



# Progress Report

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submitted to the  
Strategic Committee  
of the

**NSERC-UQAT  
Industrial Chair  
on northern  
biodiversity in a  
mining context**

FEBRUARY 23 2020

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**Nicole Fenton  
Sophie Laliberté**

Photo credits: Chair's team



# Advancement by objective

## Context

This report summarizes the Chair's progress following the 2020 field season and was prepared for the Strategic Committee of the NSERC-UQAT Industrial Chair, in the context of the February 23rd, 2021 meeting.

## Objective 1

**Objective 1A**  
**Reduce the ecological footprint of mines on biodiversity over their full life cycle**

### PhD 1 - Determining the footprint of mines on plant diversity: integrating enigmatic impacts and the mine life cycle

The PhD project (PhD1) "Determining the footprint of mines on plant diversity: integrating enigmatic impacts and the mine life cycle" is led by Xiangbo Yin, who arrived in June 2018. Xiangbo has completed his PhD academic courses. As part of his PhD exam, he conducted a literature review on the potential environmental impacts of rare earth elements mining in Canada. We have submitted a publication related to his main findings.

Xiangbo is currently analyzing the data collected around the LaRonde, Lapa, Canadian Malartic, Akasaba, Casa Berardi and Joutel mines during the summers of 2017, 2018, 2019 and 2020. Xiangbo seeks to determine the extent of mining influence (footprint) and how this is influenced by the types of ecosystems (hardwood forest, softwood forest, wetlands) and the stage of the mining life cycle (under development, in operation, closed). To determine the mining footprint, he uses plant composition (vascular plants) as an indicator. The microbiome present on bryophytes has also been sampled (laboratory analyses of the microbiome have been completed in collaboration with Christine Martineau, Canadian Forest Service (CFS)) and statistical analyses are in progress. Xiangbo continues to identify bryophyte samples collected during the summer of 2019 and once this task is completed, he will be able to use bryophyte composition as another indicator. A first publication related to this aspect has been accepted for publication, based on the analyses of BSc intern Rémi Boisvert, who worked with the team from August to September in 2019.

### 2020 fieldwork

Mining sites	Dates	Nbr days
Casa Berardi	27-31 July	5
LaRonde	13-17, 20 July	5
Joutel	10-14, 17-19 August	8
Lapa	21-23 July, 17-19 August	6
Malartic	31 August, 1-4, 8 Sept	6
Akasaba	29-30 June, 1-2, 6-7 July	6
10 control transects	13-15 August	13



Sampling surrounding Joutel mining site

**MSc 1 - Spatial footprint of particulate pollutants around active and restored mines: bryophyte growth and bioaccumulation**

The M. Sc. (MSc1) project entitled "Spatial footprint of particulate pollutants around active and restored mines: bryophyte growth and bioaccumulation" has been transformed into a postdoctoral project (Dr. Mélanie Jean). Sampling began in 2018 with four mine sites (Laronde, Lapa, Akasaba, Joutel) for a total of 197 samples collected along 28 transects (including controls). In 2019, Mélanie added the Canadian Malartic and Casa Berardi mines to the project. In 2020, Xiangbo collected moss from new control transects near the Akasaba and Casa Berardi mines. All moss samples are currently being prepared and crushed for analysis of metal content by an intern. The first heavy metal extractions from the dried and crushed mosses were successfully completed in the laboratory of Dr. Benoit Plante at the *Institut de recherche en mines et environnement* (IRME) of UQAT. Partial results of the first extractions are available and preliminary analyses show promising results, however departures in this laboratory has led to delays and we are now exploring options with different partners for sample analysis. We hope to obtain the results of all chemical analyses in April 2021. In 2020, Xiangbo and Mélanie returned to all plots around the mines and on the control transects to complete the measurements of *Pleurozium schreberi* moss after two years of growth. Due to the rapid growth rate of mosses in the study area, a large number of mosses marked in 2018 could not be found. To compensate for this lack, new mosses were marked in 2020 and will be measured again in 2021. We conducted technical tests with the RJ Lee Group to deploy



*Pleurozium schreberi* growth measurement with the help of plastic rings

dust collectors around the mine sites during the fall of 2019 (5 collectors north of LaRonde for 3 weeks). However, since the results were not conclusive, we decided not to pursue this aspect in 2020.

