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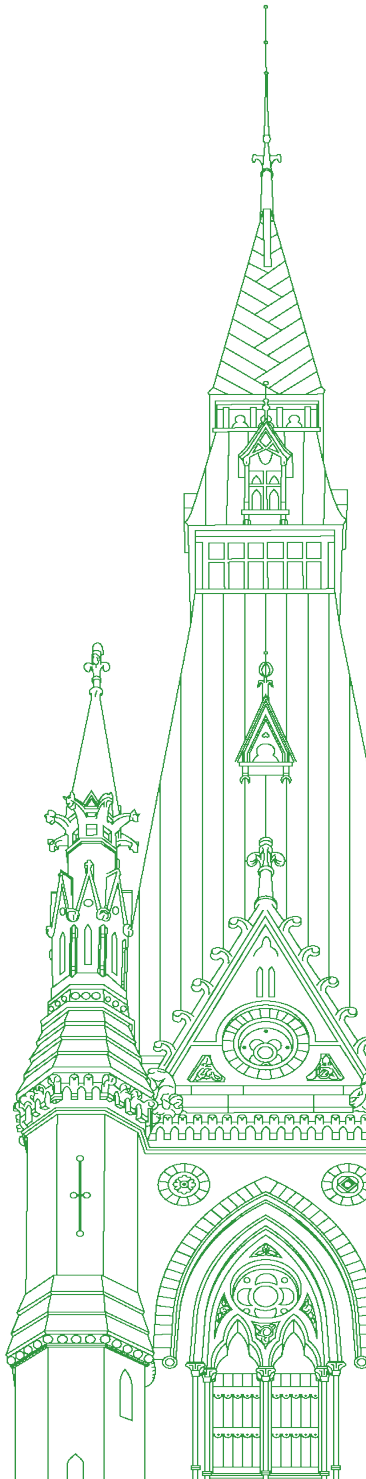

Chair: The Honourable Kirsty Duncan

Standing Committee on Science and Research

Thursday, February 16, 2023

● (1100)

[*English*]

The Vice-Chair (Mr. Corey Tochor (Saskatoon—University, CPC)): Good morning, everybody. I call this meeting to order.

Welcome to meeting number 31 of the House of Commons Standing Committee on Science and Research. Today's meeting is taking place in a hybrid format, pursuant to the House Order of June 23, 2022. Members are attending in person in the room and remotely using the Zoom application.

Pursuant to Standing Order 108 and the motion adopted by the committee on Monday, September 26, 2022, we are continuing our study of citizen scientists.

I would like to make a few comments for the witnesses and members.

There is interpretation for those on Zoom. You have the choice, at the bottom of your screen, of floor, English or French. For those in the room, you can use the earpiece and select the desired channel. I remind everyone that all comments should be addressed through the chair. In accordance with our routine motion, I am informing the committee that all witnesses have completed their required connection tests in advance of the meeting.

I welcome our witnesses. I will allow each of you to have a-five minute opening statement. I will do my best to give you notice when you're coming down to that last few seconds, and if you can try to keep it at five minutes, that will help us with the clock management.

To our MPs here, due to scheduling of House business at the end, we will be managing the clock a little more tightly than usual so that we have time to take care of some in camera business today.

With that, I will let Dr. Kerr begin for our first opening statement of five minutes.

Dr. Jeremy Kerr (University Research Chair in Macroecology and Conservation, Department of Biology, University of Ottawa, As an Individual): Thank you very much.

It's a true pleasure to be able to join you today, in person this time, in the sacred spaces of Parliament and from the unceded territory of the Algonquin people. I'm sad that our friend, the Honourable Kirsty Duncan, is unable to be here today, and I wish her a speedy recovery.

I am chair of biology at the University of Ottawa, where I also hold a research chair. I'm past president of the Canadian Society for Ecology and Evolution, and I'm a long-standing member of NSERC.

Like each of you, I care deeply about making a difference for others. I mostly try to do this through science. I've spent most of my research career working to understand how human activities affect biodiversity.

Everyone here will know that we are in the midst of a human-induced mass extinction, the likes of which we have not seen since the end of the age of the dinosaurs. This time, our own activities are the cause. To solve this wicked problem, we require an “all hands on deck” approach to understand how biodiversity is changing.

In recognition of that imperative, a post-doc on my research team, Maxim Larrivée, and I created eButterfly at the University of Ottawa 12 years ago and launched it simultaneously in French and English. Why butterflies? Because they are an indicator for how other species are doing and because they are so beautiful they can inspire the most cynical among us. eButterfly now uses artificial intelligence to help identify species from digital photos that anyone can take with a cellphone anywhere on earth.

Does such data make a difference? A few years ago, I set out to test and answer this question.

Over the past 130 years, professional scientists collected 300,000 observations of 297 different butterfly species across Canada's vast land mass. Using eButterfly, citizen scientists doubled that number in seven years. These volunteers found species in places overlooked by professional scientists and sometimes detected them at times of the year that were either earlier or later than we had previously thought possible.

The real magic happens when you combine both citizen and professional science data. That approach provides a much more complete picture of how Canadian species are responding to human impacts. In other words, citizen science data transforms our understanding of how global changes affect Canadian biodiversity, and now we know enough to take critical steps to protect species and their ecosystems. Such strategies figure prominently in the COP 15 Montreal agreement to conserve biodiversity, including to protect 30% of the world's surface by 2030 and to halt and reverse nature loss and species decline by 2050.

How will we test whether such policies are actually working? We must take a global “all hands on deck” approach, combining professional and citizen science and honouring the distinct ecological knowledge of the world's indigenous peoples. Big science needs big data, and citizen science helps us get that vital ingredient.

Canada is already using such data to help monitor the state of its threatened species, including monarch butterflies through eButterfly's mission monarch project. There's a great need to expand monitoring efforts to include other groups of species and to address other kinds of problems, but just as importantly, scientists must be willing to throw open the doors of their ivory towers to embrace more inclusive ways of measuring the world we all share.

The rapid growth in citizen science programs around the world and in Canada suggests that more scientists are willing to do just that, but we must guard against repeating the mistakes of the past, which might cause scientists to work with an unrepresentative few in our diverse country.

In the future, I hope citizen science programs will touch everyone's lives, supporting indigenous communities in their own languages and helping to inspire and include people who are underrepresented in our scientific organizations.

I hope governments in Canada will ask how citizen science programs can help to make the kinds of differences for others that motivated many of us to pursue our careers in science.

Thank you.

● (1105)

The Vice-Chair (Mr. Corey Tochor): Thank you so much.

Now we are moving on to Ms. Lewis for five minutes.

Ms. Nicola Lewis (Chief Executive Officer, Kids Brain Health Network): Good morning, and thank you to the committee for inviting me to speak with you today.

My name is Nicky Lewis and I am the chief executive officer of Kids Brain Health Network.

Kids Brain Health is a Canadian national network that puts science to work for children with neurodisabilities and their families. These are lifelong conditions characterized by impairments in cognition, communication, behaviour and motor skills resulting from abnormal brain development. We support the development of cutting-edge research and the implementation, scale and spread of evidence-based solutions.

With funding from the federal government’s networks of centres of excellence program and equally matched funding from many other partners, we have invested more than $77 million into over 200 projects and research initiatives so that kids with disabilities and their families can live their best lives.

Kids Brain Health’s focus is directed upon proven solutions in early identification, early interventions, effective treatments and family support.

Today, I will speak with you about one of our programs. It is the family engagement in research program, which is better known as the FER program. FER recognizes parents and caregivers as equal partners in all phases of the research process, from research question design to data collection and analysis, and disseminating the findings into practice. FER is funded by Kids Brain Health and co-led by parent leaders and pediatric health service researchers at CanChild centre for child disability research at McMaster University.

I would like to introduce, in the audience, Dr. Andrea Cross, assistant professor from CanChild, and Ms. Connie Putterman, a parent partner. They are two of the codevelopers and coleaders of the FER program.

The FER program includes an evolving suite of training courses, knowledge mobilization and mentorship initiatives. It is led by citizen partners and researchers, and it is rooted in the shared values of co-creation, collaboration and respect for the different types of knowledge and experiences.

The inaugural FER course is a fully accredited 10-week online course for researchers, trainees and family partners. To date, 300 graduates from 14 different countries have taken the course. Half of those are parents and caregivers. Many have advanced to become leaders across institutions and networks in neurodevelopmental disability, child health, mental health and women’s health research.

