

# SCIENCE SPOTLIGHT



Photo Credit: Beaver Hills Biosphere

## Tales from the Trees



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Canada







# Tales from the Trees



## Origin Story



### Where Did All the Water Go?

In the summer of 2020, while sitting lakeside at Cooking Lake in Alberta’s Beaver Hills, local historian Michael Boyd asked the question on many community member’s minds, “where did all the water go?”

Many of the lakes in the Beaver Hills are wide, shallow, open waterbodies. Since the 19th century, the area has seen dramatic declines in water levels; in the 1860s, Beaver Hill Lake had dried to the point of bison being stuck in the mud of the lakebed. As settlers arrived the next sixty years saw significant changes in land-use and water-use in the region; forests were cleared, and agriculture expanded in the Beaver Hills. Most of the lakes in this area have experienced a decline in water year-after-year, and Beaver Hill Lake has nearly dried out three times in the last century.

What is causing these fluctuations in water levels? What role does climate change (warmer temperatures and changes in precipitation) play? How do these recent changes compare to historical cycles of water change in the Beaver Hills?

To answer these questions, Michael joined forces with assistant professor and director of the University of Alberta Augustana’s Tree Ring Lab, Greg King to investigate these questions. Their research has involved many people and places, include the staff of the Beaver Hills Biosphere, Strathcona County and the Strathcona Museum, and Alberta Forests, Parks and Tourism. Conversations about climate change require collaboration across many disciplines and professions. The Biosphere relies on this powerful collaboration to achieve its mandate.



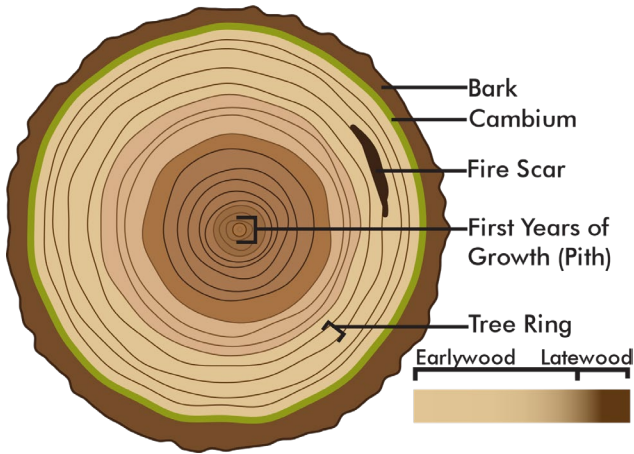
### Understanding Changes Through Time in the Beaver Hills

The Beaver Hills formed along the shores of Lake Edmonton over five thousand years ago. Both Lake Edmonton, and the Beaver Hills were the product of glaciers melting and retreating across the landscape. Bedrock and soil were ripped from the earth, carving rolling hills and leaving potholes in the valleys where ice once was. The Beaver Hills are a part of Alberta’s history; they have sheltered animals and people from the exposed prairies, they were a landmark for trails between settlements and trading posts and are the source of Edmonton’s Cree name – amiskwacîwâskahikan, meaning “Beaver Hills House.”

In the five thousand years since the glaciers retreated, the Beaver Hills have seen cyclical changes in water levels. How do we understand recent changes in water levels over centuries of cyclical change? We can look to some of the oldest recorded climate history in the region.

## ..... Asking the Trees .....

Trees act as living history books, adding new rings each year. Each tree ring is made of light-coloured earlywood from spring and early-summer growth, and the dark latewood from the late-summer and fall. Trees grow quickly if there is enough light, water, and at the right temperature. Good years of growth are marked by wider rings, whereas poorer years of growth have narrower rings.



Trees have more stories to tell than whether it was a "good" or "bad" year; there are patterns that tell us when insects have eaten the leaves off the tree, a fungus has started to decompose the wood, or a fire has burned the tree. Trees stop adding rings when the living part of the tree located just beneath the bark, called the cambium, dies.



Core Sample from Cabin.



Greg King Increment boring a cabin.

"IN THIS FOREST WERE TO BE FOUND BUFFALO, BEAR, MOOSE, DEER, AS WELL AS BEAVER AND ON THE LAKE SWAM GEESE, DUCKS, PELICANS, AND ALL KINDS OF WATERFOWL BY THE THOUSANDS. DURING THE FIRST PART OF THE NINETIES FIRE DESTROYED THIS GREAT FOREST."

- MAYOR MCCAULEY OF TOFIELD (1890S)

In the 1890s, several large fires burned through the Beaver Hills. The forests in the Beaver Hills were decimated and we lost much of the information about the climate of the region predating recorded weather. However, not all the trees burned; some that used to occupy former islands in the lakes (now connected to land due to rapidly dropping water levels) still remain. To extend that record even further back in time, Greg King's work uses wooden structures constructed in the late 1800s, such as the first homes and barns, still standing in the Beaver Hills. By combining these records, along with archival research, Greg and his team can learn about the pre-fire climate. This has allowed them to build a more than 300-year record of the local Beaver Hills climate from more than 125 trees combining both living and historic samples. The team has started to investigate what this record can tell us.