A new PhD project (PhD 6) has been added to this objective through a collaboration with Dr. Christine Martineau of the CFS. Dr. Martineau has applied for internal funding to analyze the soil and water microbiome in existing devices around mining facilities. A first field summer was conducted in 2019 by CFS staff. While we unfortunately had

**2020 fieldwork**

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to cancel the PhD position because of the pandemic, a postdoctoral fellow, Méli ssande-Océane Nagati, has been recruited to work on the microbiome component of the project, and a PhD student, Carlos Cerrejon, will work on the soil mapping part of the project.

The information obtained from the projects included under objective 1a, i.e. impacts on ecosystems (both on biodiversity, ecotoxicity and its influence on flora, the microbiome of bryophytes, water and soil, as a function of distance from the source of contaminant emissions) will provide new data on the extent and distribution of dust. The addition of water and soil in the analyses responds to a request from the partners to include these ecosystem components in the analysis of the problem. All this information can then be integrated into the various environmental assessments of mining projects to better take into



account these impacts and thus better mitigate them. Integrating this information into planning is the subject of the MSc3 project. Kadiatou Soumah will start her MSc in mineral engineering in the fall of 2021 under the direction of Isabelle Demers (IRME) and co-direction of Nicole Fenton.

### **MSc 2 - Using bryophytes to restore mine tailings impoundments: humid sites**

Dave Tremblay, the student assigned to this project, submitted the final version of his master's thesis, and the results were presented at the Chair's Annual Colloquium in 2019 and in a publication aimed at the general public. Nicole Fenton is pursuing more analyses, so more results for this project are forthcoming. This project is analyzing the usefulness of transferring disturbed organic matter residues (forest windrows composed largely of bryophytes) produced by the forest industry to mine sites to promote revegetation. A 30 cm thick layer of organic matter was installed in 8 experimental plots of 2m x 2m in two wet sectors of the Joutel mine tailings park, one sector with a neutral pH and one sector with an acidic pH. We followed the evolution of CO<sub>2</sub> emissions in the plots, as well as the evolution of the vegetation



Experimental plot with organic matter added

cover for two years. Our results show that, in the neutral zone, the addition of organic matter allows for more than 50% revegetation after two years and that this addition does not increase the CO<sub>2</sub> emissions of the tailings pond. On the other hand, in the acid zone, there was a short period of plant development (~18 months), followed by a regression, and a loss of organic matter. These data are very interesting because they suggest a potential synergy between two important industries in Northern Quebec, where the residues from one helps to restore the tailings from the other, and which could have little effect on the carbon balance of the operations. Dave Tremblay was hired by an industrial partner after graduation .

### **PhD 5 - Regional importance of mining sites for plant biodiversity**

For this project, the Chair recruited the student Nils Ambec who joined the team in September 2019. As biodiversity is a complex question, considering mining sites as a potential contributor to biodiversity in the landscape is an innovative idea. Nils will compare the unique habitat characteristics of the mine sites with other rare habitats in the region, namely paleo-iles. He completed his research proposal and sampled the paleo-island sites in 2020 to inventory the vascular and non-vascular plants present. Nils has chosen twenty mining sites and will inventory them in 2021, noting also the different geological characteristics of the sites.