We are currently in the process of adapting the course for youth and self-advocates with lived disability experience, frontline practitioners and health care providers. We are also expanding the course to ensure availability to francophone researchers and families. So far, three francophone course instructors have been trained and a French FER course will be launched this year. More recently, we launched an advanced 10-week online training course for FER graduates, called the “FER leadership academy”, with the aim of being a springboard for future FER leadership development in Canada.

The FER program has become a nationally and internationally recognized forum for training and mentorship. The program is creating a rising movement to embed best practices of citizen science into neurodevelopment and child health research institutions and networks across Canada and abroad. While the program has grown through several partnerships, further investments are needed to sustain commercialization nationally and internationally.

Over the years, we have seen the positive contributions that equitable and inclusive training has on the research for kids with neurodevelopmental disabilities and their families. Kids Brain Health is proud to fund programs like FER that allow families and caregivers with real-life experiences to provide researchers with context that they would otherwise not have, therefore producing outcomes that are much easier to implement and more likely to provide value for families.

Canada has an opportunity to be a global thought leader in citizen engagement in conducting health research and implementation for the betterment of our children and future generations. Kids Brain Health has seen success with programs that can be scaled and have the potential to be equally impactful in other areas of science and research. Federal programs, such as the strategic science fund, can play a vital role in unlocking and further enabling these kinds of partnerships.

We stand ready to help this committee, the government and the scientific community in Canada with inclusive and equitable citizen engagement in research.

Thank you very much for your time. I look forward to your questions.

● (1110)

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

Now we're on to Dr. Gonzalez for five minutes.

Mr. Andrew Gonzalez (Director, Quebec Centre for Biodiversity Science): Thank you, Mr. Chair, for this invitation to speak to the committee today.

I'm joining you from Montreal, which is situated on the traditional territory of the Kanienkehaka, also known as the Mohawk nation.

I'm a professor and researcher at McGill University and founding director of the Quebec Centre for Biodiversity Science. The QCBS is a strategic research network composed of more than a hundred researchers and 500 graduate students from 15 universities and colleges in Quebec. Over the last decade, QCBS has fostered and supported citizen science projects in Quebec, Canada, and elsewhere around the world.

Last December saw the historic agreement of the Kunming-Montreal global biodiversity framework of the UN Convention on Biological Diversity. This landmark plan with four goals and 23 targets is designed to avert the global biodiversity crisis. The text recognizes the essential knowledge contributed by indigenous peoples, local communities and citizen groups the world over. Without them, we know we will not reach these targets.

I am not exaggerating when I say that the last decade has seen a transformation in the participation and contribution of citizens to biodiversity science, where citizens with different levels of expertise can engage in scientific projects.

New technologies have been part of this story. For example, the social network iNaturalist, which allows citizens to take photos of organisms and share them with their phones, has recorded 9.7 million observations of nearly 35,000 species made by 171,000 Canadian citizens. This is a truly remarkable contribution and, indeed, this activity is filling large gaps in our knowledge of Canada's biodiversity.

A report in 2010 by the federal, provincial and territorial governments of Canada called “Canadian biodiversity: ecosystem status and trends 2010” concluded that we lack “long-term, standardized, spatially complete, and readily accessible monitoring information”. This significantly hinders our capacity to assess the status and health of Canada's ecosystems.

This quote is as relevant today as it was in 2010. Our task of monitoring biodiversity change in Canada cannot be achieved by government or researchers alone. Citizen science is vital.

In response to this growth, the QCBS has invested in projects designed to initiate and support citizen science. We do this in collaboration with partners such as government ministries, conservation NGOs and zoos. You can find the projects on the QCBS public portal called Quebio, but allow me to briefly describe a few of them.

Alarming trends in bird, bat and bee populations have been the focus of several successful citizen-led projects. The project *Des nids chez vous* or Nests at Home encouraged more than 500 elementary school kids to install nest boxes in their backyards and to monitor the presence of nesting birds via the project's website. When a bird box is occupied, scientists then track the health and success of the fledglings to understand the long-term fate of the bird population. To date, these children have made more than 4,500 observations of 111 bird species. The scientific and educational value of a project like this is obviously remarkable.

In the pan-Canadian project Bat Watch, citizens have reported the presence of over 900 bat colonies in their attics, barns or bat boxes, allowing scientists to track the impact of something called white-nose syndrome, a disease that is causing unprecedented mortality in hibernating bats in Canada.

Citizens are also helping to digitize hundreds of thousands of plant specimens in herbarium collections, thanks to an online platform developed by the QCBS. This is providing precious historical reference data now in digital form to the research community.

Canadian citizens are also contributing internationally through applications like iNaturalist, eBird or eButterfly, assisted by artificial intelligence and taxonomic experts, to report observations of wild species in other countries, and this information is being shared globally.

Citizen science also promotes science education. It allows participants to understand the wildlife and the ecosystems that surround them. Citizens are becoming experts in their own right and, in fact, able to further support the scientific activities in their communities. A recent study showed that volunteers who participated in citizen science activities have elevated scores of well-being.

In summary, the participation of citizens in research is having a transformative effect on science and society at large. We recognize the remarkable contribution of citizen science to understanding and averting the biodiversity crisis. We are only just learning to promote this society-wide effort. We hope that this committee will recognize these initiatives.

● (1115)

The QCBS will be very happy to provide additional information and support to the task of this committee. I look forward to your questions.

Thank you very much.

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

We're now moving on to the rounds of questioning.

We have MP Mazier.

Mr. Dan Mazier (Dauphin—Swan River—Neepawa, CPC): I thought I was in the second round.

The Vice-Chair (Mr. Corey Tochor): I'll just clarify.

Gerald, you have the floor for six minutes.

Mr. Gerald Soroka (Yellowhead, CPC): Thank you, Mr. Chair.

Thank you to our witnesses today. I want to start off with Ms. Lewis.

That's a unique program that's being offered. I just want to define how citizen scientists are being used there as opposed to just research people who are being examined, I guess. What's the difference between the two?

Ms. Nicola Lewis: The parent partners are part of the course. When they graduate, we have a match-making service through which they can get involved in research programs that are of interest to them. They're involved in the research right from the get-go, from the very question that's asked and whether that is a question that is relevant and that will provide a solution that will impact our families and children. That is their involvement.

In everything KBHN does in terms of the research we support, we follow what we call a “co-produced pathway”, in which our families, researchers and partners all work together from the get-go. We will not fund research if it doesn't follow that model. It's a very important model. The FER training augments that because we are bringing in new families with the confidence, expertise, knowledge and skills to join more research programs in neurodevelopmental disability.

Mr. Gerald Soroka: My follow-up question is on the FER program. You say that's in 14 different countries. Are you noticing any differences from country to country? Is it relatively all the same? If there are differences, why do you think those differences are happening?

Ms. Nicola Lewis: Thank you for the question.

In those 14 countries we've had two cohorts that were part of our commercialization efforts. One was in the Netherlands at Utrecht University and the other was in Australia through the University of Melbourne. Those cohorts have happened just in the last year.

Adaptations will be needed. We're working with the investigators at those universities to modify them. The course that was offered at Utrecht University was translated into Dutch. There will be tweaks. Overall, the fundamental principles still apply. In fact, those fundamental principles can apply to other conditions, not just neurodevelopmental. It's the model that's being followed.

● (1120)

Mr. Gerald Soroka: I'm wondering if you have any data to see if there are any differences between children from Canada and those from the Netherlands or something like that. Are you noticing any significant differences in neurological issues or not?

Ms. Nicola Lewis: I think you're asking me a question there on the prevalence of neurodevelopmental disabilities worldwide.

Mr. Gerald Soroka: Yes.

Ms. Nicola Lewis: There are a lot of similarities right across the world in terms of prevalence. I don't think that Canada is leading the way specifically in prevalence across many neurodevelopmental disabilities. In Canada the figures for prevalence we're seeing are the same as those we are seeing in the U.S. and Europe.

Mr. Gerald Soroka: Okay. Thank you for that.

Dr. Kerr, on your research and on using citizen scientists, I know it's very important to have them out there, but what safeguards do you have in place to make sure the information that's being collected is accurate ?

Dr. Jeremy Kerr: That's a superb question. The accuracy of citizen science data is paramount, or it risks actually contaminating and hindering the scientific process—which of course would be the exact opposite of what we all intend.

