UVIC KNOWLEDGE
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SNOWPACK SCIENCE

Prowse at a small lake near Inuvik, NWT.

The interplay of temperature and snow in the mountains has a huge impact on our lives

by Kim Westad

Anyone remember the summer 2006 drought in Tofino? It surprised many people who wondered how a water shortage could happen in a coastal rainforest.

That year, the high-elevation mountain snowpack that coastal British Columbia counts on for much of its water supply melted before the spring due to rising air temperatures, resulting in water shortages in the summer when the demand was greatest.

"It was a clear example of how the temperature on distant mountains can impact the water we may—or may not—have available to use," says Terry Prowse, a University of Victoria geographer and a senior federal research scientist who studies hydrology, water resources and freshwater ecosystems.

A significant amount of freshwater in western Canada and the North originates as snowpack from the Rocky Mountains. Air temperature and precipitation control the amount of snow accumulated and stored in the winter, as well as the timing of its melt.

If the melt happens before the traditional spring period, as has been happening in recent years, it can affect downstream ecology, the economy and even how we live.

At UVic, Prowse heads the Water and Climate Impacts Research Centre (W-CIRC), a joint initiative of the university and the federal Department of Environment and Climate Change Canada. The centre was created in 2002 to conduct hydrological and environmentally based, interdisciplinary research on the impact of climate change on Canadian water resources.

Centre researchers are working with scientists across the country to study snowpacks along the western cordillera, the alpine spine of North America—essentially, the Rockies.

The study is evaluating historical records, identifying trends and determining what climatic conditions have caused them. This information will be plugged into models to predict future consequences on downstream water needs—and evaluate potential long-term adaptation strategies.

"Climate change is going to have profound impacts, and our research will help inform policy-makers on how to deal with them," Prowse says.

Prowse is a lead author of many national and international scientific reports, including assessments conducted for the Arctic Council and the UN Intergovernmental Panel on Climate Change (IPCC).

These reports are written to be "policy-relevant" for governments and decision-makers, he says. "We don't want the science simply staying in a book or a paper. The Canadian public wants to see science going into policy decisions so that we can do something about the effects of climate change in a positive way."

A key part of that science is collaboration. Prowse draws on experts from a variety of disciplines on and off campus to get a more holistic look at the situation.

It's a lesson Prowse drums into his graduate students, who get hands-on experience working on scientific teams in places as far-flung as the high-elevation snow zones of the Okanagan basin, the Mackenzie River delta, and Arctic tundra lakes in northern Sweden.

"A hydrologist or climatologist can each look at the issues in isolation and provide expertise. Have them work together and you get maximum synergies," says Prowse. Add a fisheries ecologist who knows what biophysical changes could happen if river flow keeps dropping and watch the science and impact grow.

"We're building on our strengths by working together. That's the fun part."

EDGEWISE

Approximately 33 per cent of precipitation in Canada originates as snow and is a primary source of Canadian water supplies.

Snow in the mountains of western Canada and the western US contributes more than 80 per cent of water to streams in the Canadian Prairies and western US.

Steadily warming temperatures due to climate change have caused a 20 per cent decline in spring snow cover throughout the Rockies since 1980.

Less winter precipitation and earlier snowmelt will become the norm in a warmer world, scientists predict. Also, a shift in peak runoff from summer/fall to late winter/early spring will have huge impacts downstream on ecosystems, and agricultural and municipal water use.

Terry Prowse was one of several UVic-based climate scientists who shared the 2007 Nobel Peace Prize for their work with the IPCC in alerting the world to human-induced climate change and its consequences. Prowse is considered a world expert on hydrology in polar regions.

UVic is a Canadian leader in climate change research, enhanced by the presence on campus of W-CIRC and the Canadian Centre for Climate Modelling and Analysis (CCCma), Canada's flagship laboratory for climate modelling. Climate researchers from UVic and both federal centres jointly analyze data, collaborate on student training and co-author research publications.

Meet Terry Prowse at *bit.ly/uvic-prowse*