Paleo-ile



## **MSc 6 - Below-ground facilitation between tree species in the re-vegetalization of a post-mining site**

The MSc 6 project, which began in the summer of 2018, seeks to analyze how trees colonize mine tailings facilities. With this project, new collaborations with a new professor from UQAT (Dr Philippe Marchand, spatial statistics) and two professors (Drs Mélanie Roy and Monique Gardes) from Paul Sabatier University (Toulouse, France) who are specialized in the genetic analysis of mycorrhizae, have been added. A Champlain scholarship, which concretizes the collaboration between UQAT and Université Paul Sabatier, has been obtained and funds the sequencing of mycorrhizae, funding that was initially supposed



**Beattie mining site, Duparquet**

to come from Professor Yves Bergeron's Chair (Canada Research Chair in Ecology and Sustainable Forest Management). Field work was carried out in 2018 to characterize the spatial distribution of tree species at the Beattie mine site in Duparquet. Spatial analyses were carried out by a Master 1 student (Tristan Lafont Rapnouil, a student from France, doing an internship in Quebec) in 2019 spring and revealed a non-random distribution of tree species at the site.

Supun Madhumadhawa was recruited to lead the MSc project and started in January 2019. He conducted mycorrhizal sampling in the 2019 summer and mycorrhizal fungi analysis in Toulouse in the 2019 fall. The analysis of his data aim to understand how trees colonized the former Beattie Mine tailings site (Duparquet), and question if facilitation exists underground, by studying the mycorrhizal fungi present. To do this, Supun measured tree growth parameters and took leaf and fine root samples from the trees as well as soil samples. DNA extractions from soil and root samples allowed the identification of existing mycorrhizae, determining their taxonomic diversity, the richness and abundance of species in the communities, and comparing the communities with each other. Results indicate that only half of the specimens of paper birch, balsam poplar, willow and white spruce had fungi associated with their roots and 75% of the cedars sampled had mycorrhizae. The results also indicate that mycorrhizae communities are not host-specific, i.e. species-specific. Furthermore, there does not appear to be any benefit to the trees from having mycorrhizal symbionts. Supun is finishing the analyses and expects to submit its memory during the winter of 2021.

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## **MSc 7 - Regional importance of tailings for waterfowl compared to beaver ponds in Abitibi-Temiscamingue**

Émilie Desjardins has now finished her project, which began in the 2018 winter. During the summers of 2018 and 2019, she carried out waterfowl observations on 15 mine sites and 39 control sites (active and inactive beaver ponds) in order to better understand the use of these sites by waterfowl. Other habitat properties (such as water pH, depth near the shoreline, etc.) were measured for each of the sites in order to consider them in the analyses.

So far, she has been able to demonstrate that a diversity of waterfowl species use mine ponds and that this phenomenon is not limited to the few sites known to ornithologists. Results indicate that mine sites appear to be used at least as much as beaver ponds for four duck species analyzed. Among them, it was also shown that Common Goldeneye, a diving duck species, would use the mine sites to a greater extent compared to beaver ponds. New variables were included in the analyses to explain the observed patterns.



**Objective 1B**  
**Understanding the biodiversity**  
**present on mining sites**

To do so, an inventory of fish at each site was conducted during 2019 summer, and measurements of the vegetation at the studied sites were also added. Émilie submitted her thesis and presented a research seminar on June 18 2020. Her research has been submitted as a scientific article, and revisions are underway, which will hopefully lead to publication. In addition, this project was the subject of a radio interview in the Chroniques forêts de l'IRF on Radio-Canada Abitibi-Témiscamingue and was also summarized and explained in a popularized article published in the Couvert Boréal.





# Objective 2

Objective 2  
Avoiding risk for biodiversity: developing tools for ecological planning

This objective seeks to understand the distribution of wetland biodiversity from several angles in Eeyou Istchee James Bay in order to provide a classification adapted to this region.

## PhD 2 - Analysis and modeling of the dynamics of bryophyte and tracheophyte communities in wetlands of northwestern Quebec

Marc-Frédéric Indorf (PhD 2) is leading the project on plant biodiversity in Eeyou-Istchee James Bay wetlands. He has conducted more than 8 months of field work in total with at least 2 months per mining facility, in a total of 37 sites. Marc-Frédéric has completed the identification of terrestrial bryophyte samples and is now working on microhabitats. He is preparing a first paper on biodiversity structure of vascular plants and terrestrial bryophytes in wetlands. A French intern, Lilian Car, spent 5 months with us in 2019 and helped Marc-Frédéric prepare peat and water samples for laboratory analysis, identified vascular plants, and performed a first analysis of the distribution of different types of wetlands within watersheds. Marc-Frédéric continues to identify the other samples (of microhabitats) and has completed his internship with Ouranos for the modeling of future climate in Eeyou Istchee Baie-James.

