
# What about that summer?!

*Sarah Rosolen, Manager, South Slave Research Centre*

For once, no one was complaining about the weather, or the bugs, this summer! Researchers were back in the NWT in full force this year, and there was lots of research action in the South Slave! We were happy to see so many researchers reaching out to community: working with local IGOs, guest lecturing at the college, and visiting PWK classes as well as their camp at Thebacha. They also helped us reboot the Speaker Series. If you are a researcher coming to town, please let us know so we can help connect you with schools and public talks. And thank you to all the researchers who took the time to submit research updates - I have been pleasantly overwhelmed the the response!

In terms of locally grown research, IGOs were also super busy with research and monitoring work. I couldn't begin to list all of the projects on the go, and they seem to keep growing! I am very thankful to Jon McDonald, fieldworker for Fort Smith Métis Council, for sharing a story about their work in this issue.

Also in this issue, Laura Neary, PhD candidate at Waterloo, shares a personal reflection on her experiences doing research in the South Slave. I also asked Claire Singer, PhD candidate at St. Mary's University (Halifax) to include a story on how she digitized herbaria collections from various organizations, including the college, in the NWT last year. This is a valuable asset that is now publicly available - thank you for this work!

Finally, as everyone is starting to think about next summer -- a few different agencies and IGOs have started talking about a **Northern Whooping Crane Festival**. If you are interested in getting involved, drop me a line! srosolen@auroracollege.nt.ca

@SouthSlaveResearch

## IN THIS ISSUE

# ARI STEM Outreach

*Hilary Turko, Outreach Coodinator - South Slave*

This summer was a busy one! Thanks to a great team of summer students we were able to participate in the Salt River First nation STEM camp, offering hands-on science and technology activities each afternoon!

We built pirate ships and periscopes, made magic potions and golden snitch catapults, played with ozobots and rockets, extracted the DNA from a strawberry, and learned about neuro-prosthetics by controlling a robotic arm with our own muscle contractions!

# Dark Sky Festival

The Dark Sky Festival was back with in-person activities, lectures and sky watching, and ARI was excited to once again host the Friday afternoon STEM activities for youth and families! We started indoors, with space-themed activities, including robot design and creating artwork to send to space on the AuroraSat, before moving outside to make giant bubbles, try our accuracy with stomp rockets and of course, cool down with some ice cream!


This image was created with artificial intelligence. Visit https://openai.com/dall-e-2/ to make yours!

## Add STEM to your event!

We love to share our STEM! Let us know what you have going on and we will try to be there in person. If we aren't able to be there, we can set you up with lots of cool activities and equipment!

Contact Hilary: hturko@auroracollege.nt.ca

## Summer Speaker Series

The ARI Summer Speakers Series was back this summer with in-person talks showcasing the scientific research happening in our region!

- *What Happens to Fungi and Bacteria after a Wildfire*; with Dr. Thea Whitmas and Dana Johnson from the University of Wisconsin-Madison;
- *How are Microplastics Moving in Northern Waters*; with Madelain Bourdages and Jesse Vermaire from Carleton University;
- Akira Osawa's team from Japan was in town and did a guest lecture for ENRTP about their decades of work in boreal forests;
- *The Solar Activity Observed with the Fort Smith Neutron Monitor*; with James Roth and Pierre-Simon Mangeard from the Bartol Research Institute, University of Delaware;
- And, a team from Wilfrid Laurier/Waterloo was here and took 2nd year ENRTP students out to learn about sediment core sampling and spoke to junior high students from PWK.

Did you miss out? Join the South Slave Research Centre Facebook page for updates and information on future research talks!

community profile

# Fort Smith Métis Council

*Jon McDonald, Field Worker Fort Smith Métis Council*

Fort Smith Métis Council (FSMC) had a busy summer getting our feet wet and muddy, monitoring everything from water and fish to bison and birds to bats and amphibians.

As the new field worker for FSMC, I have been working hard to build connections with all of the government agencies and researchers who are working on Métis territory. The Council needs to be involved in projects so that we can communicate what is happening on the land to the community. We need to bridge the gap between scientific knowledge and traditional knowledge and at the same time, break down the stigma of working with the government. We feel that more can be accomplished by working with government and by realizing that they share our goals of protecting the environment. When FSMC is a partner, we are able to deliver the message to our community - and that might be received differently than coming from government.

*Jon McDonald (FSMC) and Gila Somers (ENR) collecting large bodied fish samples on the Slave River.*

We are becoming partners in research projects, rather than just boat drivers. ENR and researchers are beginning to ask for our advice and input on study design because they value our expertise and knowledge of the land. It wasn't always this way, though - there is a long history of government and researchers not listening to community. However, we are starting to see change and are hopeful about continuing to grow those relationships.

