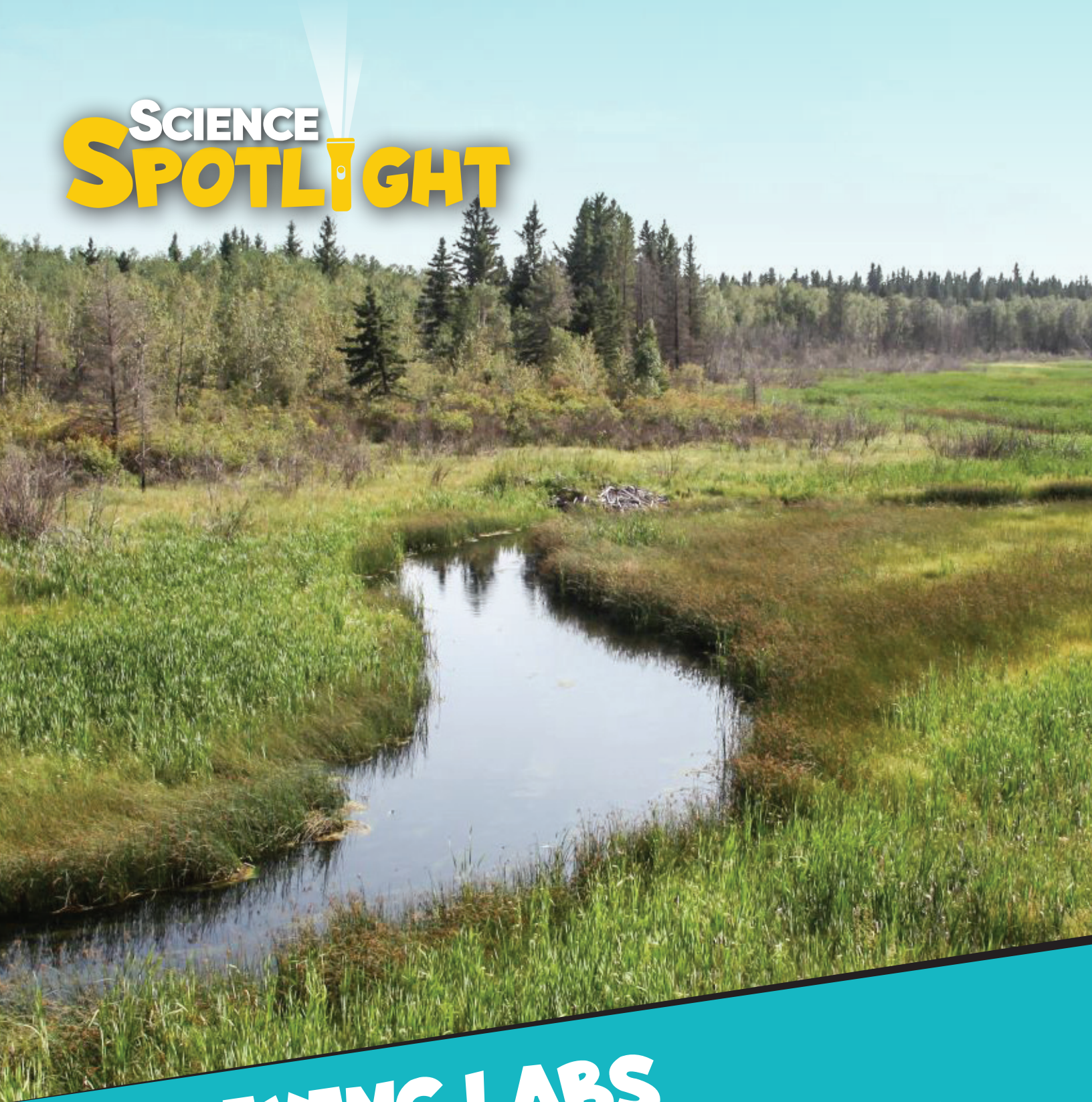
SCIENCE SPOTLIGHT



LIVING LABS
TIME TO COL-LAB-ORATE!

GEN ACTION

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Canada

SASKATCHEWAN SCIENCE CENTRE
Real science. Real fun!

BRIDGE TO LAND WATER SKY

LIVING LABS
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Origin Story:
TEAMWORK MAKES THE DREAM WORK

Innovation is the process of an idea or invention becoming a good or service people use, or a new way of thinking or doing something. Scientific and technological innovation has brought countless, vital solutions to many human problems. Climate change is a human-caused issue presenting one of the biggest challenges to ever face human innovation as the consequences are dire and solutions need to be found incredibly fast; therefore, we need methods to innovate quickly!

When you think of a laboratory, what do you imagine? Perhaps white lab coats, benches, stools, and a bunch of fancy equipment come to mind. Traditional laboratories are places that provide ways to experiment, observe, or practice in a field of study, often for research and innovation purposes, but are by no means the only place to do so.

Living labs are a newer concept that, unlike traditional laboratories, work in real-life and bring together all collaborators. This includes even the people intended to use or directly be affected by the innovation. By having the users participate in the development and testing of innovative technologies and practices, scientists can gather feedback at every stage in the study/design process. Researchers can then optimize every decision at every stage of testing. With a collaborative approach like this, innovative climate change solutions can be found faster!

A Living Lab with Ancient Knowledge...

