

# Water contaminant management

Conditions such as climate change, air pollution and industrial activity trigger reactions in bodies of water and in the contaminants they contain. Marc Amyot's research at the Université de Montréal is **providing insight into the contamination of aquatic environments** and the lives of the animals and people living in and around them.

## The researcher

A professor in the Department of Biological Sciences at Université de Montréal, Marc Amyot is the **Canada Research Chair in Global Change Ecotoxicology**. He earned a Governor General's Gold Medal for his research into mercury photoreduction and received the Prix Acfas Michel-Jurdant for his commitment to environmental microbiology. Amyot's research is multidisciplinary and **works directly with the communities affected**.



## The research

Amyot's research examines the mechanisms that allow contaminants to transform and migrate through constantly changing ecosystems, particularly in Northern environments. He seeks to understand how these contaminants move up the food chain and into the human body. He also examines human digestive processes and analyzes how we can mitigate human exposure to contaminants in Traditional Inuit foods. **With partners, Amyot is developing soil decontamination methods**, with a focus on ecological approaches adapted to the different latitudes where he works.

The current shift to electric vehicles, wind power and other green technologies requires rare earth metals. Deposits of those metals in Northern Canada are largely untapped and likely to be exploited in the near future. While this raises many questions about how to manage water contaminated by mining activity, little scientific data is available on the subject.

## About the Canada Foundation for Innovation

Since its creation in 1997, the CFI has committed more than \$10.5 billion in support of more than 13,000 research infrastructure projects in all disciplines at 174 institutions in 81 municipalities across Canada.

Understanding and monitoring contaminants — and mitigating their potential impacts — is **important, not only for public health, but also for Inuit culture and identity** as it relates to the land. This is the challenge that Amyot is trying to address by working directly with Inuit communities.

Strengthening these partnerships is also central to the construction of small hydroelectric dams like the one in Inukjuak, home of the world's first dam built on permafrost. It is now known that permafrost is a significant source of mercury, which is what brought Amyot's research team to the site.

## The research infrastructure

In 2015, Université de Montréal received a CFI award of **\$357,438** for research equipment that would be used for activities such as advanced trace and ultratrace analyses to detect chemical elements, including rare earth elements, in matter. The equipment is still on the cutting edge and continues to be used by Amyot and his research team and partners.

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## The impacts

The research conducted by Amyot and his scientific and community partners produces valuable data that is used to plan industrial and hydroelectric projects in a way that minimizes the negative impacts on ecosystems and public health. The results of their research also help keep Canada's regulatory framework and guidelines for managing water contaminants up to date.



### Planning the construction of hydro dams

Given their lack of direct access to the Hydro-Québec network, some of the province's isolated communities, including a number of First Nations and Inuit communities, have had to turn to fossil fuels to meet their electricity needs. **Small hydro dams have shown great promise** for communities located near rivers that have the required flow rate. While these dams help **reduce the environmental footprint** of fossil-fuelled electricity production, they also transform these water bodies, which in turn impacts the natural and deposited contaminants they contain.

Supported by a \$1.8-million Alliance grant from the Natural Sciences and Engineering Research Council, **Amyot and his team are working with Innu, Atikamekw and Inuit communities, as well as other university researchers, Hydro-Québec and Innergex** to document, understand and monitor changes in the composition of contaminants found in the water around these kinds of dams. This new data is already allowing the communities in question to manage the negative impact of the dams, including the presence of contaminants in the food chain. Knowledge is also transferred to the hydroelectric industry to inform the management of existing dams and the planning of identical or similar projects.



### Improving guidelines for contaminant management

Amyot's work helps public authorities **establish and update their regulatory frameworks and guidelines for managing contaminants in water:**

- Amyot sits on the Health Canada advisory committee that reviews standards for mercury in fish and other impacts on the food chain
- Amyot participated in the advisory committee on toxic substances in the St. Lawrence River in collaboration with the St. Lawrence Action Plan (SLAP), which is a partnership between the governments of Canada and Quebec.



### Shedding light on food contaminants

Tania Groleau, a master's student supervised by Amyot, and Mélanie Lemire, a researcher from Université Laval, are exploring traditional Nunavik recipes to shed light on — and even **dispel fears about — the possible presence of toxic contaminants in these foods**. Groleau collects data from samples of fish broth, which is often recommended for pregnant women and children, to help communities make informed decisions and even enhance the nutritional value of dishes that hold an important place in Inuit culture.



### Providing tools for informed decisions

For Hilda Snowball, former mayor of the Inuit village of Kangiqsualujjuaq, research must **give the community tools to make informed decisions**. It's a vision shared by Amyot, who worked with research collaborators to launch the Imalirijit (Inuktitut for "those who study water") program, **setting up a community-based system to monitor water quality** before any activities from a rare earth metals mining project impacted the George River watershed.

Members of the Inuit community and scientists are collecting samples and interpreting them together. They have already **built a substantial body of baseline data** that will allow the community to independently assess any impacts that could adversely affect community health.

The project also includes youth **summer science camps**, during which Amyot's students and a research team from the Université du Québec à Trois-Rivières work with community Elders to **offer activities that combine Traditional Knowledge with scientific knowledge** in a way that is tailored to the world in which the young participants live.