*Chris Cunada (ENR) and Ryan Pischinger (FSMC) working on fish in the ENR lab.*

*FSMC working with Chris Cunada and Christine Dunbar (ENR) electrofishing on the Slave River*

# Fort Smith Métis Council (continued)

One of FSMC's research objectives is to be a watch-dog for industry. Métis members are concerned that oil sands tailings ponds are being released in the winter, harming the water and wildlife. We want to develop year-round environmental monitoring so we can continue to let people know "The water is safe to drink, and the fish and wildlife are safe to eat". We are working with ENR to secure funding to support year round water quality and small body fish sampling for the next 3 years. This is only the start -- we need years of studies and a lot of data to see changes and answer questions.

Ultimately, the FSMC wants to sustain hunting, fishing and trapping for generations to come, and this will only happen by working together. FSMC has been involved with ENR on multiple projects including; Community Based Monitoring (CBM), Trans Boundary agreement, Biodiversity Program (wildlife cameras, audio recorders for birds, bats and amphibians), Slave River Lowlands Bison Populations study, WBNP Bison disease study, Bat health and population study, Invasive Species (vegetation), Species at Risk, and Bell Rock remediation project (Northern Transportation cleanup). We are also trying to find funding for other environmental programs and to get youth involved with monitoring and research so they can carry on the work for generations to come.

*Monitoring little brown bats on with Joanna Wilson (ENR)*

*FSMC (Jon McDonald) working with ENR - Brad Woodworth and Liam Case to deploy wildlife cameras on Métis territory*

# NWT Herbaria Digitization

*Claire Singer, PhD candidate, St. Mary's University (Halifax)*

In spring 2022, herbaria specimens in a number of NWT locations were digitized (i.e., photographed to be digitally available). This included specimens held by Aurora College – Thebacha campus, Parks Canada – Wood Buffalo National Park (Fort Smith and Fort Chipewyan collections), and the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories, Yellowknife.

Digitization work was conducted in Fort Smith and Yellowknife by Claire Singer, doctoral candidate with Saint Mary's University (Halifax, Nova Scotia). Claire is an NWT resident who returned north to complete this work.

A total of approximately 4,000 specimens were digitized. The Consortium of Pacific Northwest Herbaria (managed by the University of Washington) has offered to host the digitized images and corresponding data. Upload of data and images to the Consortium is occurring gradually, given the volume of images to be entered.

If you would like to access these physical or digital collections in the NWT, please contact Dr. Peter Lin at Aurora College (PLin@auroracollege.nt.ca), Lori Parker at Parks Canada (lori.parker@pc.gc.ca), or Dr. Suzanne Carrière at ENR (Suzanne_Carriere@gov.nt.ca).

# Personal reflection on doing research in the South Slave

## Laura Neary, PhD Candidate

I am so very grateful for the opportunity to co-design and lead this new research project studying ponds in the Whooping Crane Nesting Region. During my three short trips to Fort Smith I learned so much about the land, water and rich history of the region.

I explored the beautiful Salt Plains, Rapids of the Drowned, Mountain Portage and Pine Lake. I enjoyed visiting the Museum, the Desnedé Farmers Market and of course spent too much money at NSixty! I owe a huge thank-you to Sarah Rosolen and Hilary Turko who helped me connect with many people in Fort Smith -including teachers at PWK high school who invited me to chat with students at the culture camp and lead a science lesson at the high school in September. I also owe a thank-you to Bryce Olsen who helped me organize and coordinate a field trip for the second year ENRTP students to collect sediment cores from Pine Lake in September. While I was unable to attend the Fall Fish Camp at Hay Camp, I visited shortly before it took place where I met some very inspirational people.

*Laura Neary and Laura Anderson posed for a photo on the side of the helicopter before heading out to collect water samples in August.*

I am excited to share that I have received funding from Northern Water Futures that will allow me to stay in Fort Smith for the summer of 2023! During this time, I plan to introduce the whooping crane pond research project widely and share the results from sampling in 2022. I also hope to volunteer for various community events including the STEM camp hosted at Salt River First Nation Conference Centre and attend the spring and fall fish camps on the Salt River and at Hay Camp. I am very thankful for this amazing opportunity and look forward to the many experiences it will bring!