We have a number of different safeguards. One of the things we do in our program, which is replicated in many others, is to ask citizen scientists to submit their observations in the form of a digital photograph. It is a very easy thing to do these days with cellphone technologies. That's one layer.

When that photograph is submitted, we have a panel of experts, people who are the very best folks in the country for identifying butterflies. They can look at that photograph and say, "Okay, this is what you think it is." Then we can do other things as well. We can say, "Okay, you just said you saw a monarch butterfly, but it's January. I think you might be thinking of something else." We can do little checks like that. We can evaluate the known flight seasons of different species and say, "Okay, this is when this butterfly is reasonably active and there's a little bit of error on either side of that time. Is it possible you could have seen this butterfly in this place at this time?"

There are a number of different layers. We don't use the unvalidated data for science purposes. We use only the materials that have gone through a number of different independent quality checks.

That's a really good question.

Mr. Gerald Soroka: Okay.

Dr. Kerr, that was going to be my follow-up because I know we have had other scientists talk about how they have extreme people, one way or the other, trying to manipulate the research. However, you're saying that if it's not validated, then we don't ever have to worry about inaccurate information from your side.

Dr. Jeremy Kerr: If somebody really wanted to cause true mischief and was an expert in an aspect of, in my case, biodiversity, it would be possible to cause mischief, but the fact of the matter is that I have never encountered somebody with such a level of expertise who actually wanted to cause harm.

The other thing is that, if there's an outlier observation that somebody very cleverly slipped into the system, other experts would be excited about this. Then they would go and check and fail to find that this could be supported.

The system has a lot of checks and balances. I wouldn't say we never have to worry about it in the broad realm of citizen science—

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that. We have to move on to our next member of Parliament.

We have, from the Liberals, MP Sousa.

Mr. Charles Sousa (Mississauga—Lakeshore, Lib.): Thank you very much, all of you, for your presentations. They were very enlightening. They were discouraging but encouraging at the same time, given all the monitoring and engagement by citizen scientists.

Ms. Lewis, you have a cheerleading squad with you. It's great to see what I call "warrior moms" in my riding, people who are fighting to ensure that their kids are developed and have all the opportunities afforded to them. They do extraordinary work. I'm pleased by your presentation today. I'm also encouraged by the network that has been established in what you do.

Can you share with the team here how these projects have enabled these young minds to grow and provide contributions that are unexpected?

● (1125)

Ms. Nicola Lewis: I would like to answer that by talking about families, parents and trainees, because the program is a matched program. We have an equal number of parents and caregivers and an equal number of junior scientists and trainees, typically, taking the program. They work together in the shared safe space to complete the course and the certification.

Then, when they become involved in the research themselves, the trainees have a new perspective on how to conduct science and on the importance of the contributions that families, individuals and caregivers can give to the research. The families themselves then feel like they are equal and respected members of a team.

Mr. Charles Sousa: That's a segue to my next question for both Mr. Kerr and Mr. Gonzalez.

I think, Andrew, you mentioned something about the lack of monitoring and information availability, yet, for Mr. Kerr and the team, so many good things are happening and much is being reported.

Can you elaborate on what is lacking, then, in your mind, Mr. Gonzalez?

Mr. Andrew Gonzalez: What we're talking about is a capacity within Canada to systematically assess the state of its ecosystems in a way that supports policy and conservation action in light of that policy, from coast to coast and south to north.

The current situation is that, although we do have many observations of nature—in the order of millions of observations—they tend to be located in a particular part of the country, essentially toward the southern border where many people, obviously, live in Canada. There is this geographic bias in where our best information is, and that is not sufficient to assess how biodiversity across the country is changing.

This is where the combination or the collaboration between citizen scientists, researchers and government departments can come together to create a new collaboration, if you like, to endow the country with the biodiversity data we need to respond to the new biodiversity agreement.

Mr. Charles Sousa: Thank you for that.

Mr. Kerr, when we talk about the integrity—and you've already responded to an earlier question with respect to this.... I went through eButterfly and I went to look at your site, and it's great to see so many people engaged.

I take some sense of comfort that you see that not too many people are trying to manipulate it, but how, then, do we help Andrew in ensuring that there is integrity and that there is engagement, and that more and more people are involved? How do we encourage that to be so?

Dr. Jeremy Kerr: That's an excellent question.

I think that scientists have to be their own ambassadors and speak passionately and publicly about why curiosity about the world matters, but also make it clear that we want to try to reduce the expertise barriers for people to be part of that science process. We see lots of examples of people beginning to engage, because they realize that you don't have to have a Ph.D. to do something that really matters in the context of the scientific process.

I think we need to discard our solitude-based approach, which is what has historically informed the way we think about these issues.

Mr. Charles Sousa: That's encouraging.

I'm sure I'm out of time.

Nicky, we are not alone, as you can see. I think that's one of your mottos.

Congratulations to all of you.

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that and for keeping it within the time.

We will move on to MP Blanchette-Joncas.

[*Translation*]

Mr. Maxime Blanchette-Joncas (Rimouski-Neigette—Témiscouata—Les Basques, BQ): Thank you, Mr. Chair.

I would like to acknowledge all the witnesses joining us today, as part of our study.

I'll address my first questions to Mr. Gonzalez, from the Quebec Centre for Biodiversity Science.

Good morning, Mr. Gonzalez.

Which language do you use for most of your activities?

Mr. Andrew Gonzalez: That depends. My courses at McGill University are given in English, but as a codirector of the QCBS, I often have the opportunity to use French, especially when communicating with departments and ministries, such as the Department of Environment and Climate Change, and the Quebec ministry of wildlife and parks, or conservation NGOs.

● (1130)

Mr. Maxime Blanchette-Joncas: Thank you very much, Mr. Gonzalez.

I'm pleased to be speaking with you in French, one of Canada's two official languages.

I think that what you said in your speech is very important. One of the things you talked about was a lack of information. Obviously, that has repercussions on the ability to report on the effectiveness of ecosystems and their biodiversity.

That role does not fall to the government alone. There is an opportunity here for collaboration with citizen science.

How could we guide or influence the public so as to ensure they become interested and engaged in citizen science? This would then enable them to contribute to the development of science in general, both traditional science and citizen science.

Mr. Andrew Gonzalez: That is a very good question.

We are effectively talking about a collective effort around this biodiversity crisis. In my view, it is about creating networks. The QCBS network is unique because it links citizen science to policy makers, and NGOs to business. We can then be a catalyst for that collaboration, since the network has built trust.

We are able to respond to departmental needs, which we have been doing for the past 10 years, and to articulate those needs, often in the form of data and information, through dialogue with citizen groups.

Through our online platform, which is accessible to the public, we can encourage public engagement with respect to government and, at times, municipal directives. This can also be done at the subnational level. In fact, it was noted in the new Kunming-Montreal Global Biodiversity Framework that this is going to play out at the municipal or the subnational government level.

That's where I see a real opportunity to change the situation, because we can create links and engage in long-term collaborative efforts across Quebec.

Mr. Maxime Blanchette-Joncas: Thank you for sharing this information with us, Mr. Gonzalez.

I fully agree with what you said, namely that strong citizen science has transformative effects on society at large and, as you just mentioned, on various levels of government.

In regard to citizen science, I am trying to figure out how to solve a conundrum, specifically the problem of mobilizing the knowledge of a particular segment of the community. I am referring in particular to the French language, which is not very prominent, or altogether absent, in some areas of science in general and, of course, some scientific fields.

Mr. Vincent Larivière, a professor and researcher, mentioned that there is unequal access to opportunities of impact on knowledge mobilization.

How can we conceive of having a concrete impact on the public through science if it is expressed in a language that does not reach part of the population?

How do you think citizen science can be done if there is inadequate access to scientific content?

You work in both of Canada's official languages. How do you go about solving this conundrum and overcoming this challenge, which, in my view, may not be insurmountable but is still very difficult to solve?

Mr. Andrew Gonzalez: Yes, that seems insurmountable, but I am convinced that we can do it. The Quebec Biodiversity Science Centre is designed to do just that. It is a network of 15 universities and colleges. Most of these universities are part of the Université du Québec chain. We have a network of bilingual researchers.

