatives, source water protection, regulatory activities, public education and negotiation of Transboundary Water Management Agreements.

- Provide water-related research and monitoring updates. Panel discussions will follow and focus on how these initiatives can inform NWT water management, the Water Strategy and a future Action Plan.
- **Discuss the independent evaluation and core components for developing the next Action Plan to ensure water partners' involvement in the next implementation phase.**
- **Set priorities and targets for 2015 implementation activities.**

The outcomes of the workshop will help set direction for implementing the Water Strategy in 2015 and beyond. For more information about ongoing projects visit: www.nwtwaterstewardship.ca

**Please contact nwtwaterstrategy@gov.nt.ca by January 23, 2015
to confirm your attendance**

Training Opportunity – Project WET – February 3, 2015

In conjunction with the workshop water partners are invited to take part in a free one-day training session on Project WET (<http://www.projectwet.org/>) on **February 3rd in Yellowknife**. For more information about the training session and agenda, contact Stephanie Yuill at [Stephanie Yuill@gov.nt.ca](mailto:Stephanie.Yuill@gov.nt.ca)

Working Agenda

Wednesday February 4th

8 - 8.30 am **Arrival and Registration** *Tree of Peace*

8.30 - 9 am *Opening Prayer*

Welcoming Remarks

Agenda Overview

9 - 10:30 am **I. Update Water Strategy Initiatives**

-
- *Community-based Monitoring* *(Diane Betsina, Yellowknives Dene First Nation and Jennie Vandermeer, ENR)*
 - *Source Water Protection* *(Blair Carter, Ecology North and Jennifer Fresque-Baxter, ENR)*
 - *Regulatory Overview* *(Nathen Richea, ENR)*
 - *Public Education and Communication* *(Tasha Stephenson, ENR and Rose Jackson, Ecology North)*
 - *Mackenzie Data Management System* *(Walter and Duncan Gordon Foundation)*
-

10:30 am –
12 pm

II. **Water Research Updates**

- *Wilfrid Laurier University (WLU) Water Research Initiatives overview (Mike English, WLU)*
 - *Assessing the potential impact of changes in the annual snowpack to the Bathurst Caribou herd (Michael English, WLU)*
 - *The Cold Region Hydrologic Model and Other Tools for Climate Change Adaptation in Water Management (Brian Sieben, Environmental Division, ENR)*
 - *Investigating the Cumulative Effects of Environmental Change and Industrial Activity in the Tathlina Watershed” (Michael Palmer, NWT Cumulative Impact Monitoring Program, ENR)*
 - *Delta Dialogue Network (Jennifer Fresque-Baxter, Water Resources Division, ENR)*
-

12 – 1 pm

Lunch (provided)

Film Screening: “The Permafrost of the Peel Plateau”

1 – 2 pm

Water Research Updates

- *The impacts of permafrost degradation on aquatic health in the Peel Plateau (Krista Chin, NWT Cumulative Impact Monitoring Program)*
- *Tracking Change – Local and Traditional Knowledge in the Mackenzie River Basin (Brenda Parlee, University of Alberta)*
- *Tłįchq Aquatic Ecosystem Monitoring Program (Boyan Tracz, Wek’eezhii Renewable Resource Board)*

2 – 3 pm

**III. Current Remote Sensing Initiatives
in the NWT**

- *Water Ecosystem Monitoring using Earth Observations- Slave River and Delta (Joseph Chamberland, C-Core)*
- *Using Remote Sensing Data to Support Cumulative Impact Monitoring of Water Resources in the NWT (Olivier Tsui, Hatfield)*
- *NWT Centre for Geomatics (Jurjen van der Sluijs)*

3 – 4 pm

IV. Panel Discussion

How can remote sensing fill information gaps and advance water-related research and monitoring?

4 - 4:30 pm

Summary and Wrap up

6 – 9 pm

**Evening Session on Data Management System for
the Mackenzie River Basin**

(Hosted by Walter Duncan Gordon Foundation)

The Gordon Foundation and the GNWT are looking for feedback on an online tool to help make information about freshwater quality in the Mackenzie River Basin more widely accessible. For more information see attached poster. There will be a prize draw and dinner will be provided.

Thursday February 5th

8:30 - 8:45 am **Agenda Overview**

8:45 - 9:45 am **V. Transboundary Water Management Agreements**

Update on transboundary water management agreements with British Columbia and Alberta (Erin Kelly, lead negotiator, ENR)

10 - 11:30 am **VI. Baseline Water Monitoring Updates**

- *Environment Canada (Anita Gue)*
 - *Water Resources Division (Juanetta Sanderson and Derek Faria)*
 - *Gap analyses of water monitoring in the NWT (Ruari Carthew, Summit Environmental)*
-

VII. Panel Discussion

What are potential approaches to fill identified monitoring gaps in the NWT?