-Laura Neary, University of Waterloo

*Laura Neary and Laura Anderson spent time within the community engaging with students at the culture camp hosted at the Thebacha campground in September and playing volleyball and teaching a science class at PWK!*

# BISON HEALTH OPEN HOUSES

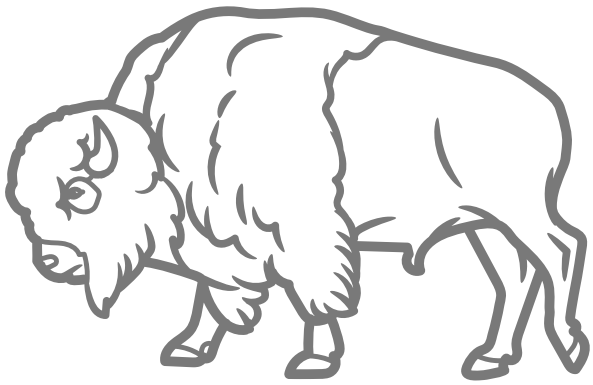
## FORT SMITH (NOV 8)
## FORT CHIPEWYAN (NOV 9)

Dr. David Hall and I (Dr. Kyle Plotsky) from the University of Calgary are investigating the socioeconomics of wood bison disease management in Wood Buffalo National Park. We are hosting a couple open houses on the bison health issue to introduce ourselves to the communities around the park.

Please join us between 5pm and 8pm at the SJ Family Center in Fort Smith on November 8th or at the Mamawi Community Hall in Fort Chipewyan on November 9th. Conversation topics will include where these diseases originated and what has been done to address the disease issue. A member of Parks Canada will be on hand to talk about some of the current bison work in the park.

Refreshments will be available and there will be draws for Amazon gift cards (Christmas is approaching after all).

Please stop by for some conversation about the bison health issue or visit our website (ucvm-bison-project.com) for more information! If you have any comments or questions, feel free to contact me at kyle.plotsky@ucalgary.ca.