Also, the websites and platforms I mentioned earlier, such as “Neighbourhood Bat Watch” and “Des nids chez vous”, or nests at home, were designed in French. You can change the language with a click, and participants, such as the 500 students at the school I mentioned earlier, choose French in most cases—

[*English*]

The Vice-Chair (Mr. Corey Tochor): I have to cut you off. I'm sorry. We are out of time on that one.

We're moving on to Mr. Cannings.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Mr. Chair, I would ask Mr. Gonzalez to provide a written answer. I think he had a lot to tell us on this topic.

I would be very grateful if Mr. Gonzalez could provide us all the information he wanted to share with the committee.

● (1135)

[*English*]

The Vice-Chair (Mr. Corey Tochor): If he can, on the last question....

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you.

Mr. Andrew Gonzalez: I would be very pleased to do that.

[*English*]

The Vice-Chair (Mr. Corey Tochor): All right, Maxime.

We're moving on to MP Cannings.

Mr. Richard Cannings (South Okanagan—West Kootenay, NDP): Thank you.

Thank you to all the witnesses here today. This is such an important topic, and we have some very informed witnesses.

I would like to ask Dr. Gonzalez and Dr. Kerr a question about citizen science in the environmental-ecological realm.

How important are the long-time series and vast geography that we face in Canada? My question is simple: How can the federal government promote this? There seems to be such a dramatic shift in the amount of data we get and the need to effect policy. How can the federal government best support citizen science? Is it by funding coordinators from NGOs? Is it having scientists on staff who go out and promote this?

How can we best take advantage of citizen science as we face the biodiversity crisis we are in?

Mr. Andrew Gonzalez: Feel free to start, Jeremy. Go for it.

Dr. Jeremy Kerr: I think there are a number of different mechanisms to consider, here.

First of all, Canada enjoys its tri-council based approach to research funding. It would be straightforward to adopt a tri-council based initiative that facilitates the expansion and use of citizen science programs for public outreach in order to inspire Canadians and contribute to policy insights. I think that's one mechanism.

Another mechanism takes, perhaps, more of an Ottawa insider's view, in that the public service has extraordinary internal capacity but does not routinely rely on external sources, such as citizen science—with some important exceptions. I think there are mechanisms, both federally and provincially, that we could encourage the public services of these governments to adopt, which would facilitate their engagement with the broader knowledge-based community around the use and deployment of citizen science programs for various purposes.

Mr. Andrew Gonzalez: I'm happy to add a bit on a situation I'm currently concerned about.

Canada is blessed with an extraordinary level of expertise and engagement among the research community, the citizen community and indigenous peoples. We have invested heavily in our programs for sampling certain elements of our biological diversity. What we have not done is stitch those efforts together.

What I'm trying to promote—and what I would like us to think about, moving forward—is the creation of a Canada-wide, multilanguage and multiperspective biodiversity observation network. This would upscale the QCBS model. We get engagement coast to coast by working with local communities through this networked approach.

I don't think this is an insurmountable problem. In the 21st century, across a territory of this size, we have to work in this networked fashion. I'm calling this the Canada biodiversity observation network. It will be something like the meteorological service that we have and rely upon every day. Imagine that as an analogue to understanding the state and fate of our biological diversity.

Mr. Richard Cannings: Thank you.

I'd now like to go back to Dr. Kerr.

You mentioned we would need to have immense amounts of data to, for instance, test whether the land and waters we protect under “30 by 30” is doing the right thing. Are we using citizen science to choose those areas, in the first place?

Dr. Jeremy Kerr: Certainly there is excellent availability of information on these topics that the public service is making use of. I mentioned our project, mission monarch, which is informing recovery efforts for monarch butterflies in Canada.

There are ways in which we can begin to use modern conservation science techniques for decision-making about how to prioritize areas for conservation, but the only way that's going to work effectively is by pulling in data sources of all kinds. As Dr. Gonzalez has quite rightly pointed out, there is far too much Canada for the amount of data that we actually have, which means that some of what we must do will be inferential, using things like remote sensing in the context of a broader and integrated biodiversity observation network.

The tools to inform that process were part of the target one initiative and figure prominently in decision-making. It's our job as scientists to ensure they remain present throughout that process.

● (1140)

The Vice-Chair (Mr. Corey Tochor): Thank you so much, Mr. Cannings.

Moving on to the next round, we have MP Mazier for five minutes.

Mr. Dan Mazier: Thank you, Chair.

Thank you to the witnesses for coming here today.

I represent rural Canadians, and they know a lot about the natural environment and land stewardship. Unfortunately, the government doesn't always listen and doesn't reach out to these people when developing policy.

What role do farmers, ranchers and landowners have in conservation and environmental policy?

I'll start with Mr. Kerr.

Dr. Jeremy Kerr: Thank you very much. It's an excellent question.

I talked in my remarks a little bit about the need to be inclusive. I meant that very specifically to be everybody. Communities that are not typically part of decision-making processes ought to be, because that's how we are supposed to do things in Canada.

My experience, in working with rural communities and with landowners outside our cities, is that every single one of those people cares about stewardship. I've never met a producer who wanted to degrade the capacity of the environment to continue to provide a means of living for their families into the future.

I think we have to approach those communities with great respect, listen carefully to what they feel the priorities are around stewardship and weave that into our broader narrative. Those voices deserve respect, and I'm encouraged by the policies that I see being developed, which will do exactly that.

Mr. Dan Mazier: Mr. Gonzalez, do you have anything to add?

Mr. Andrew Gonzalez: Yes, indeed. It's an incredibly important problem.

I have two levels of an answer. What we're finding, first, is that rural communities and landowners working far from the city often have an extremely deep appreciation and understanding of their biological diversity. Because of the types of technologies that Jeremy and I have spoken about today, they have never been more connected or better engaged in this sharing process—the sharing of observations and information.

Second, that accessibility translates to an easier engagement when, through conservation projects and practices, for example, we want to establish new protected areas under the new 2030 goals, far from the city. Through the QCBS we've been involved in several projects that have involved landowners far from the city, far from Quebec or Montreal, in thinking about how to preserve the connectivity of our landscape.

I worry less about their role than I might have done 10 years ago. We're seeing an uptake in this and broad engagement.

Mr. Dan Mazier: Thank you.

Ms. Lewis, I think you would agree that when conducting brain research—and I think most Canadians would agree as well—it's important to listen to the professionals, whether that be doctors, scientists or, in this case, the citizens who are working on your project.

How do we ensure that decisions being made from research produced by certified professionals are not the opinions of politicians?

Ms. Nicola Lewis: I think that's the role of knowledge mobilization and knowledge translation. I think that's where the peer-review process comes in, in terms of the sharing of the results of science and the acceptance of that high academic standard of the research that's conducted.

I know with Kids Brain Health we look at research that's leading-edge in this country around neurodevelopmental disability and how that can go forward.

We don't support research that hasn't gone through a very rigorous process. There has to be evidence and proof of principle before our organization works with a program, because what we're interested in is implementation, how you can have impact.

We know the statistic that it takes 17 years for an initial research program to get to impact. We would like to see that sped up. We work with scientists who say, “We have something here. We have a solution to a problem that's been identified. Can you help us to get this to scale and spread, working with our parents and families?”

That's what we're about. We're about enabling excellent science to make it into the community.

● (1145)

Mr. Dan Mazier: Does anyone else have an opinion on that?

How do we make sure that science prevails at the end of the day and not political opinion?

Dr. Jeremy Kerr: Very quickly, science is a self-checking process. As long as it's conducted openly, it's very hard to conceal mistakes. I think it is its own mechanism for self-correction. While it continues to be open, there is an opportunity to make adjustments to ensure that we're using science and not purely subjective views in making decisions.

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

We now move on to Ms. Diab.

Ms. Lena Metlege Diab (Halifax West, Lib.): Thank you very much, Mr. Chair.

Welcome to all our witnesses.

Just listening to you I see the passion and the excitement in how you describe citizen science and how you describe making a difference for others through science. It's wonderful to see that and it's been a great study. We've learned quite a bit about how everybody can be involved in one aspect or another. I know there have been a number of questions on reliability, integrity and engagement, so it's great to have received all these answers.

I'm going to ask Ms. Lewis because we haven't had many witnesses, to be quite frank with you, on health, health care and particularly in that field in health research. It is something that I'm personally interested in. Again, we haven't had many testimonies on that.

Can you talk to us a little bit more about the opportunities that citizen scientists have?