12 – 1 pm

Lunch (provided)

Additional Opportunity for water partners to discuss the Mackenzie Data Management System.

3rd floor large boardroom Scotia Centre 12:15pm -1pm.

The Gordon Foundation and the GNWT are looking for feedback on an online tool to help make information about freshwater quality in the Mackenzie River Basin more widely accessible.

1 – 3 pm

**VIII. Independent Evaluation/
Upcoming Action Plan**

Independent evaluation and intended outcomes

(Donald Murray, Harry Cummings Associates and Nicole Fraser MacDonald, Shared Value Solutions)

3 – 4 pm

IX. Moving forward into 2015

Priorities for 2015-2016: What do we do next?

(Erin Kelly, Associate Assistant Deputy Minister, ENR)

4 – 4:30 pm

Summary

Closing Prayer

Appendix B – Water partner survey to confirm priorities discussed during the workshop – May 2015

In addition to the discussion that took place at the workshop, a survey was provided to the water partners in May 2015 to confirm the discussed priorities. The survey provided an opportunity for all water partners to provide input including organizations unable to attend the implementation workshop.

There were a total of 14 survey respondents, representing approximately 12 organizations.

Source Water Protection Planning

100% of the respondents agreed that source water protection planning is a priority. Most organizations want to be involved in implementing the priority. There was a recommendation to align these efforts with the communities' regulatory requirements so as not to overtax the community. Other respondents highlighted the source water protection course developed by Trent University, Sir Sandford Fleming College and Aurora College. Additional comments in regards to this priority were about making funding available to communities to work on their source water protection planning, understanding that the current supporting guidance documents available to communities might be quite onerous and not suitable for all communities. A more simple and alternative process is needed. To increase the interest for source water protection, it was suggested a strategic connection be made with land protection as the current proposed protected areas align well with portion of the watersheds that would fall under a source water protection plan. Finally, ENR Public Education can play a supportive role in introducing source water protection concepts to schools and youth.

Transboundary Water Management Agreements

All respondent were supportive of this priority. About half of the respondents would like to be involved in the negotiation and the implementation of the agreements.

Additional comments were concerns about the gaps in enforcement of the agreements. Some organizations will be able to inform the public in the NWT and in other jurisdictions to enable support for the implementation of the agreements. Aurora College would like to have guest lectures or presentations for their students about the transboundary agreements. Public Education (ENR) can play a supportive role in educating the public and schools about the agreements. The Agreement with Yukon was seen as a priority for one of the respondents.

Supporting Community-based Monitoring

All the responses were supportive of this priority. The majority of the organizations would like to be involved. It is important that community-based monitoring align with identified community

concerns. Additional comments related to municipal water licences and whether community monitoring could include waste streams, which would help the communities with their compliance monitoring.

If GNWT-ENR had the capability to analyze data from additional community-based monitoring initiatives it would further support this priority. There is a need to structure the training so it could be linked to and fit with other training or diplomas (e.g., monitoring training provided by Aurora College). Enhancing capacity at the community level in all areas of water management should be a priority, including municipal water licence compliance. This type of monitoring could be linked to conservation related activities/ opportunities.

Information Management

12 out of the 13 responses were supportive of this priority. Half of the organizations are willing to participate, some limited to an advisory role. Additional comments included making sure information is available to decision makers in resource management and to the general public, and making all information available not just selected parts. The implementation activities related to information management play an important role in filling the current knowledge gaps.

Development of a new Action Plan

12 out of the 13 responses were supportive of this priority. The majority of the respondents want to be involved and contribute to the development of the Action Plan. Some have contributed through the evaluation process and identified under which theme the organization would be willing to participate and provide information. Additional comments were to build on the already established priorities and not include new implementation areas.

The participants were asked to rank the identified priorities. The highest ranking priority was identified with a 1 and the lowest ranking priority was identified with a 5:

1. Community-based Monitoring
2. Source Water Protection
3. Transboundary
- 4/5. Develop a new Action Plan/ Information Management

Additional Priorities

Survey participants were also asked to identify additional priorities that were not discussed during the workshop. The following is a summary of suggested priorities:

- develop a plan on how to build long-term capacity for community-based monitoring, including project management on a community level;

- align priorities when possible with current water licence requirements for communities to help ensure their limited resources can be maximized;
- hold more public discussion about what should be the limits and conditions on oil and gas activities (e.g., hydraulic fracturing); and
- prioritize communication and engagement with Water Partners.