# RESEARCH UPDATES

## Transboundary Slave River Fish Monitoring

## Non-native species AND Indigenous knowledge of berries

Claire Singer

## Water in the whooping crane nesting area

Laura Neary, Laura Anderson, Roland Hall, Brent Wolfe

## What happens belowground after a fire?

Thea Whitman

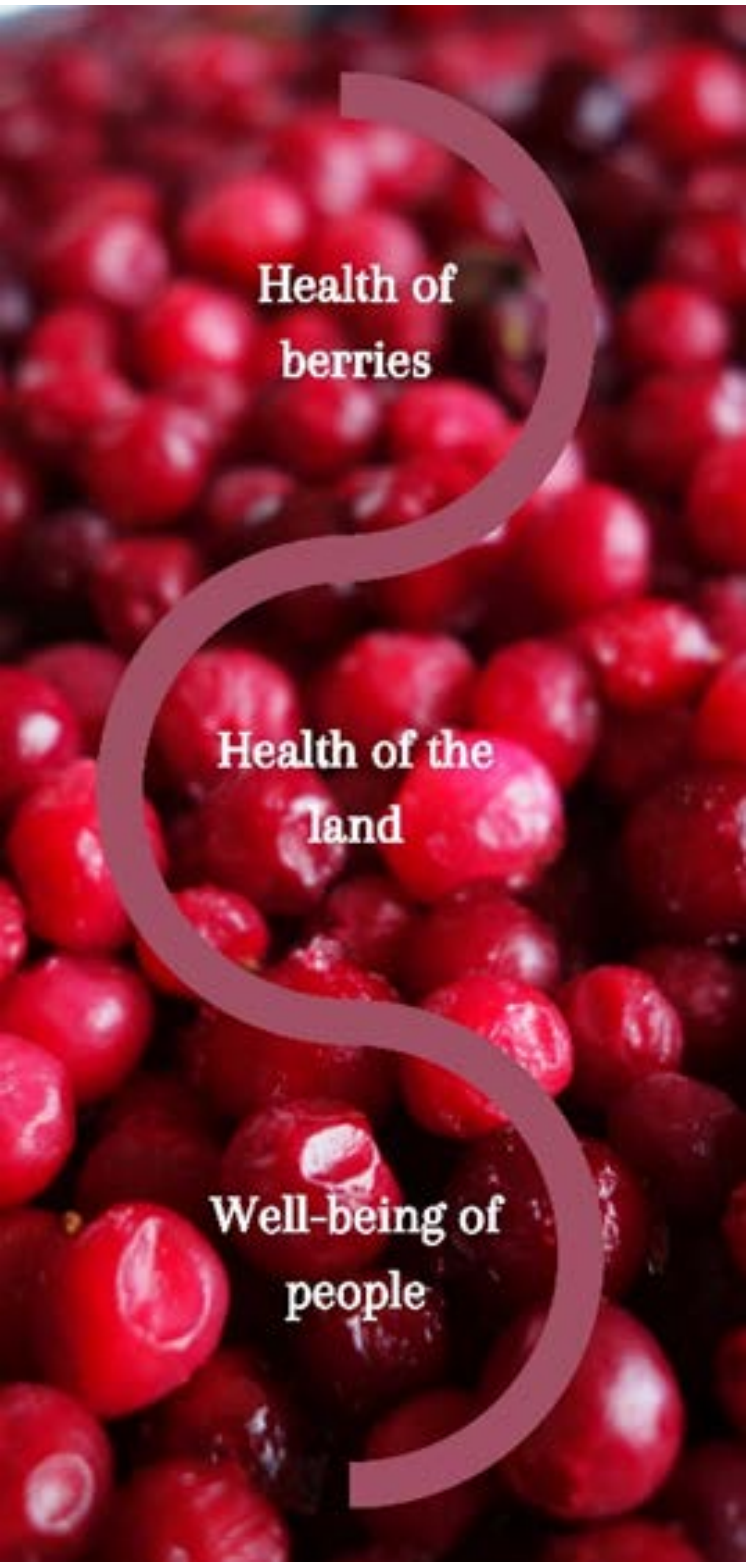
## Kyoto University Research Teams

## Microplastics in Great Slave Lake

Madelaine Bourdages

# Indigenous Knowledge of Berries in the Northwest Territories

*Claire Singer, PhD candidate, St. Mary's University (Halifax)*




Across the north, berries have been important for many generations of people, being used for food, medicines, and household products. Berries are also important for many animals, particularly birds, small mammals, grizzly bears, and pollinators. Berries are so important to some of these species that berry growth influences habitat selection, movements, and over-wintering success. Declines in berries have been reported by Indigenous knowledge holders in some areas of the NWT. These concerns have been echoed across the circumpolar north. The extent and cause(s) of the declines are unknown, nor whether these changes represent normal cyclical trends, although factors such as climate/weather and competition with shrubs have been suggested elsewhere.

It is from this context that our project, called 'Indigenous Knowledge of Berries in the Northwest Territories' was born. We want to learn about how people feel about berries, how they use berries, whether berries are healthy in different regions of the NWT, changes that are being seen in berries, and what might be causing those changes. The information shared with us will be used to prepare reports and articles about how berries are doing in the NWT as well as a calendar of flowering and berry ripening times and a recipe book.

This work is particularly important in light of the impact climate change is expected to have within the NWT. Ultimately, if declines are occurring, or if they occur in the future, we need to know about it so we can discuss ways to improve the situation for berry plants, and therefore people and animals.

Continued next page.

# Indigenous Knowledge of Berries (continued)

*Members of the working group and advisory committee (aka Berry Happy Pickers). Back row, left to right: Michele Grabke, Elaine Lamalice, Madison Menacho-Melnyk, Lila Erasmus, Claire Singer, Deneze Nahkehko. Front row, left to right: Anne Thrasher, Margaret Leishman, Margaret McDonald, Celine Proctor, Alestine Andre, Annie Buckle.*

The project is being led by a group that includes Indigenous knowledge holders, university researchers, and staff from the Government of the Northwest Territories (GNWT). We all call the NWT home and most of us grew up here. The project is being led by Alestine Andre and Claire Singer. An advisory committee of knowledge holders from across the NWT is providing advice and direction. These individuals include Lila Erasmus, Margaret McDonald, Annie Buckle, Bea Lepine, Elaine Lamalice, Celine Proctor, Anne Thrasher, and Margaret Leishman. GNWT staff participating in the project include Gila Somers, Michele Grabke, Sarah Dennis, and Lauren King.

Special thanks to the Gwich'in Tribal Council, Gwich'in Renewable Resources Board, Sahtú Renewable Resources Board, Wek'èezhìı Renewable Resources Board, North Slave Métis Alliance, Species at Risk Committee, Conference of Management Authorities, Social Sciences and Humanities Research Council, ArcticNet, GNWT, and Saint Mary's University for their support of the project. Please contact us at NWTBerries@outlook.com with any questions or if your organization would like to participate in this research project.