You talked about mothers in this case. Can you talk a bit more about that and health research for citizen scientists. I would love to get a little bit more for our study on that.

Ms. Nicola Lewis: There is a tremendous opportunity to embrace citizen scientists in all of the work that comes through that is supported by the federal government and that is supported by NGOs like ours. I think if the tri-council put in a requirement around citizen engagement like they are doing right now towards EDI and other areas, that would go a long way to supporting the work that is being done. I think when I've been talking about the family engagement in research, it's a model. The model is not just training. The model is around support, around advancement of leaders in family engagement, the advancement of those champions and mentorship. It's not enough to have training. We've learned that along the way over the last five years.

We have seen with the research programs that we fund—and I talked about over 200 programs of research—every one of those programs has family engagement and partnership engagement. They've really helped shape the best research that we possibly can do.

Ms. Lena Metlege Diab: You're talking about brain research. In Halifax, where I come from, I represent a rich community in Halifax that has the brain repair centre at Dalhousie University. I know they're doing magnificent work.

Is there collaboration? Do you share, or are you even aware of it?

Ms. Nicola Lewis: We are aware of it. We're aware of all the brain research centres across the country. KBHN is a very large network. It wouldn't surprise me if there are multidisciplinary researchers out of that institute who are involved as collaborators in many of our projects, because they are multidisciplinary and they are across Canada. While the PI may be located at McGill, for example, in Montreal, the team is not solely located there. It's comprises researchers from right across the country.

Through that, we encourage the work that we do and we do lots of sharing. We have a very large network and a very large mechanism through social media.

Ms. Lena Metlege Diab: That's fantastic to hear.

I know at Dalhousie they are engaging, quite a bit, early researchers but also undergraduate students and graduate students.

What role can they have to play in the work that you're doing?

Ms. Nicola Lewis: I hope they would apply to come and join the family engagement in research program, to get certified and to go through the course. It's a commitment. It's 30 hours of time online. It would give them tremendous insight, knowledge and skills to then apply those lessons to the work they do. The family engagement research program is open to any researcher or trainee who works in neuroscience to apply for the program. It's free of charge. KBHN has supported all of our family members and our trainees so far to take the course.

● (1150)

Ms. Lena Metlege Diab: I'm going to end by saying that one of my children is a neuroscientist with his Ph.D. and is working in that field. For me, this has been a tremendous opportunity to have you here and to ask you that, because I think it's a phenomenal area that we need to do a lot more in.

Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you.

We'll go to our two and a half minute round with MP Blanchette-Joncas.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Chair.

Mr. Gonzales, I took a look at the website of the Quebec Biodiversity Science Centre. It is very interesting. I noticed that it included many publications. There were 182 in total.

How many of these publications would you estimate are in French, roughly?

Mr. Andrew Gonzalez: I don't know, but I would say that most publications in biology, as in most scientific fields, are in English. It is the lingua franca of science. If I had to make an estimate, I would say it's between 1% and 5%.

Mr. Maxime Blanchette-Joncas: I will give you the exact answer, Mr. Gonzales: it is 1%.

Of those 182 publications, two are in French. I'm asking you this question to get at another problem: How do we get the public interested in citizen science if the scientific content that might interest them is not available in their language?

I understand that English is the lingua franca of science, but we must also understand that in Quebec and francophone communities in Canada, the relationship between French and English is not the same as in the rest of the world. I would like to hear your thoughts on that.

The mobilization of scientific knowledge in French in Quebec, and even in francophone communities outside Quebec, is certainly inadequate. Isn't this an inequality, and even a barrier to science as a lever for economic and social development for francophones?

Mr. Andrew Gonzalez: I would argue that, in any case, there are several barriers to mobilizing scientific knowledge. You know that most of these papers are behind what's called a paywall. People have to pay to get through that wall. Universities and researchers pay to access this knowledge in scientific journals. So there is already a first barrier to accessing a scientific article, regardless of the language in which it is written.

Then there are barriers associated with the need to communicate clearly the results of advanced scientific work through the media, whether it's radio, print or television. I think we can be critical of science in general in terms of how well it mobilizes this knowledge in a language that is accessible to—

[*English*]

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

I apologize for cutting you off, but if you have more, you can always submit your answer in written form.

Mr. Andrew Gonzalez: Yes, will do.

The Vice-Chair (Mr. Corey Tochor): Now, going on to the final two and a half minutes, we have MP Cannings.

Mr. Richard Cannings: Thank you.

I'll follow up on that, because I was going to ask a question about how beneficial citizen science is, not just for the scientists and the science data and information we gather but for the citizen scientists themselves in terms of the benefits they get with the feeling of inclusion and their ownership of the data.

Mr. Mazier was talking about farmers and rural people with that deep knowledge. Citizen science projects could give them that sense that they're doing something, that they are part of this. They could understand it, and they would see the results. I just wanted to talk about that.

I would add, following up on Mr. Blanchette-Joncas, that most of these citizen scientists are not reading the scientific papers that come out of this. They're reading the reports that come out in the brochures and newsletters. I come from the Birds Canada world, where all of that is in both languages. That's where they get that sort of feedback, as well as on the sites themselves.

Could you maybe spend a very short period of time—because I've talked a lot—on how important it is to engage those citizen scientists and report back on their results so they can feel that they truly are a part of that whole scheme?

That's for Jeremy or Andrew.

● (1155)

Dr. Jeremy Kerr: Perhaps I'll lead things off then, Mr. Gonzalez.

Citizen scientists deserve and have earned the respect of the professional science community because their expertise is profound. In addition to our giving them the sense that we actually honour their contributions, they are sometimes the most knowledgeable people about what's going on in their communities, about the species that are present and about identifying those characteristics of biodiversity that are distinct in those places.

There are so many ways in which we can communicate that outstanding kind of contribution. I speak to school kids. I've done some national presentations to classrooms simulcast all over the place. Children are deeply excited about the fact that they can be scientists too, and they can. They just have to care enough and they have to know that we care to accept what they contribute. The same thing is true in a more adult kind of way in every community with which I have interacted over many years now. My sense is that citizen science is a two-way street. It's a kind of conversation between the professional science community and the broader Canadian landscape.

The Vice-Chair (Mr. Corey Tochor): I'm sorry, but I'm going to have to cut you off. We are out of time there. I encourage you to submit a brief afterwards on the subject.

With that, I'd like to say a big thank you to all of our witnesses today. We will suspend briefly before moving on to our next panel.

● (1155)

_____(Pause)_____

● (1200)

The Vice-Chair (Mr. Corey Tochor): Welcome back, everybody.

We are now moving into our second panel.

Up first for an opening statement of five minutes, we have Dr. Hajibabaei.

Welcome to the committee.

Dr. Mehrdad Hajibabaei (Professor, As an Individual): Thank you so much.

Mr. Chairman and respected MPs, members of the science and technology committee, thank you for providing me this opportunity to speak about the important topic of citizen science.

I speak here as the scientific lead of a highly collaborative project called STREAM, which stands for sequencing the rivers for environmental assessment and monitoring. This project was launched in 2019 and is deeply rooted in over 20 years of research and development in Canada and internationally.

My academic base is the University of Guelph, at which I'm a professor of molecular biodiversity and also the chief scientific officer of the centre for biodiversity genomics, which has led the world in the application of DNA-based tools for biodiversity discovery. This week, we celebrated the 20-year anniversary of the introduction of DNA bar-coding and the bar code of life program.

DNA bar-coding uses species-specific regions of the genome for distinguishing species. Under our guidance, the scientific community has now sequenced over 10 million specimens from about 400,000 species, providing a powerful biological database for species identification in a range of settings from food safety and security to species conservation.

We have also pioneered the bulk identification of species in biological communities in aquatic ecosystems using a technique known as environmental DNA metabarcoding, which uses high-throughput sequencing platforms. This approach is transforming biodiversity monitoring in support of water quality assessments.

Given its large land area and significant remoteness, Canada represents a major challenge for river biomonitoring. Climate change and various development projects pose more challenges for timely and effective biomonitoring programs. Current tools are not accurate and scalable. Over 15 years ago, I started collaborating with scientists from Environment Canada and Parks Canada on utilizing DNA-based biodiversity tools for addressing a chronic lack of biomonitoring data. However, I soon realized that a major bottleneck we are facing is related to generating samples from rivers across Canada on a timely basis.