### 2020 fieldwork

Nbr sites	Mining site	Community	Dates	Nbr days
1	Casa Berardi	Pikogan	20 August	1

Preliminary results suggest that classification into different types of peatlands in the region can generally be established with the different plant communities present, but there is a great deal of variability that



Marc-Frédéric and Tana on the field

makes it difficult to easily characterize these communities. The determining factors for the establishment of these communities have been identified and validated at different spatial scales (physico-geographic factors, environmental factors, biotic interactions and niche differentiation). The next step will be to better understand the role of environmental factors in peatland types and to further analyze biotic interactions and niche differentiation processes for bryophytes.

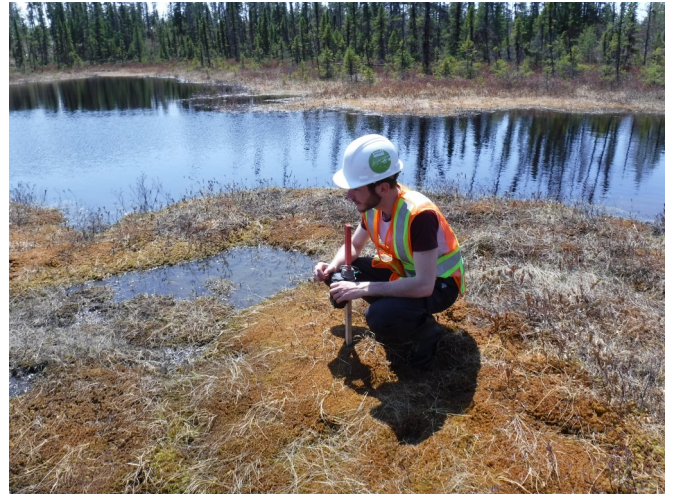
## MSc 4 Lichen communities of peatlands in Eeyou Istchee James Bay: Biodiversity and environmental factors

Tana Route (MSc 4) sampled on the same sites as Marc-Frédéric. Tana finished her lichen identifications in 2019 fall and was able to complete her statistical analyses in January 2020. Since then, she has written her dissertation and submitted the final version and has officially graduated. She found 76 species of lichens and identified a southwest to northeast gradient in richness. Snags and live trees were the microhabitats with the most diverse communities, and the near absence of snags in some wetland types (uniform fens) makes these wetlands less rich than black spruce bogs and uniform bogs. Tana started a job at an American university in January 2020, but will be back in the summer and fall of 2021 to help with new lichen projects in the lab.



### **PhD 3 - Diversity of vertebrate communities in small wetland habitats in northern Quebec**

Mariano Javier Feldman (PhD3) is leading the project on vertebrate biodiversity for these wetlands, particularly for small ponds, which are very common in the landscape of Eeyou Istchee James Bay. Mariano has completed his PhD courses and is currently finalizing a scientific article on the role of citizen science in research, which is part of his doctoral exam. He has also recently published an article related to his previous work on beavers in Argentina. For this project, Mariano conducted two 4-month field seasons in 2018 and 2019 and sampled 50 ponds, equally distributed between the different types of ponds (beaver ponds and peat bog ponds) and between the different mining sites, themselves located along a north-south gradient. For the 2019 field season, he added fish and odonates to his sampling. Mariano is now proceeding with the analysis of photos, recordings and collected specimens. The results of the recordings for three species of frogs, namely the wood frog, the northern frog and the spring peeper, are currently being analyzed. During the fall Louis Imbeau (IRF) has finished identifying the bird species present on the recordings across all of the sites, for the two years, which represents 66 hours of bird calls.