# Transboundary Slave River Fish Monitoring: Safeguarding a Precious Resource

*Department of Environment and Natural Resources, Watershed Stewardship Division*

The Alberta-Northwest Territories Bilateral Water Management Agreement signed in 2015 helps protect waters that flow from Alberta into the Northwest Territories. In addition to water quality and quantity monitoring, biological monitoring programs were started on the Slave River to watch for changes in the aquatic environment that might be caused by development or climate change.

**Why monitor fish?**

Fish are a vital food source and an indicator of aquatic ecosystem health. They are sensitive to change and can provide an early warning of stress in the environment. Tracking fish health and contaminant levels over time can also help address community concerns about whether the fish are healthy and safe to eat.

*Left to right: Michael Palmer and Chris Cunada seine fishing.*

**How do we monitor fish?**

The transboundary program builds on previous studies by using the same species used in the past and species identified by community members as being important: lake whitefish, pickerel (walleye), northern pike (jackfish), burbot (mariah or loche), longnose sucker, and goldeye. As part of the program, fish were captured at Fort Smith and in the Slave River Delta near Fort Resolution in 2019 and 2021. The monitoring plan follows an adaptive monitoring approach, where fish monitoring occurs every 3 to 5 years, or more frequently if there are clear indications of change.


*Lawrence Beggair collecting a blood sample from a fish. 2019, GNWT.*

Samples and information collected as part of the transboundary program include:

- Fish length and weight
- Liver, gonad, and spleen weight
- Sex and sexual maturity
- Age of the fish
- Deformities, lesions, tumours, and parasites
- Tissues (muscle, liver, and bile) sampled for metals and oil and gas-related chemicals

# Transboundary Slave River Fish Monitoring (continued)

The tissue samples can show concentrations of various substances such as metals like mercury or arsenic, and oil and gas chemicals such as polycyclic aromatic hydrocarbons (PAHs). Results from the Slave River transboundary fish monitoring program are compared to results from upstream and historical fish studies to help us determine if changes are happening.

*Chris Cunada dissecting small-bodied fish. 2019, GNWT.*

**What did we find?**

The overall health of fish from the Slave River and Delta appears to be in good condition. There are some signs that large-bodied fish are changing, but more research and monitoring are needed to understand natural variability. Specific results include:

·By comparing to previous studies, initial analyses show that in 2019 and 2021 female walleye were smaller, the liver sizes in whitefish were smaller, whitefish males were smaller, and burbot female livers were smaller in 2019 but back within range of historical studies in 2021. All other indicators were similar to previous studies.

·Levels of metals, including mercury, and PAHs were within consumption guidelines.

**Who do we work with?**

The transboundary fish monitoring program is jointly funded by the Alberta and Northwest Territories governments under the Alberta-Northwest Territories Bilateral Water Management Agreement. Many partners are involved in the fish monitoring including Smith's Landing First Nation, Northwest Territory Métis Nation, Wilfrid Laurier University, the University of Calgary, and the University of Saskatchewan.

*Kelly Munkittrick demonstrating fish dissection. 2019, GNWT.*

Visit the Alberta-NWT Transboundary Water Agreement website or read our latest Annual Report for more information. Have a question or information to share? Get in touch! nwtwaterstrategy@gov.nt.ca (Northwest Territories) or aep.tws@gov.ab.ca (Alberta)

# Sources, transport, and fate of microplastics along the Mackenzie River from Great Slave Lake to the southern Beaufort Sea

*Madelaine Bourdages, Carleton University*

Microplastics (plastics smaller than 5 mm) are an environmental concern, and much remains unknown about the transport and fate (where microplastics end up) in Arctic freshwater environments.

Researchers from Carleton University aim to quantify and determine the types of microplastics in Arctic freshwater environments and to better understand the potential sources, transport, and fate of microplastics in these environments. In July 2022, surface water and sediment samples were collected from Yellowknife Bay and the Yellowknife River, from the Slave River and Fort Resolution Bay, from the Mackenzie River near Fort Providence, Inuvik, and Tuktoyaktuk, and from the Beaufort Sea. Sample collections were conducted with support and guidance from community members. Samples will undergo laboratory processing at Carleton University to extract potential microplastics from the samples. Samples that were collected in Yellowknife in 2021 show the presence of microplastics, however, concentrations are relatively low.

Please contact Madelaine Bourdages (madelainebourdages@cmail.carleton.ca) with any questions.

