

Agriculture & Environment

Environmental Innovation Program

WATER INNOVATION

FUNDING DETAILS

Cumulative effects of climate, landcover & snowpack trends on Alberta's Eastern Slopes water resources

The project nurtures multi-stakeholder partnerships to develop innovative data and technology workflows to better understand, monitor, disseminate and educate on historical, current, and future conditions of Alberta's Eastern Slopes vegetation and snowpack resources. Using satellite imaging and airborne lidar in combination with in-situ hydro-meteorological station data, hydro-climatic models and online game engine technology, the team of researchers will tackle discrete but inter-related objectives that follow a logical hierarchy from observation-based knowledge creation to simulation-based prediction to immersive digital twin environmental construction to public education and outreach.

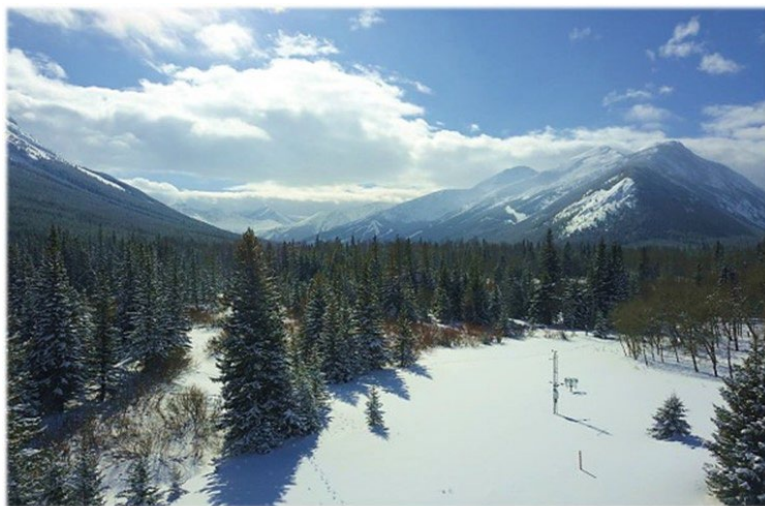


Figure 1. Sound environmental management and protection of Alberta's Eastern Slopes are critical to sustaining the province's water resources. Photo credit: Thomas Porter



RECIPIENT:

University of
Lethbridge, Dr.
Chris Hopkinson



PROJECT DATES:

JAN 2022 – DEC
2026



TOTAL BUDGET:

\$ 1,728,000



PARTNERS:

University of
Waterloo, MacHydro
Consultants, Alberta
Environment and
Protected Areas,
Parks Canada, Fluid
Planet Inc, Inside
Education



AI FUNDING:

\$ 695,000

APPLICATION

Advanced monitoring systems, models and simulation tools will enhance our understanding of the cumulative effects of climate, landcover & snowpack trends on Alberta's Eastern Slopes of the Canadian Rockies (ESCR) water resources. This supports improved current and future public land and water resource management in Alberta's ESCR.



ALBERTA INNOVATES

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PROJECT GOALS

The main project objectives are to:

- Develop time series datasets from multiple sources to map forest and wetland vegetation phenology, vegetation changes, and glacial change along the Eastern Slopes of the Canadian Rockies (ESCR)
- Ascertain trends in snowpack quantities and persistence across the ESCR and infer regional scale vegetation – snowpack feedbacks. Modeling using landcover and snow cover data, the project will improve on the ability to derive peak and seasonal discharge volumes.
- Identify shifts in water balance and peak flow timing linked to landcover change, teleconnection patterns or long-term hydro-climatic trends.
- Develop immersive digital twins to deliver multimedia-based visual systems and knowledge that supports environmental education on the role the ESCR and how these environments are changing due to natural and anthropogenic pressures.



8 publications



7 HQPs trained



3 policies /
practices
influenced



Multiple
knowledge
mobilization events

BENEFITS TO ALBERTA

The main project outcomes / impacts will be:

- understand landscape change and succession processes to support National and Alberta Eastern Slopes of the Canadian Rockies (ESCR) land and water management, fire and pest risk assessments, and public outreach.
- understand ESCR snowpack trends and controls to embedded into water resources and flood hazard forecasting models
- handling gradual and episodic land cover dynamics in the Raven hydrological model to improve forecasting and scenario-testing across the ESCR. Enhancements to produce improved reservoir inflow forecasting, flood forecasting, and water management modelling.
- operational snow cover and SWE monitoring, modeling and mapping framework to support forecasting and as input to water resource and hazard forecasting models used by Alberta's public sector.
- high tech innovative digital resources to make public education on source-water features, changes and protection more accessible.

CURRENT STATUS

Jun 2024 – In progress

Multiple team meetings held. HQPs currently active on: snow – vegetation feedbacks (1 PhD + 1 MSc), forest and wetland changes (1 PhD, 1 MSc), snowpack lidar sampling / modeling (1 complete PhD – now PDF). Snowpack research commenced in 2023. Fluid Planet & Inside Education developed and implemented lidar digital twins for high school education & public outreach. UWaterloo & ULeth have made progress on snowpack modeling procedures in Raven.

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