

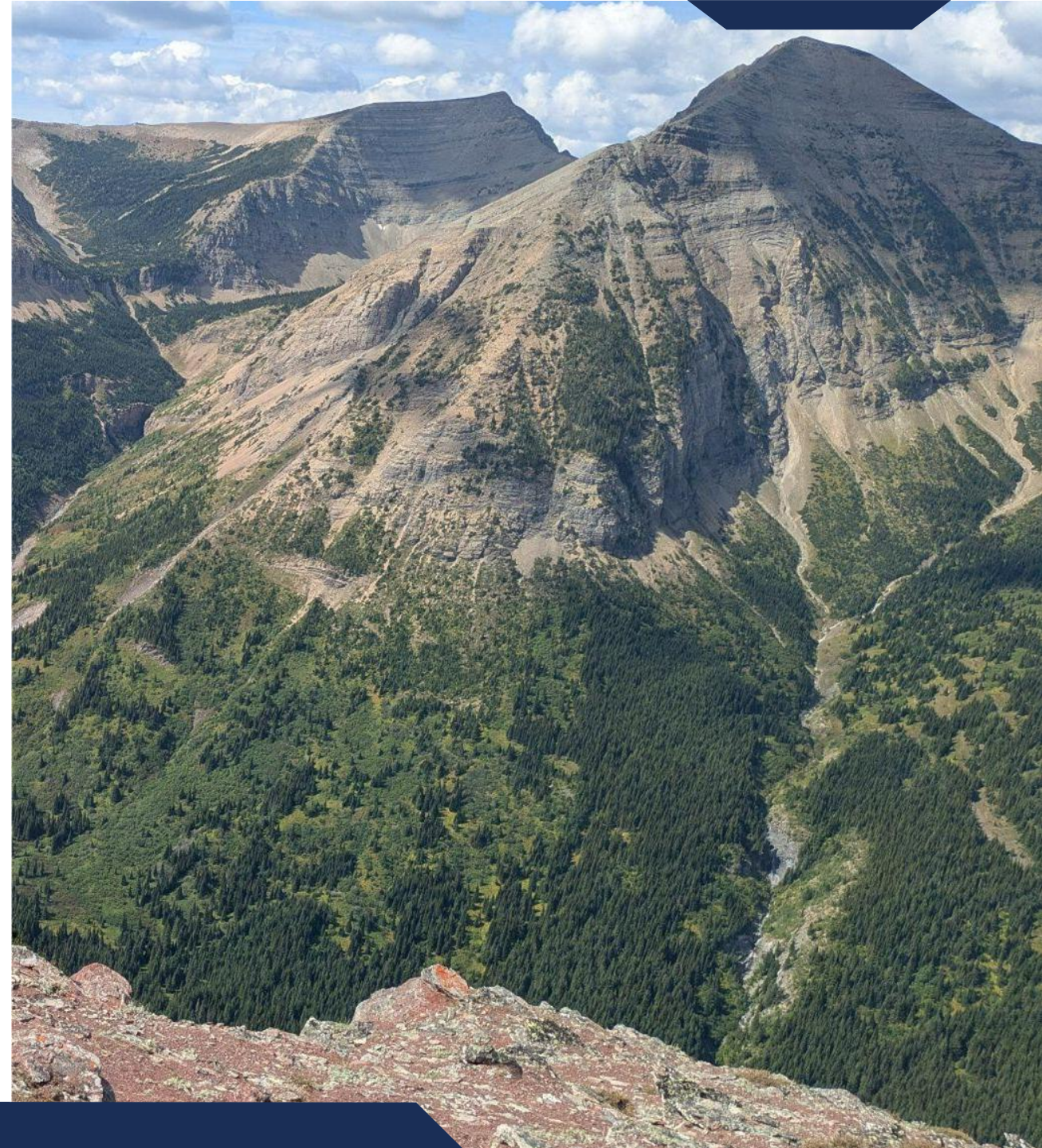


Establishing the Southern Alberta Mountain Observatory (SAMO)