To speed up the making and use of sustainable practices by Canadian farmers and combat climate change within its borders, Agriculture and Agri-Food Canada has launched the Living Laboratories Initiative for a new approach to Canadian agricultural innovation. As the world's fifth-largest exporter of agri-food and seafood, Canada exports to over two hundred countries. That is a lot of food we make! But according to a recent global study, food production contributed to one third of all human-caused greenhouse gas emissions in 2015. With increasing emissions comes a changing climate, causing farming to become much, much more difficult due to worldwide weather extremes. This means more sustainable agricultural practices are needed, and fast! The Living Laboratories Initiative aims to provide a quicker way to find climate solutions and includes all the ingredients for agricultural living labs; it involves testing in real-life contexts (farms) where researchers and farmers work together and collaborate with multiple wide-ranging groups to focus on farming needs throughout the process of innovation.

The Bridge to Land Water Sky is a project chosen to be a part of the Agricultural Climate Solutions – Living Labs program and is the first Indigenous-led living lab in Canada. Based in Saskatchewan and led by Mistawasis Nêhiyawak in collaboration with Muskeg Lake Cree Nation, the University of Saskatchewan, and the Redberry Lake Biosphere Region, the project works towards restoring our shared relationship to the land, finding climate change solutions, and protecting Indigenous values, treaties, communities, lands, and resources for future generations.

Indigenous groups of Canada have lived sustainably with the land for thousands of years and many Indigenous ancestors in Saskatchewan were very successful farmers; the close relationship they shared with the land, water, and sky likely played a large role in this. Indigenous agricultural relationships and knowledge are therefore invaluable when combatting climate change; sustainability is and has always been the answer.

The name "Bridge to Land Water Sky" means restoring this connection (bridge) of all people to the land, water, sky and reviving these ancient values and relationships to promote healthy, sustainable environments. Anthony Johnston, a special advisor with Mistawasis Nêhiyawak, explains that often it is thought only Indigenous peoples share these relationships with the land, water, sky, but in reality it is everyone.

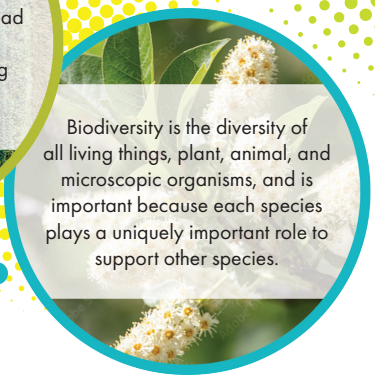
This living lab is also working on an innovative approach to work with grain farmers on small- and large-scale farms by testing the effects of applying combinations of 3 agricultural guidelines at once to help boost farmland health and sustainability. Each bundle of guidelines will work to:

1. **Increase cover crops and plant diversity to promote soil health.** With a variety of plants comes a variety of nutrient needs and root systems, resulting in a mosaic of soil nutrients and structure, which makes the soil nourishing enough to grow things without help from nutrient supplements like fertilizer.
2. **Optimize the way soil nutrients are managed and use pesticide reduction strategies.** Reducing the use of fertilizers and pesticides protects the surrounding soils, waters, air, and species.
3. **Diversify the landscape to include wetlands, trees, berry shrubs, medicinal and traditional plants to support biodiversity.** With more habitat variety, more species can exist, and the entire system becomes more viable to support life, including crops!

The Bridge to Land Water Sky is also working to recover barren lands in the area and restore them to rangelands for bison populations. Bison can make grasslands more resilient to climate change in many ways, mainly as a dominant grazer; they diversify the land to support other species, especially grassland birds who go on to do the same for other species, and so on, which helps increase biodiversity!

Making our farmlands and surrounding environments more sustainable and diverse is an incredibly important step in maintaining not only our food production, but also the health of our land, water, sky. By bringing together multiple perspectives like the Bridge to Land Water Sky living lab, we can work faster towards the common goal of healthy environments and combatting climate change. Connecting back to the ancient ways can allow us a prosperous future with healthy land, water, sky.

Cover crops involve plants that are not for harvest but instead help with soil health, pests, suppressing weeds, increasing biodiversity, and more.



Biodiversity is the diversity of all living things, plant, animal, and microscopic organisms, and is important because each species plays a uniquely important role to support other species.

TIME FOR GENACTION!

Climate Action: GO WILD!

We are all a part of nature, whether we choose to spend our time in it or not. Our human ancestors lived and evolved in nature and passed those primal genetics on, making us all wild animals at our core!

As a wild animal, it is important for you to maintain a relationship with nature for your own health and the planet's. By being closer to nature, we can better understand and protect it, however many studies have also shown there are physical and mental health benefits correlated to spending time in nature. Coincidence? Or are we built to be living in nature's harmony?

Try to go wild more often and take some time to form a relationship with the natural world you see around you. Whether it be connecting to the water flowing in a stream and appreciating its power to permit life on our planet, or perhaps respecting and being thankful for the trees that work every day to purify the air; everything in nature is working in some way to keep nature alive, and we are a part of this system. As natural beings, we have a role in maintaining the beautiful natural world and this can begin with forming a relationship!

This Science Spotlight was written based on Bridge to Land Water Sky. Mistawasis Nêhiyawak, Muskeg Lake Cree Nation, North Saskatchewan River Basin Council, Redberry Lake Biosphere Region, University of SaskatchwanSaskatchewan, Agriculture and Agri-Food Canada. Executive Summary, n.d.

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Climate Change
Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.
Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

Climate Change: Past, Present, and Future is based on...Delmotte, Masson, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, et al. 2021. "Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change." Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.