Together with collaborators from Environment Canada, WWF Canada and Living Lakes Canada, which has representatives here today, we launched STREAM in 2019 with funding from a competition presented by Genome Canada. We developed a modular program whereby community groups, including several indigenous communities, became partners in STREAM.

To ensure effective engagement of community members, we developed a standard training module by taking advantage of the CABIN framework. All our citizen scientists are certified for gathering samples and various site metadata using a standard operating procedure. We have engaged over 100 individuals from many communities, and they have collectively gathered over 1,400 samples from watersheds across Canada.

Our objective has been to generate biodiversity reports for community groups in less than two months. We have generated over 70 reports thus far and have also established an online knowledge portal with various tools for visualizing and reporting data. Because STREAM samples are collected by local communities, our program continued even during the pandemic.

Since our Genome Canada funding ran out, STREAM is now partially supported by a grant from Environment Canada. We also have philanthropy funding from the Illumina foundation, an American genomics company.

Given the importance of generating knowledge to sustain Canadian freshwater ecosystems, we are hoping to build a more sustainable funding model for STREAM and to expand the approach for other taxonomic groups such as fish and vertebrates, as well as hosts and vectors of infectious agents such as emerging zoonotic viruses.

I would be happy to address any questions. Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you so much.

Now we'll move to our second presenter on the second panel.

We'll have Ms. Hartwig for five minutes.

Ms. Kat Hartwig (Executive Director, Living Lakes Canada): Good morning.

My name is Kat Hartwig. I'm the executive director and co-founder of Living Lakes Canada.

I've worked in the NGO environmental sector for 33 years, focusing the last two decades on citizen-science water stewardship and community-based water monitoring.

I am honoured to be speaking to you today from Brisco, B.C., the traditional territory of the Ktunaxa and Secwepemc nations. Living Lakes Canada recognizes indigenous people as the rightful caretakers of their unceded territories.

Joining us today are my colleagues, Raegan Mallinson and Georgia Peck, managers of our biomonitoring and lake monitoring programs.

In 2022, the Canadian Climate Institute issued a report stating that, by 2025, over 90% of climate impacts and disasters will involve water. This will slow down Canada's economic growth by $25 billion annually. It is clear that the climate crisis is a water crisis and must be solved collectively. Governments at all levels and all scales play a critical role. However, it will require many more hands on deck to address a challenge that should have been addressed 30 years ago.

Through community-based water monitoring, our governments can mobilize and build upon the passions of thousands of citizens who have deeply vested interests in maintaining watershed health, water security and, thus, food security. We also need to be able to manage adaptively in response to the unforeseeable, climate-driven changes in the water cycle.

Living Lakes Canada is a national, award-winning charitable organization. Our science-based programs range from groundwater, lake, stream and wetland monitoring to lake foreshore health assessments, biomonitoring for restoration, and a national lake blitz. For hydrometrics, we monitor flows for fish and fire suppression and apply a water-balance approach to facilitate future water budget needs.

We build open-source data hubs, which are data repositories for water monitoring groups and are interoperable with federal and provincial databases such as CABIN. Data transparency and accessibility provide the foundation for data democratization.

In 2018, Living Lakes Canada co-convened a national round table for indigenous and non-indigenous community-based water monitoring leaders, including policy experts from ECCC and CIRNAC. We developed 60 recommendations for the federal government, which can be found in the supporting documents both in French and in English.

The overarching recommendation themes were, first, capacity building by building on existing community monitoring efforts and supporting youth programming and cross-sectoral partnerships; second, efficient and effective monitoring by ensuring that data monitoring standards and protocols are universal, transparent and built on best practices; third, data management by scaling up open-data management efforts both within and outside of government; and finally, regional and national collaboration by increasing efficiencies and building synergies versus silos.

Water governance in Canada is complex and can have multijurisdictional gridlocks. Community groups offer untapped local capacity and can play a unifying role in ensuring that the health of fresh water will help meet the Canada Water Act mandates while advancing whole-of-government priorities.

In closing, my strongest suggestion is that the federal government—with all due respect—catch up. We are well beyond proof of concept on this topic. The government must support the growing momentum around indigenous and non-indigenous community-based water monitoring. Regardless of the vehicle you choose to use, be it a sleek Canadian water agency or otherwise—whatever the mechanics—it needs to be nimble, have low barriers for citizen entry, build upon existing best practices and initiatives and, most importantly, ensure high-quality control for outputs.

Water monitoring to address climate impacts takes time and money, neither of which we have the luxury of wasting.

Thank you to the organizers for this opportunity today, and thank you to the standing committee for all of the work that you do for all of us.

● (1205)

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

Now, we'll move on to our final opening statement.

Mr. Stewart.

Mr. Carl Stewart (Director, Western Canadian Wheat Growers Association): Good afternoon. My name is Carl Stewart, and thank you very much for this invitation.

I farm wheat, canola, soybeans and peas in Manitoba. I'm also a director for the Western Canadian Wheat Growers Association. We represent grassroots wheat farmers. Our goal is to promote policies that strengthen the sector, help Canada be a world leader in wheat production and ultimately benefit consumers with healthy and affordable food staples.

I gave a great deal of thought to this invitation. As farmers, we deal every day in science, the science of soil preservation, crop management and fertilizer. We care deeply about science and technology, because those help us become better farmers and deliver higher quality and better yields.

We have always worked closely with Agriculture Canada, a department that was—was—in the business of leveraging science to make Canadian agriculture safe, healthy and productive. I'll say more on that later.

Good science doesn't just come from scientists in research labs or universities. Good science also comes from the citizens who practise it. Doctors, for example, are scientists insofar as they apply what they learn in constantly evolving and experimental settings with their patients to see what works best.

We are worried that science is taking a back seat to ideology. I'll give you an example. The current federal government says that it wants farmers to reduce fertilizer use to help it meet commitments to greenhouse gas reduction. The trouble is that there is no science that backs up that policy position.

It's simple. With less fertilizer, we will grow less wheat. World demand for wheat will not decline, so less Canadian wheat will be produced and more will be produced overseas by countries whose farmers use far more fertilizer than Canadian farmers. It's called carbon leakage. Cutting our fertilizer use will cause more fertilizer-based CO2. It's a simple calculus, but it's not being applied by our government.

Recently we learned that Agriculture Canada, which used to be committed to using science to help Canadian farmers grow more crops, has now changed its mandate to "mitigating and adapting to climate change". That scares farmers, because now Ag Canada cares less about what grows in the Palliser triangle and more about Paris accords.

As for citizen science, well, there may be a role for it, but we worry that citizen science can easily be captured by the dominant ideology of the day. Instead, we would advocate, as far as agriculture is concerned, that we leave the science to scientists and practitioners. The greatest benefit to consumers will come from scientists and practitioners working together to increase the food supply to keep it safe, healthy and affordable. Let's keep ideology out of the food supply.

Thank you.

● (1210)

The Vice-Chair (Mr. Corey Tochor): Thank you so much for that.

We're now moving on to our six-minute round of questioning. First up for the Conservatives is Mr. Mazier.

Mr. Dan Mazier: Thank you, Mr. Chair.

Mr. Stewart, citizen science involves listening to citizens when developing policy. You mentioned the government's fertilizer policy. Did the Liberal government consult with the Western Canadian Wheat Growers Association before introducing their fertilizer reduction policy?

Mr. Carl Stewart: They did not.

Mr. Dan Mazier: Not at all...?

Mr. Carl Stewart: Not at all, unfortunately.

Mr. Dan Mazier: I assume you know many farmers across Canada. Are you aware of any farmers who were consulted on the government's fertilizer policy before it was announced?

Mr. Carl Stewart: Unfortunately, once again, I do not.

Mr. Dan Mazier: If farmers are expected to meet the Liberals' fertilizer reduction targets, what would be the impact on Canadian food production?

Mr. Carl Stewart: I'll reference a report that Meyers Norris Penny did for Fertilizer Canada. The report is titled, “Implications of a Total Emissions Reduction Target on Fertilizer”.

This is based on a 20% and not a 30% reduction. Yields, of course, will go down through time as soil reserves of nutrients get depleted. If the implementation were to start in 2023 out to 2030, Myers Norris Penny predicts a loss of 23.6 bushels an acre of canola, 67.9 bushels an acre of corn and 36.16 bushels of wheat per acre. That would all essentially be loss that would have to be made up elsewhere.