Greg's team found a significant May and June precipitation signal; this means that when there is a wetter in early summer, the trees grow more. This signal is important for two reasons: lake levels in the Beaver Hills are at least partially dependent on precipitation (rain and snow); and, with a strong signal, we can now reconstruct what the precipitation levels were for the past 300 years!

This process is ongoing, but initial results show that although lake levels have fluctuated over time, the current precipitation patterns are some of the lowest over the past 300 years. Understanding changes over thousands of years, however, requires more than archival research. It also invites a conversation with those who have cared for the land since time immemorial. That is where the work of the Beaver Hills Biosphere comes into play.



# Asking the People

Bob Montgomery and Pamela Billey work for the Beaver Hills Biosphere. Through their work, they create welcoming spaces for folks to connect and re-connect with each other and with the Beaver Hills.

Indigenous peoples lived within the Beaver Hills for millennia until European settlement forced them onto reserves and away from their homelands. Bob works to reconnect Indigenous peoples to their homelands and re-invigorate Indigenous knowledges of living harmoniously with the land.

Reconnecting people with the land is one powerful way to undo some of the destruction caused by the last century of western land use. Bob and Pamela's work incorporates research like Greg King's to build a deeper understanding of the changes the Beaver Hills have seen over time.

What stories do the people and places you live tell? What stories will you tell about your connection to place and your contributions to climate action in your area?

## Meet Our Local Climate Heroes!



### Michael Boyd

Since retiring from a thirty-two year career with the Government of Alberta, Michael Boyd has worked as a volunteer historian, both on his own and with the Strathcona County Museum and Archives. He is particularly interested in the history of the Cooking Lake area within the Beaver Hills Biosphere. He has written a book on the history of the Lakeview Dance Hall that once stood on the south shore of Cooking Lake.

Photo Credit: Beaver Hills Biosphere



### Greg King

Greg King has studied trees in many places, including Ontario, the Northwest Territories and Switzerland. In 2018 he started as an assistant professor of environmental science at Augustana and made Camrose his new home. Outside of the university you might catch him chasing toddlers, in the garden or the campus orchard, on the ski trails, paddling a river or playing ultimate frisbee/disc golf.



### Pamela Billey

Graduating with an Environmental Resources Management Degree, Pamela has worked in various fields focusing on issues related to land use, environmental policy, conservation, reclamation, and working with communities to better understand how cultural and local knowledge can inform and support solutions. Pamela enjoys kayaking and is an outdoor enthusiast outside her career as an Outreach Coordinator.



### Bob Montgomery

*Working with the land alongside Indigenous peoples.*

As a descendant of both settlers and Métis peoples, Bob takes responsibility for caring for the lands that have nourished his ancestors for generations. Bob has worked with the land in a variety of contexts from education to addictions recovery and now to learning practices of caring for the land with Indigenous knowledge systems. He connects with experts from various First Nations and Métis communities to guide this work at the Beaver Hills.

# TIME FOR GENACTION!

## Try This at Home:

### Build Your Own Tree Cookie!

You will need: yarn (light brown, dark brown, and black); scissors; paper; white glue; & markers.

1. Make a small circle of dark brown yarn in the middle of your background paper. This is the pith of your tree. Cut the yarn, and glue it to the background page.
2. Make a circle of light brown yarn around the dark brown pith in the middle of your paper and glue it to the page. Make a circle of dark brown around the light brown and glue it down.
3. One tree ring has a light ring and a dark ring. Alternate light brown and dark brown circles to make tree rings on your paper. If it was a good spring of growth, make more than one circle of light brown yarn.
4. FIRE! Not every fire kills a tree! Sometimes, only part of the tree is injured or killed. Use a short piece of black yarn to make your fire scar – this is the spot where the tree burned. Don't worry, it survived this fire!
5. Finishing it off: Draw a circle in green around your tree cookie. This is the living part of the tree: the *cambium*. Use markers and dark brown yarn to make the bark of your tree. *Bark* is the outermost layer of a tree.

## Climate

### Connect with an Elder

The land where you live has seen a lot. The land's stories help us build connections with place. They help us understand how we are all connected. They can inspire us to care for these places in new ways. There are many ways to discover the stories of the places you live. Go for a walk and share experiences with relatives, find a new trail or green space and visit it often to notice changes through time, visit your local library or archives to uncover the stories this land has to tell.

Connect with an Indigenous Elder in the place where you live. Many libraries, and other public institutions have Elders in residence. Take opportunities to sit with an Elder. Connect, listen and express gratitude for the teachings you receive.



# 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.