Installation and monitoring of the camera-trap

### **MSc 5 - Indigenous uses and importance of wetlands and assessment of moose stress near mines in Eeyou Istchee**

The fourth component of Objective 2 is a classification of these same wetlands according to their value to indigenous communities, led by Master's student Eliane Grant. With her expertise on biocontaminants, combined with the observations of the tallymen and those of Eliane (herself a Cree hunter), we have added a section on the stress hormones present in moose hair, a species of prime importance to the communities that use the wetlands of the James Bay region. This component will allow us to question the impact of various land disturbances, including mining activities, on moose stress. Eliane began collecting moose hair samples in the fall and winter of 2019-2020, but having been on maternity leave from May to December 2019, this component of the project got off to a slow start and will be in full swing during 2020-2021. Since her return to work, Eliane has received her ethics certificate for her community interviews that were scheduled for this spring and early summer. Given the current pandemic situation, Eliane's project is moving forward slowly, but she has established a relationship with the MFFP to have more moose hair samples, and is starting her interviews by videoconferencing. Sampling kits have also been distributed in the communities of Pikogan, Nemaska, Mistissini and Waswanipi. Hunters will therefore proceed with moose hair sampling during the 2020 fall and 2021 winter.



Participation in the aerial moose inventory of the MFFP

The postdoctoral project planned for the integration of all the wetland classification results (PhD2, MSc4, PhD3, and MSc5) on both the biodiversity and indigenous aspects has not yet begun since it depends on the results of the other projects mentioned above. This project will be an opportunity to better understand the link between biodiversity and indigenous land use and ecosystem services. The resul-



ting classification will be used as a decision support tool in land use planning in Eeyou Istchee Baie-James. Nicole Fenton is beginning the process of analyzing this component and is developing a collaboration with Chrystal Mantyka-Pringle, who has extensive experience in this field. Recruitment of a post-doctoral student for this project will take place in the winter of 2021.

These projects will be used to establish a classification of wetlands in relation to their biodiversity. This knowledge is important since the Nord-du-Québec region has a great abundance of wetlands for which very little knowledge exists. In addition to the development expected in the coming years (Plan Nord), climate change is also strongly affecting these environments. It is therefore important to better understand and know these environments, which are still relatively unaffected. Moreover, by classifying them, it will allow a better consideration of the richest and most critical environments in terms of biodiversity.

### **PhD - Bryophyte diversity and rare species estimation in boreal forests using remote sensing**

This project led by Carlos Cerrejon, a PhD student, is one of several projects aimed at improving knowledge of biodiversity in the Eeyou-Istchee James Bay region and is funded by UQAT and Environment and Climate Change Canada. Its main objective is to develop predictive models, using medium and high resolution remote sensing data, of bryophyte biodiversity (species richness, distribution of rare species, etc.) in remote boreal forests in northern Canada. Carlos now has several results showing that his predictive models have a very high efficiency rate (Cerrejon et al. 2020). Specifically, richness models for both total bryophyte species and at the guild level (e.g. mosses, liverworts and sphagnum mosses) have provided Carlos with the ability to predict areas that are particularly rich in moss or liverwort species. These prediction models are better than any available precedents and open the door to new planning tools. His second chapter on rare bryophytes indicates that habitat for these species can be predicted via remote sensing derived indices. This project demonstrates the potential of remote sensing to assess and predict bryophyte biodiversity across the landscape and lays the groundwork for the eventual inclusion of bryophytes in sustainable development planning in Northern Quebec.



Plant identification





# Objective 3

**Objective 3**  
**Reduce the impacts of cumulative disturbances on ecosystem service provision by developing avoidance and mitigation strategies**

This objective is being undertaken by Maxime Thomas who started PhD project 4 in the fall of 2018. This project seeks to understand the effect of cumulative disturbances, including climate change, on three key species chosen by the three indigenous communities. Since his arrival, Maxime has written his thesis project and has met with two of the communities (Pikogan and Nemaska) to begin establishing links and to discuss potential target species. Following these meetings, two species were identified: Labrador tea and blueberries. While the pandemic has slowed down the advancement of this project Maxime has now finished all of his course work and is starting to meet with the communities in order to organise data collection during the summer of 2021.