# Investigation of "artesian wells" near Buffalo River

*Dr. Pete Cott, Aquatic Quality Scientist and Bruce Hanna, Advisor Regional Science Programs, Environment and Natural Resources, Yellowknife.*

## The issue

Groundwater upwellings containing metals and sulfur flow from holes and rock fractures, locally referred to as "artesian wells". White staining and a strong rotten eggs odour at these sites are very noticeable and as a result there has been long standing environmental and human health concerns raised by the NWT Metis Nation (NWTMN) and the Fort Resolution Metis Council (FRMC). Exploratory drilling for mineral exploration occurred between 1978 to 1983 in support of the Pine Point Mine, east of the Buffalo River and some of the groundwater upwellings are coming up through old boreholes Attempts to plug exploratory drill holes with gravel at the time were unsuccessful (Paul Herrington, NWT Métis Nation, personal communication). Some of these artesian wells are located at Mellor Rapids, on the east bank of the Buffalo River, about five kms north of Highway 5 (Fig. 1). Naturally occurring groundwater upwellings in the area are due to the fractured nature of the Karst limestone subsurface geological formations and shallow groundwater aquifers. Local knowledge indicates that these artesian wells flow year-round and that there are many in the area.

*Figure 1: The "artesian wells" along the Buffalo River just upstream of Mellor Rapids. The white staining on the rock draws attention of people travelling along the river.*

# Investigation of "artesian wells" near Buffalo River (continued)

Water quality sampling of artesian wells was conducted 20-22 September 2022 in the vicinity of the Buffalo River (west of Pine Point, north of Hwy 5), building on sampling conducted by GNWT inspectors from Lands and ENR the previous year. The objectives were to resample those sites visited last year near Mellor Rapids, and sample additional artesian wells, as well as surface waters so comparisons can be made between the artesian wells and the receiving environment. We sampled 14 sites, including the Buffalo River upstream and downstream of Mellor Rapids, artesian wells that were caused by drilling and those that are likely natural.Samples are being analyzed for nutrients, total metals, ultra-low mercury, BTEX, THM and volatile hydrocarbons, extractable hydrocarbons, and phenols. The results should be back from the analytical laboratories later this fall.

*Figure 2: Water samples taken at MR8, a ground water upwelling locally referred to as an "artesian well". The white staining is from sulfur-rich water from the groundwater below. MR8 was the result of a borehole made during mineral exploration several decades ago.*

The sampling of the Mellor Rapids artesian wells conducted in 2021 did indicate elevated levels of metals such as aluminum, iron, and mercury compared to the CCME Freshwater Guidelines for the protection of Aquatic Life; however, these need to be compared to background levels in the area (such as the Buffalo River) to see if the levels are abnormal for that location. Sulphate was elevated in all samples but is not considered a concern as these upwellings are not used as drinking water sources. Sulphate is a combination of sulfur and oxygen and is part of naturally occurring minerals in some rock, particularly limestone, which gets dissolved over time and released into ground water. Sulphate is digested by sulfur-reducing bacteria and produces a sulfurous odour. This is the strong "rotting egg smell prevalent at these artesian wells. While the white residue is likely a combination of "hardwater staining" caused by calcium and magnesium rich water as well as sulphate.

Once results are analyzed and interpreted, they will be communicated with the NWTMN and FRMC and summarized in plain language and technical scientific reports. This information is important to address community concerns as well as to further characterize the environment prior to renewed mining development at Pine Point. It should be noted that it is now required that boreholes be plugged with concrete prior to backfilling with gravel preventing groundwater upwellings.

# Assessing Spread and Impact of Non-native Plants in the NWT

*Claire Singer, St. Mary's University (Halifax)*

The spread of non-native species (aka alien, novel, or invasive species) is recognized as an important threat to the environment worldwide. These species often get moved around by people, on purpose (planted in gardens) or unintentionally (via roads, attached to vehicles), and then establish in areas near us. Sometimes, these species then move into neighbouring natural areas. Mostly, these species are pretty harmless, but once in a while, they can affect the environment, the economy, or people. Until recently, these kinds of invasions weren't too much of a concern up here, but as people move into new areas and as climate change progresses, the possibility of invasions is likely to increase.

In this context, my goal has been to investigate spread of non-native plants from human introduction sites (roads and communities) into forest fire burns and along rivers in the NWT. These natural disturbances (fires disturb forests and the water in rivers provides continuous disturbance of riverbanks) are considered vulnerable to non-native plant invasion since they are open (no dense forest stands), with lots of light and nutrients, and therefore offer good spots for non-native plants to move into.