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Westwood

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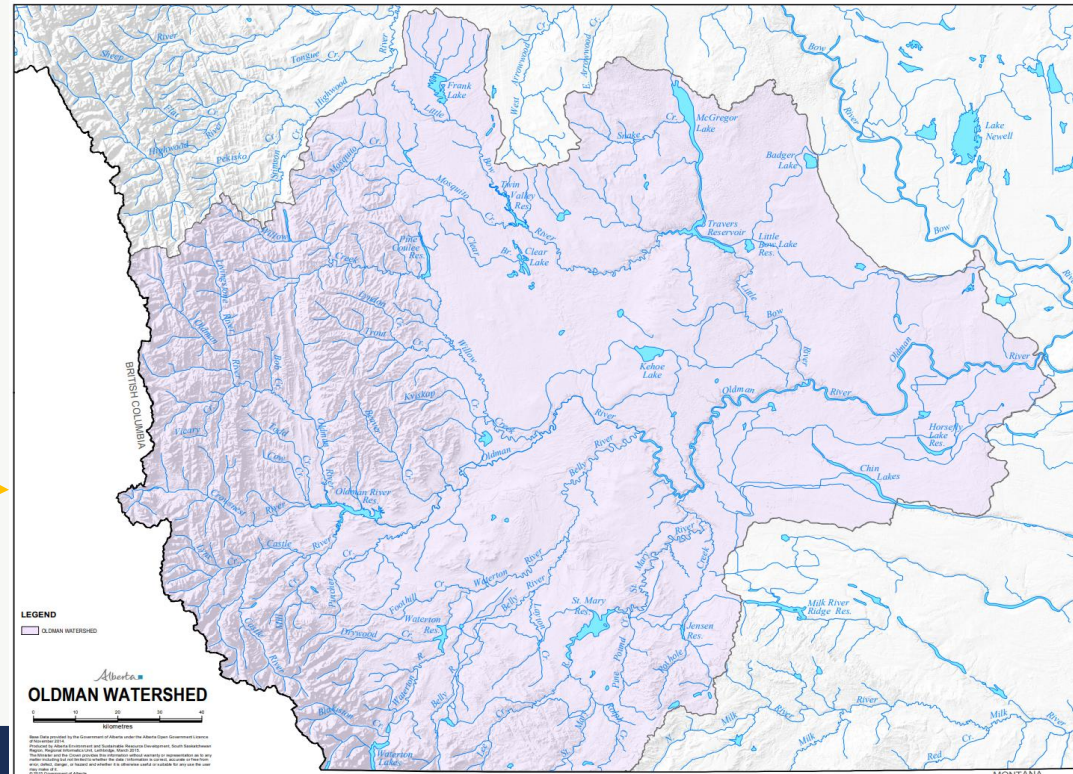
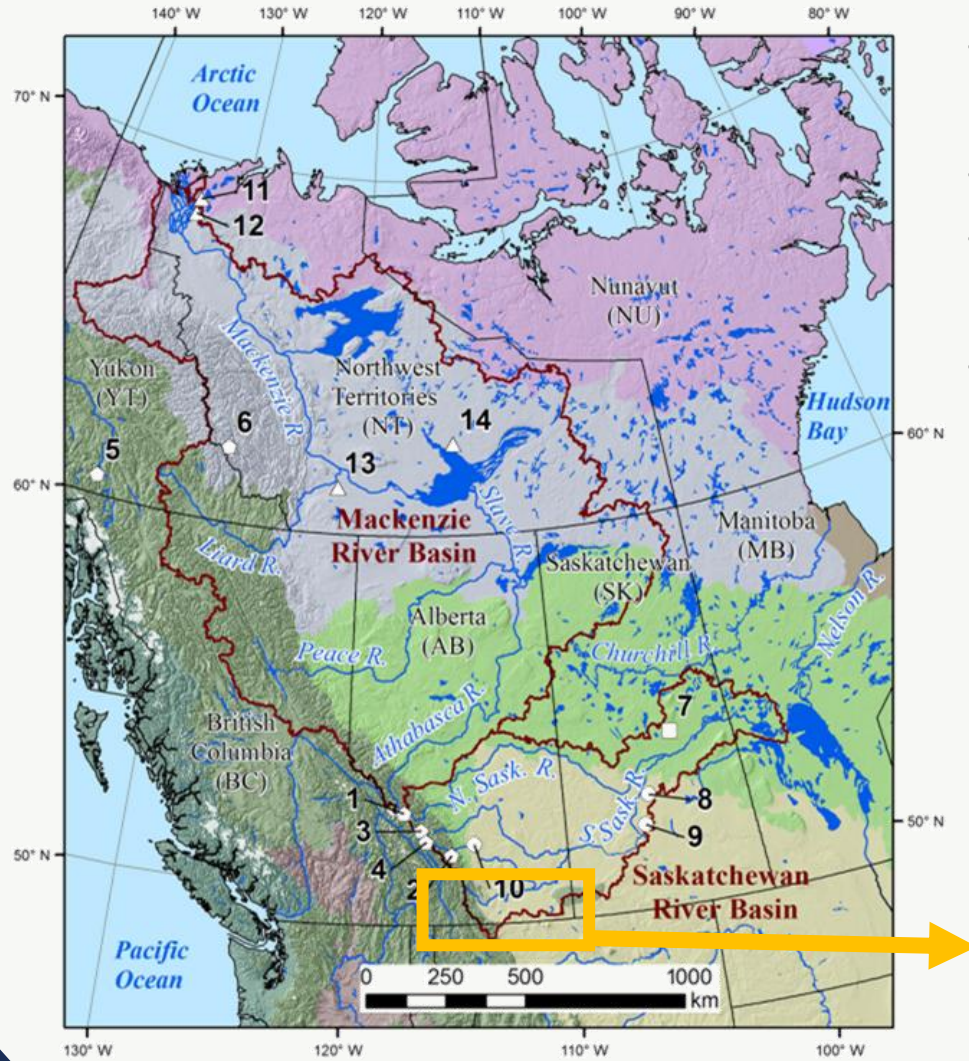
INARCH Meeting, Sept. 8, 2026, Kananaskis