# Chair's team

With its various projects, the Chair involves several people, especially in the summer with the addition of field assistants.

Employees/students	Number	Time percentage spent on the project
Professors	12	sans objet
Undergraduate Students	4	33
Master degree students	4	100
Doctoral Students	5	100
Postdoctoral Fellows	1	100
Research Associates	1	80
Technicians	0	0
Liaison officer	1	33
College students	1	33
Administrative support staff	1	20





# Transfer, communication and interaction with the various stakeholders

## Second Annual Conference of the Chair

On September 16, 2020, the second annual Conference for the NSERC-UQAT Industrial Chair on Northern Biodiversity in the Mining Context was held online. It was an opportunity for the students to present their projects and some preliminary results to their colleagues, to the Chair partners and to a series of interested people who were present. The partners were also able to introduce themselves and explain some of their projects related to the environment, and more specifically, to biodiversity. The poster, schedule and recordings of the presentations are all available [online](#).

## Synthetic notes

In order to explain the current projects and to present the team in a simple and accessible way, summary notes have been prepared over the past year. The projects are grouped into 3 topics: “[What is the impact of mine dust on plants?](#)”, “[What is the biodiversity that can be found on mining sites?](#)” and “[To better know our wetlands](#)”. A synthetic sheet for Objective 3 will be produced soon.

## Tour of communities and partners

In 2020, due to the particular context of the pandemic, there were no on-site visits to communities or partners. However, a few team members were privileged to attend the annual general meeting of the Nemaska community in November 2019 in order to present the projects and discuss species selection for Objective 3.

## Presence in the research community

The Chair's projects have also aroused the interest of the research community when students and researchers attend various symposiums and conferences.

Conferences and posters	Dates
Mélanie Jean - <a href="#">Empreinte spatiale de la pollution particulaire autour de mines actives et en restauration : Bioaccumulation des bryophytes</a> (13). [Poster] 21e Colloque de la Chaire industrielle CRSNG-UQAT-UQAM en aménagement forestier durable.	November 27, 2019 Rouyn-Noranda
Marc-Frédéric Indorf and Lilian Car - <a href="#">Les tourbières ombrotrophes nordiques, pourraient-elles soutenir l'implantation de l'épinette ?</a> (14). [Poster] 21e Colloque de la Chaire industrielle CRSNG-UQAT-UQAM en aménagement forestier durable.	November 27, 2019 Rouyn-Noranda
Marc-Frédéric Indorf - Plant species coexistence in Baie-James, Québec: a hierarchy of community assembly processes [Conference] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Mélanie Jean - Are the friends of my friends also my friends? Synthesizing co-occurrence data on bryophytes, lichens and vascular plants to prioritize host-cyanobacteria research [ [Conference] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020



## Presence in the research community (continued)

Conferences and posters	Dates
Mariano Feldman - Under-use of citizen science data for botanic research: What are we waiting for? [Poster] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Maxime Thomas - Vulnerability of cultural keystone species to cumulative impacts of anthropogenic and natural disturbances [Poster] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Carlos Cerrejón - No place to hide: Rare plant detection through remote sensing Carlos Cerrejón [Conference] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Xiangbo Yin - The offsite impacts of mining on plant diversity in boreal areas [Conference] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Nils Ambec - Végétation d'habitats rares naturels et anthropiques : contribution à la biodiversité régionale et origine des colonisateurs [Poster] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Supun Madhumadhawa Pawuluwage - Factors influencing facilitation between boreal tree species during the regeneration process in post-mining sites [Poster] <a href="#">Annual meeting of the Canadian Botanical Association (ABC-CBA)</a>	June 1-2, 2020
Émilie Desjardins - Les étangs de parcs à résidus miniers peuvent-ils faire office d'habitats de qualité pour la sauvagine en période de reproduction? [Seminaire]	June 18, 2020
Marc-Frédéric Indorf - Analyse et modélisation des dynamiques des cortèges de bryophytes et trachéophytes des tourbières du nord-ouest du Québec [Conference] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Tana Route - Les communautés de lichens des tourbières en Eeyou Istchee Baie-James : biodiversité et facteurs environnementaux déterminants [Conference] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Mariano Feldman - Diversité des communautés de vertébrés des milieux humides de petite taille dans le Nord-du-Québec [Conference] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Carlos Cerrejon - Estimation de la diversité des bryophytes et espèces rares dans les forêts boréales à l'aide de la télédétection [Conference] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020