*Aisling Dunn (research assistant) alongside white sweet-clover on Highway 4.*

We conducted research in burns along highways 1 (Fort Providence to Fort Simpson), 3 (Yellowknife to Fort Providence), 4 (Ingraham Trail), and 5 (Hay River to Fort Smith) between July 1-August 7, 2022. Data analysis is currently underway but very roughly, we saw fairly limited spread from roadsides into burns, despite sometimes substantial roadside presence of non-native plants. Where we did find it, it was mostly in areas with deciduous or mixed tree (deciduous and coniferous) regrowth. In contrast, we saw substantial spread on the riverbanks of the Mackenzie, Liard, and Slave rivers (near Fort Providence, Fort Simpson, and Fort Smith, respectively) between July 25-August 5, 2022.

Next year, I hope to conduct additional river surveys near Fort Liard and Hay River and to set up a study to assess the impact non-native plants are having on native species communities. Hopefully, the results of this research will assist decision-makers in the NWT, particularly given the importance of plants as habitat to other species.

Special thanks this year go to the North Slave Métis Alliance, Łíídlı̨ Kų́ę́ First Nation, Fort Smith Métis Council, and Ernest Nadli for support in completing the river surveys, to the Wildlife Conservation Society - Boreal Fellowship Program, Northern Scientific Training Program, Natural Sciences and Engineering Research Council, and the GNWT for funding field work, to Johanna Stewart, Shakita Jensen, and Aisling Dunn for assistance during field work, and to my supervisor, Dr. Erin Cameron for her support throughout this project. Please contact Claire Singer (Claire.Singer@smu.ca) with any questions.

# An Update on Whooping Crane Pond Research

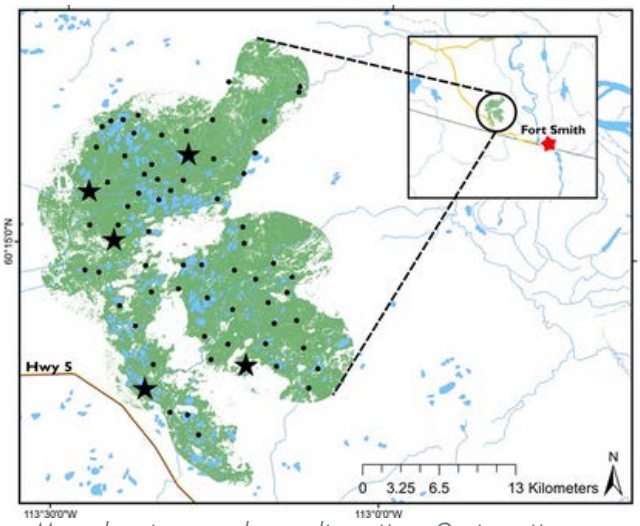
*Laura Neary, University of Waterloo*

Researchers from the University of Waterloo and Wilfrid Laurier University had a fantastic summer collecting samples for their new project in the Whooping Crane Nesting Region, exploring Fort Smith and meeting many new people.

We collected water in June, August and September at 63 ponds in areas near the Sass and Klewi rivers. Felix and Julie Beaver made a substantial contribution towards water sample collection this year. The water samples will be submitted for measurement of 1) water isotope composition to determine pond water balances, including the influence of input from snowmelt, rain and groundwater, and losses by evaporation and 2) water chemistry variables (total and dissolved nutrients, pH, DIC, DOC, DO, ionic concentrations) to characterize variation in water quality across the sites. We also deployed water depth loggers that measure pond depth at hourly intervals in June and retrieved them in September. These data will allow us to study pond level fluctuations caused by groundwater discharge, rainfall and evaporative drawdown. Laura Neary will be analyzing these data over the upcoming winter months!

Sediment cores were retrieved from 5 ponds near the Sass and Klewi rivers (Figure 1). The cores were sliced up in half centimeter intervals and separated into individual sample bags (Figure 4). Laura Anderson will be looking at microscopic algae preserved in the sediment (i.e., diatoms) to understand how conditions in these ponds have changed over time. Johan Wiklund operates the gamma ray spectrometers at the University of Waterloo and will be determining the age of each depth in the sediment cores.

*(From left to right) Bryce Olsen, Everett and Abraham. In partnership with Aurora College, the researchers organized a field trip for the second year ENRTP students to collect sediment cores from Pine Lake. A video showcasing this field trip will be available in the upcoming months!!*




*Map showing pond sampling sites. Coring sites are identified by a black star.*

*Julie Beaver collecting water sample from the pontoon of a helicopter in September 2022*

*(From left to right) Johan Wiklund, Laura Anderson, Laura Neary and Roland Hall preparing a sediment core to be sectioned by first extracting the water at the top of the core tube.*

# What happens belowground after a fire?

*Dr. Thea Whitman, University of Wisconsin*

This summer, soil scientists from the University of Wisconsin-Madison visited Wood Buffalo National Park to study how fires affect soil microbial communities. The research is led by PhD student Dana Johnson in Dr. Thea Whitman's lab, and builds on her master's research project, which was also based in the park. While in WBNP, the team collected soil cores from sites that were either primarily jack pine or primarily black spruce and had not been burned in over thirty years. These cores will be used to study how fire changes microbial communities and how soil - which stores a lot of carbon - releases CO2 into the atmosphere after a fire.