Mr. Dan Mazier: Would there be less food produced in Canada?

Mr. Carl Stewart: That's correct. There would be less food, so supply goes down, demand goes up and costs go up substantially. Canada is a large exporter of these crops, so world markets would see a considerable disruption.

Mr. Dan Mazier: How will this government's fertilizer plan affect the incomes of family farms?

Mr. Carl Stewart: The short answer is significantly negatively.

The problem with farming is that all the money is in the last few bushels and acres. Of course, these numbers change from year to year depending on input prices and crop prices, but the first 60%, 70% or 80% goes straight to creditors.

You have pay for equipment loans. You have to pay for crop inputs. It's those last few bushels an acre that go straight into the farmer's bank account. A reduction in yields would be a disaster.

● (1215)

Mr. Dan Mazier: It would make you less competitive with other exporters as well. Do you want to explain that a bit? Where does this put us on the world stage in terms of farmers competing with the rest of the world?

Mr. Carl Stewart: Canada is already one of the highest-cost producers there is of agricultural commodities. We're furthest from the destination markets. There's lots of red tape. My family actually got started farming in 1980, when interest rates were high. The only way the farm managed to be where it is today is that everybody worked like dogs for a long period of time and made a bunch of sacrifices. It's not an easy industry.

If you were to take all the capital involved with farming and compare it to annualized stock returns in any particular index, let's just say that it's not even close. The index outperforms farm gate returns any day of the week.

Could you repeat the question? I lost track there.

Mr. Dan Mazier: That's okay. I have more questions for you. You did good there. You answered it.

Yesterday, the agriculture minister stated, “We are working with farmers for farmers.” Do you agree with her statement?

Mr. Carl Stewart: I strongly do not. We feel like we've been left out.

On your previous questions there, we haven't had any consultation at all. If you're actually for farmers, you would think that the bare courtesy would be to do at least some consultation to see what the effects are. We feel that we haven't been fairly represented in Ottawa for quite some time, and it seems to be getting worse, not better.

Mr. Dan Mazier: It's clear that the government isn't listening to farmers. What message do you have for the politicians who are pushing forward with the fertilizer reduction policy?

Mr. Carl Stewart: I'd say that our biggest concern out of all of this is just the complete lack of due process. There was no scientific data produced to support this and no consultation with practitioners. Ultimately, there won't be any net benefit to the world.

Canada's nitrogen use efficiency is 72%, which is higher than the global average. Western European countries, for example, have a nitrogen-use efficiency of 61%. Limiting our productivity will lead to higher production in countries with a worse environmental track record than Canadian farmers'. Canadian farmers have been implementing the 4R fertilizer stewardship and best management practices for over 15 years now, with over six million acres verified, and this is all without government intervention.

This policy is disastrously uneconomical, unenvironmental and unscientific.

Mr. Dan Mazier: Thank you.

That's all I have, Chair.

The Vice-Chair (Mr. Corey Tochor): Thank you so much.

We're now moving on to MP Collins for six minutes.

Mr. Chad Collins (Hamilton East—Stoney Creek, Lib.): Thanks, Mr. Chair. If you don't mind, I'll get us back to the citizen science study that we're doing.

After that last exchange, I actually feel compelled to ask about scientific literacy and how we're using and relying on NGOs and organizations across the country and their armies of volunteers to help us with misinformation and disinformation as it relates to science.

Maybe I can start with Ms. Hartwig.

After that last exchange, I started to think about some of the things I heard at the door when going through the election in terms of people questioning vaccines and the effectiveness of vaccines, and questioning science, really. I think most of us around this table would agree that it was science that got us through the pandemic, and I think science will get us through and help us combat climate change, to your point.

If I could, I'll ask Ms. Hartwig for her comments as they relate to how citizen science will help us combat some of the misinformation and disinformation we hear as that relates to our climate crisis—and it is a crisis. How will science and citizen science help the government make informed decisions on policy matters related to the same?

Ms. Kat Hartwig: Thanks for the question. It's pretty loaded.

Our area of expertise is to empower citizens to do water monitoring and to do community-based water monitoring, driven by and for the community, when they have questions and concerns about water, water security and in particular water that supplies water for food security. For example, where I live in the East Kootenays, we have the challenge of climate change deniers not really believing that we are going to be impacted. Lo and behold, though, we have lakes that are drying up. We have severe drought conditions and flooding. Mother Nature is presenting what's going to happen, whether we like it or not.

I feel that one of the ways we can combat misinformation is by simply doing the work that needs to be done, collecting the data with rigorous scientific protocol and solving problems collectively. I don't think there's an opportunity for us to be pointing fingers at each other. We're all in this together. We all have children. We all need food. We all need water. That may sound idealistic, but I think we need to keep our eye on the ball.

● (1220)

Mr. Chad Collins: Thanks, Ms. Hartwig.

Professor Hajibabaei, can I ask you the same question? Science is more important today, I think, than ever before, and we've made progress in the scientific area over the last 20 or 30 years. Again, that helps us get through the pandemic.

Of course, we've seen the whole questioning of science that has come up from a political perspective. We certainly see it almost every day that we're here in Ottawa. We experience that, obviously, on social media. We even see it in the news today, on a growing basis.

In terms of the work that you're doing—the biodiversity monitoring, what we're doing to try to address and combat our climate crisis—how important is it for you and the citizen scientists you work with to ensure, from an education perspective, that the citizens who are participating and the information that flows to the general public are seen as something worth value?

Dr. Mehrdad Hajibabaei: It's definitely a very important topic, and I'm glad that you brought it up. I think that education is the key thing that we need to work on. The earlier we start, I think, the better it will be in terms of the long-term impact.

I'll give you a couple of examples of the work that we have been doing. I'm a bench scientist working in the lab on a computer, but I get to go out to the field and see some of the sites. A few years ago, I had the chance of visiting some of the sites that are used for oil and gas extraction around the Cold Lake area in Alberta. I saw that basically there were large patches of the forest being cleared for the facilities and pipelines, and so on. We were involved with coming in and finding ways to restore the forest to its natural state.

It's just like when you do surgeries. Nowadays, rather than doing these large, invasive surgeries, we can do very small incisions that are more accurate. Imagine if the engineers or the workers involved in this knew the importance of biodiversity and the difficulty of bringing back these forests to their natural states. They would probably be thinking about methods and approaches that could be less harmful to the environment. Even though they are not experts in this field, they could collectively have the knowledge and understanding of, for example, the importance of the environment.

I throw in a key word that we've been thinking about, which is “bioliteracy”. In general, for everything biological, from medical and life sciences to environmental and biodiversity-related issues, I think bioliteracy.... Citizen science programs are some of the best ones. People, whether school kids, indigenous communities or workers in an oil company, will all believe they're part of the scientific enterprise of gathering information. That will allow them to go in and learn what the information is going to be used for. How are the scientists at Environment Canada or at NGOs like Living Lakes going to use this information? That's going to create this bioliteracy layer that we're all looking for.

Nowadays, putting the checks and balances in place, we can actually utilize this information. It's educational, but it's also scientifically very useful for us and probably, for some issues, the only way to go forward.

● (1225)

Mr. Chad Collins: Thanks, Professor.

I have one last question, Mr. Chair. I know I'm running out of time.

My question is for Ms. Hartwig. We went many years without investments in science. In fact, I don't think science was seen in the past as being of much value to the government prior to our government taking office.

You talked about playing catch-up and building capacity. What do you think the government needs to do to make sure that science is important and that we're making key investments in the citizen science area?

The Vice-Chair (Mr. Corey Tochor): We are out of time, so you are going to have to submit it in a brief afterwards. We're very interested in your response.

With that, we are now moving on to the next six-minute round with MP Blanchette-Joncas.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Chair.

I would like to acknowledge the witnesses who have joined us.

Science and scientists like facts, and I imagine parliamentarians do too. I cannot ignore the facts, or the situation mentioned earlier by one of my colleagues, who said that there had been some catching up in terms of investments in science. Let me correct those facts.

Canada is the only G7 country to have cut its investment in research and development over the past 20 years. As far as I know, and again based on the facts, various governments have led this country over the last 20 years. I think there are some people and witnesses around this table who will be able to draw their own conclusions.