## Presence in the research community (continued)

Conferences and posters	Dates
Eliane Grant - Utilisation et importance des milieux humides par les autochtones et évaluation du stress chez l'original à proximité d'exploitations minières en Eeyou Istchee [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Maxime Thomas - Vulnérabilité d'espèces culturelles clés aux impacts cumulatifs des changements environnementaux en contexte autochtone [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Supun Madhumadhawa Pawuluwage - Est-ce que les champignons mycorhiziens sont partagés entre les arbres qui colonisent un ancien site minier? [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Émilie Desjardins - Utilisation des parcs à résidus miniers par la sauvagine en comparaison avec des étangs à castors en Abitibi-Témiscamingue [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Nils Ambec - Étude d'habitats rares et de leur apport en biodiversité à l'échelle régionale [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Mélanie Jean - Empreinte spatiale des polluants particuliers autour des mines actives et restaurées - Croissance et bioaccumulation des bryophytes [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Xiangbo Yin - Déterminer l'empreinte spatiale des mines sur la diversité végétale: intégrations des impacts énigmatiques et du cycle de vie des mines [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020
Christine Martineau - Présentation invitée RNCAN - Empreinte spatiale des mines sur les propriétés physico-chimiques, biochimiques et microbiologique des sols et de l'eau [Conférence] <a href="#">2e Colloque annuel de la Chaire industrielle CRSNG - UQAT sur la biodiversité en contexte minier</a>	September 16, 2020

## Scientific publications

Carlos Cerrejón, Osvaldo Valeria, Nicolas Mansuy, Marion Barbé, Nicole J. Fenton, [Predictive mapping of bryophyte richness patterns in boreal forests using species distribution models and remote sensing data](#), Ecological Indicators, Volume 119, 2020, 106826, ISSN 1470-160X, <https://doi.org/10.1016/j.ecolind.2020.106826>.

## Media presence and outreach

Article / report	Date and media
Émilie Desjardins - Les sites miniers: désert biologiques ou habitat prisé par les oiseaux? [Popularized article]	Summer 2020 Couvert Boréal
Chronique forêt: <a href="#">Les étangs miniers comme habitat pour la sauvagine?</a> [Radio segment] Émilie Desjardins	June 22, 2020 Radio-Canada Première Région Zéro 8
Chronique forêt: <a href="#">La science citoyenne, ou comment tout le monde peut contribuer à étudier nos forêts</a> [Radio segment] Mariano Feldman	June 29, 2020 Radio-Canada Première Région Zéro 8
<a href="#">Une réussite pour le premier Colloque de la Chaire CRSNG-UQAT sur la biodiversité en contexte minier</a> [Press release]	September 15, 2020 Actualités UQAT
Eliane Grant- Radio interview on the Moose Health Status Project in Eeyou Istchee (no audio recording available)	September 18, 2020 James Bay Cree Communications
Supun Madhumadhawa Pawuluwage and Sophie Laliberté - Certains champignons ne sont pas seulement comestibles, ils aident à régénérer les forêts! [Popularized article]	Fall 2020
Sophie Laliberté - Les champignons, ces alliés des arbres sous la surface [Popularized article]	November 2020 Journal Grand Héron





THANKS TO ALL THE PARTNERS OF THE  
NSERC - UQAT INDUSTRIAL CHAIR ON NORTHERN  
BIODIVERSITY IN A MINING CONTEXT



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Grand Council of the Crees (Eeyou Istchee)  
Grand Conseil des Cris (Eeyou Istchee)

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Cree Nation Government  
Gouvernement de la Nation Crie