*Our field crew (from left to right): Dana Johnson, Kelsey Kruger, Dominique Letourneau, Thea Whitman.*

After collecting soil cores in June, the team brought them back to Wisconsin to begin the experiments. The cores were dried for several weeks to simulate drought conditions, then burned at temperatures representing both lower intensity fires and higher intensity fires typical of those that may occur in WBNP. After burning, the researchers have been tracking the amount of CO2 being released from the cores. CO2 is released when microbes decompose soil organic matter - not so different from how humans eat food and breathe out CO2!

As the experiment progresses, the team will use this data to model the amount of soil carbon that enters the atmosphere post-fire. They will also be extracting DNA from these cores to see what kind of microbes live in them and how they respond to fire. This research helps us understand how fires affect microbial communities, and how the environment may respond to changing fire regimes of the future.

*Soil core from a jack pine site after being dried and burned.*

*Dana Johnson holding up a soil core taken at a black spruce site.*

*Soil core (wrapped in aluminum foil) being burned. Yellow wires track the temperature as the cores are burned and cooled.*

# Vegetation and fire history in WBNP and its vicinity

*Naoko Sasaki, Ryoma Hayashi and Koji Shichi*
*Kyoto University, Japan*

The paleoecology group focused on collecting surface sediment samples at Pine Lake, Wood Buffalo National Park in the 2022 field season.

Our research project aims to reconstruct vegetation and fire history around the lake in the recent past. Lake sediments, which contain pollen grains and charcoal fragments, accumulate year by year and record the changes in vegetation and fires in the surroundings. Although sedimentation rates can vary between lakes, we expect a 30-cm core of surface sediment would reveal the environmental history over the last 100 years or longer.

With a support from ARI and WBNP we collected two ⩾30-cm sediment cores at the water-sediment interface of the lake successfully. Pb-210 radiometric dating and pollen/charcoal analysis of the sediment cores are currently underway.

The team also shared their knowledge with both ENRTP classes by providing a guest lecture.

*HR-type sediment sampler: an acrylic tube 11 cm in diameter and 50 cm in length was attached to the sampler with 10-kg weights. The sampler has a flap at the bottom to prevent sediment samples from falling off. Photo: Ryoma Hayashi*

*Preparing the HR-type sampler on a Zodiac inflatable boat at Pine Lake. The sampler, fixed with a hoist rope, was dropped to lake bottom 20 m in depth at Pine Lake. Photo: Koji Shichi*

*Each sediment core mostly consists of soft organic mud. We extruded the sediment from the acrylic tube vertically by pushing upward from the bottom, sub-sampled sediment materials at every 1-cm interval, and saved the individual samples in small plastic bags separately.All the sub-sampling was completed immediately after the lake coring to avoid sediment mixing, oxidation and contamination on the way back to our research labs in Japan. Photo: Naoko Sasaki*

# Post-fire dynamics of tree growth and carbon storage in WBNP and its vicinity

*Yojiro Matsuura, Shinya Sugita, Hatena Osawa &*
*Nahoko Kurachi- Kyoto University, Japan*

Our project aims to monitor and reconstruct changes in carbon sequestration in the northern boreal forest - a crucial information in view of human-induced global warming and its impacts. Over the last two decades we've monitored the post-fire regeneration processes, soil formation, and tree-growth functions for reconstruction of carbon sequestration in forest stands, mainly consisted of Jack pine, black spruce and aspen. This year (2022) we went back to some of the monitored stands that were set up in 2012 and 2015 immediately after major fires in the park. Pictures below demonstrate the post-fire stand regeneration processes. Data analyses are currently underway.

**180-year-old jack pine stand, 100km west of Fort Smith**

*Before fire (2015 May)*

*Just after fire (2015 Sep.)*

*Jack pine seedlings one year after fire (2016 Sep.)*

*7 years after fire (2022 Sep.)*

**A mixed black spruce-jack pine-aspen stand, along Salt Plains entrance road**

*Just after fire (2012)*

*10 years after fire (2022)*

*Jack pine and aspen seedlings grow faster than those of black spruce.*