I'll come back to the actual topic at hand and address the Living Lakes Canada representatives. I think that most of my colleagues at the table have already understood that I support citizen science and I believe that it is essential on many fronts. As Quebec's chief scientist, Dr. Quirion, previously testified here, we can use citizen science to counter disinformation and increase scientific literacy among the general public.

I would like to hear from the Living Lakes Canada people, who are scientists in the field. How can we bring benefits to citizen science?

[*English*]

Ms. Kat Hartwig: Thank you for the question. I'm not sure I completely understood. I'm going to reiterate it, and you can tell me if I'm correct or not.

It sounded to me as though you're asking how we can dispel myths and provide more truth around citizen science, or around science in general.

[*Translation*]

Mr. Maxime Blanchette-Joncas: I will put my question in simpler terms. I know my introduction was long.

What are the benefits of using citizen science?

I'll take the opportunity to add another question to my first: What can we do, as a government, to support your citizen science initiatives?

[*English*]

Ms. Kat Hartwig: Thank you for reiterating the question.

I'm going to give the question over to my colleague Raegan Mallinson, but first I want to say that citizen science has access to sectors that the government may not normally have access to. Through social media, we are able to access young people, make science interesting and sexy, and make people want to participate. That's an avenue that, perhaps, is less available to the government.

I'll pass this on to Raegan, who directs our biomonitoring, and then I'll come back to your second question of what the government can do. Actually, I might answer that now.

I think what the government can do is help us build partnerships. We have 60 recommendations that we provided to the government, but I think that if we can have fewer silos and have more co-operation, and build exciting programs together, which we already have with the University of Guelph, for example, with Mehrdad and with the WWF.... There are really amazing and innovative partnerships. For example, we have partnered with the Alpine Club of Canada for our high-elevation monitoring, so we get skiers, snowboarders and alpinists helping to collect data.

We can make it fun and interesting, and not as daunting for young people. We have to inspire hope.

With that, I'll pass it to Raegan. Thank you.

Ms. Raegan Mallinson (Manager, Biomonitoring Program, Living Lakes Canada): Thank you so much for that question.

What citizen science can do and what advantages it provides include, as Mehrdad was mentioning, multidisciplinary partnerships. Those are key to everyone serving and operating out of their strengths, whether it be the citizens or the communities in their local or indigenous knowledge, and then the researchers in data analysis, interpretation and large-scale projects.

Multidisciplinary projects are very important. They provide huge cost savings. Instead of the government having to travel to remote sites to provide reference sites, we've been working with communities to provide that information right in their backyards. They also provide, again, remote data, which other speakers have spoken to. This is really important for water data.

Scientific literacy builds trust in the institutions, because there are opportunities for communication and understanding.

● (1230)

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you very much.

I want to come back to the importance of citizen science.

In 2019, the G7 Academies of Science issued a joint statement on citizen science in the Internet era ahead of the G7 Summit in Biarritz, France.

That statement contained a number of recommendations, including one to create specific funding programs for citizen science. As we know, some initiatives already exist. Dr. Rémi Quirion, Quebec's chief scientist, came before us to present the Engage program. However, it is clear that the federal government has done very little to increase the visibility of certain projects or establish projects providing financial support to citizen science.

I would like to hear your comments on that.

Is it important to have financial support from the government to create and develop citizen science initiatives?

[*English*]

Ms. Kat Hartwig: Who is the question directed to?

[*Translation*]

Mr. Maxime Blanchette-Joncas: I'm addressing this important question to anyone from your organization who can answer it.

[*English*]

Ms. Kat Hartwig: I'll start if you don't mind.

I will say that, yes, we need support from the government. I think that Canada is a laggard in that department. We fund projects for specific species at risk and things like that, but what we don't do is make normal community-based water monitoring or citizen science. We work with the Global Nature Fund in Germany, and we're connected to Living Lakes International. It's astounding the comparisons between the EU and Canada in terms of the money that's allocated for community-based water monitoring both indigenous and non-indigenous led.

For example, in the Columbia Basin, to collect the water data in order to allow our communities to have—

The Vice-Chair (Mr. Corey Tochor): I apologize. We are 45 seconds over already and we're not even getting through—

[*Translation*]

Mr. Maxime Blanchette-Joncas: Mr. Chair—

[*English*]

The Vice-Chair (Mr. Corey Tochor): I would ask you and the other panellists if they can write a written brief to explain your answers to that question. It would be much appreciated.

We will move on to the last spot in the six-minute round. We have MP Cannings.

Mr. Richard Cannings: Thank you.

Thank you to the witnesses for being here.

I'm really struck in this panel by the whole concept of collaboration, especially hearing from Living Lakes and STREAM about all the partners that you've mentioned, whether it's Environment Canada, Parks Canada, University of Guelph, the CABIN program or all these other citizen science programs that are feeding in. I know Living Lakes has a whole suite of those projects across the country.

I'll start with Ms. Hartwig.

It's always good to talk to somebody speaking from the Kootenays. Can you maybe elaborate on that concept of collaboration, which is something you mentioned in your recommendations, and on how the federal government can help you with that collaboration process?

I'll let you take that away.

Ms. Kat Hartwig: Thank you for the question, Mr. Cannings, and thank you for helping to organize this session. I think it's very important.

Collaborations are everything. We are in an era of a climate crisis. We can't be working in our silos. We must reach across and do multisector collaborations.

It depends on the project. For example, as I was saying earlier, in the high elevation monitoring program, we've collaborated with unlikely people who are now becoming water literate—the Alpine Club of Canada and high-elevation [*Technical difficulty—Editor*] managers. We know that we're past peak flow in the Columbia Basin, which means that we have diminishing returns in our water supply from glacial melt, which means that our recharge rates are changing and it means that snowpack is changing and all of these urgent things that people are now understanding in these partnerships.

We partner with Teck, the coal mine, in terms of looking at some of the water quality issues in the Elk Valley. We partner with indigenous partners.

I'll maybe defer to Georgia, who hasn't had a chance to speak about some of the partnerships she's developed through the foreshore management project that she's doing.

● (1235)

Ms. Georgia Peck (Manager, Lakes Program, Living Lakes Canada): Absolutely. Thank you very much, Kat.

Through the foreshore integrated management planning project, which was originally created by Fisheries and Oceans Canada in the early 2000s, we have developed some pretty exemplary partnerships with indigenous communities across British Columbia to help move this project process forward in the most inclusive way possible.

We have recently co-created a local indigenous knowledge and values framework with the Upper Nicola Band located in Okanagan, B.C., to ensure inclusivity throughout the project.

As Kat mentioned, climate change is a global issue and one that we cannot tackle alone. Collaborations and partnerships have never been more important than they are today. As you mentioned, the Kootenays are an amazing example of how those partnerships and collaborations can propel movement forward.

Mr. Richard Cannings: Thank you.

I'd like to quickly turn to Dr. Hajibabaei to talk more about the biological. I'm very curious. I know more collaboration.... Things I've reported on iNaturalist have ended up getting bar-coded by your people.

In STREAM, what is the breadth of the biodiversity that you monitor through that bar-coding?

Dr. Mehrdad Hajibabaei: The collaboration is key. In my opening remarks, I tried to describe the process. It's been over 20 years of R and D and going from grant to grant. We've been very privileged. In Canada, we have programs like Genome Canada and various programs in Environment and Climate Change Canada that have funded us.

In 2017, my job in the academic sector was to do the science, develop the technology and then see how it was going to be disseminated. WWF Canada came to us with their plans for the watershed reports, and that started the new line of collaboration with Living Lakes and all the groups they collaborate with as well as indigenous communities and various community groups.

From that standpoint, it would be impossible to gather this much data from a vast geographic area, especially for us in Canada, without this type of collaboration.

From the standpoint of the information we are gathering, with the tools that we have and the data that is generated through the samples that our partner is providing, we are getting maybe more than 10 times more data, focusing on macro-invertebrates, currently, because they are the bioindicators. As I mentioned, we are moving quickly.

We have plans with PHAC and CFIA to use the same type of community-based monitoring to tackle some of the emerging zoonotic viruses and vectors and their hosts through this environmental sampling. I think this is just the beginning. I think that this type of program will definitely play an important role for the future of monitoring programs in Canada and internationally.

Mr. Richard Cannings: Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you so much to our witnesses.

Thank you to our MPs for insightful questions today.

We have some in camera committee business to take care of, so we will conclude this portion of the committee. We will suspend briefly in order to move to in camera.