Southern Alberta/Oldman Watershed

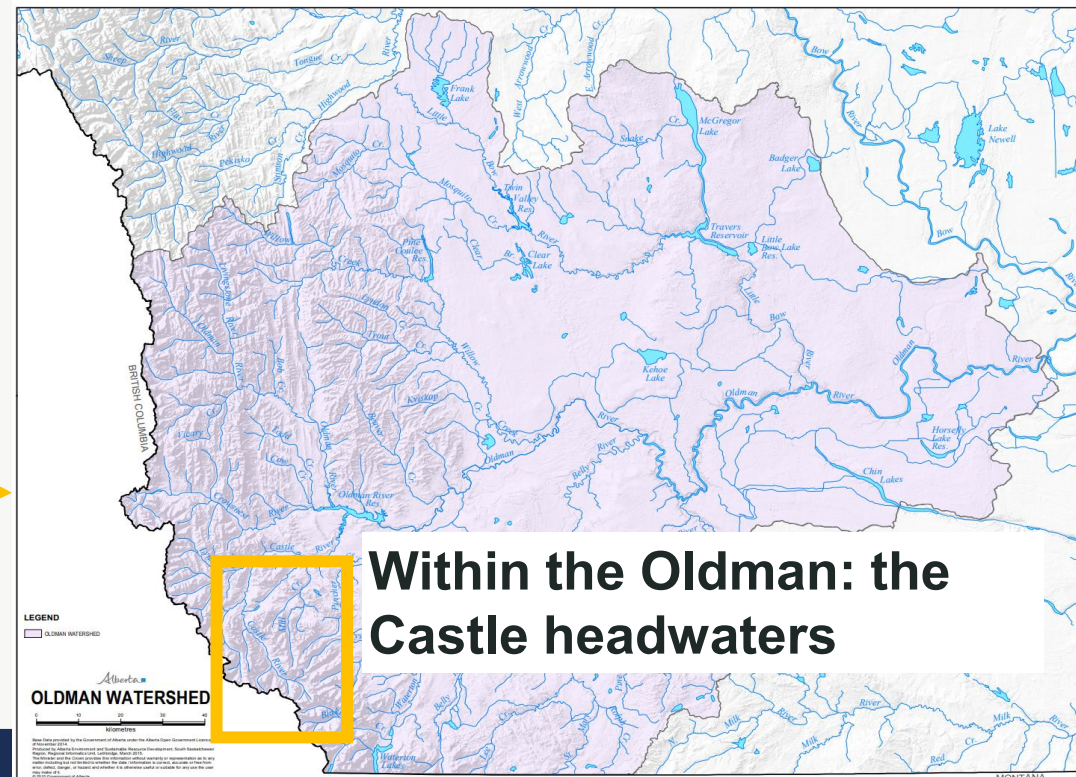
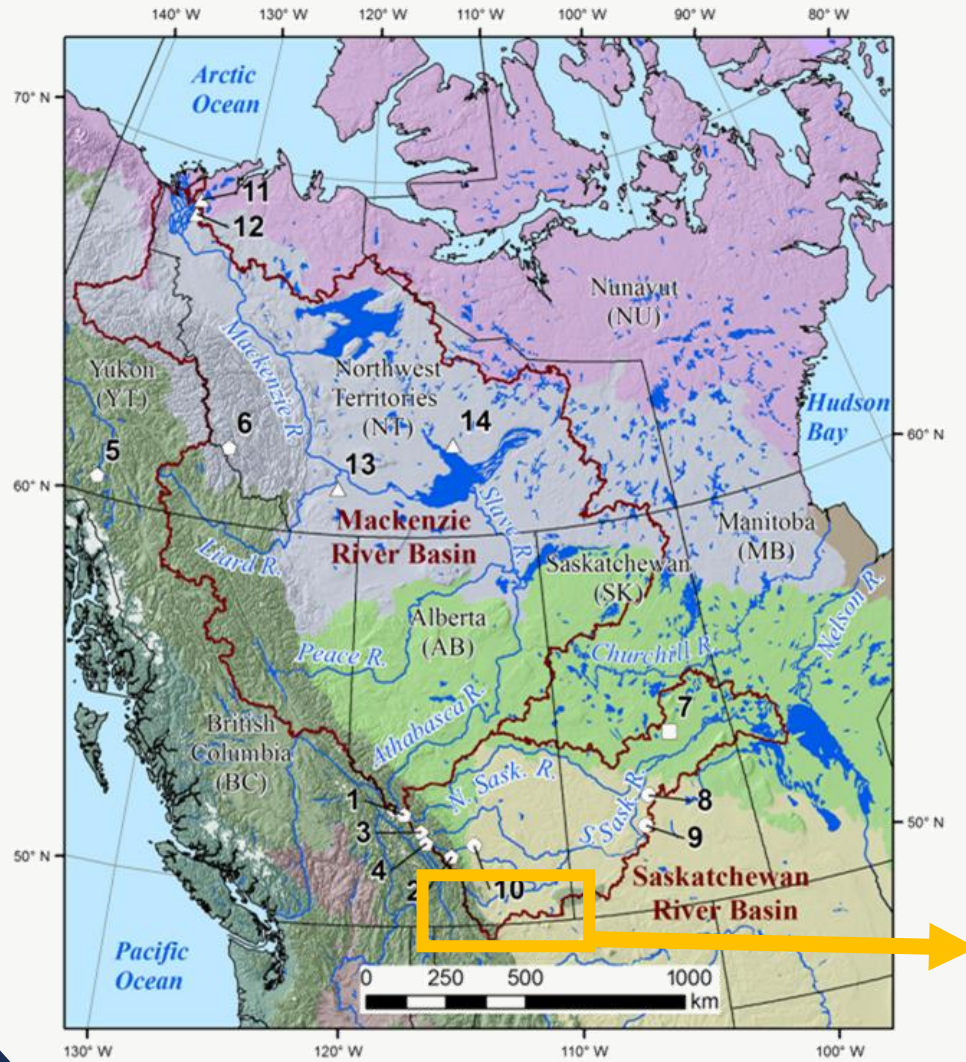
- One of Canada's most intensively irrigated agricultural regions around Lethbridge.
- Heavily snow-fed watershed
- 83.5% of Oldman sub-basin allocations are for irrigation (2023).
- Worsening drought risks in a changing climate





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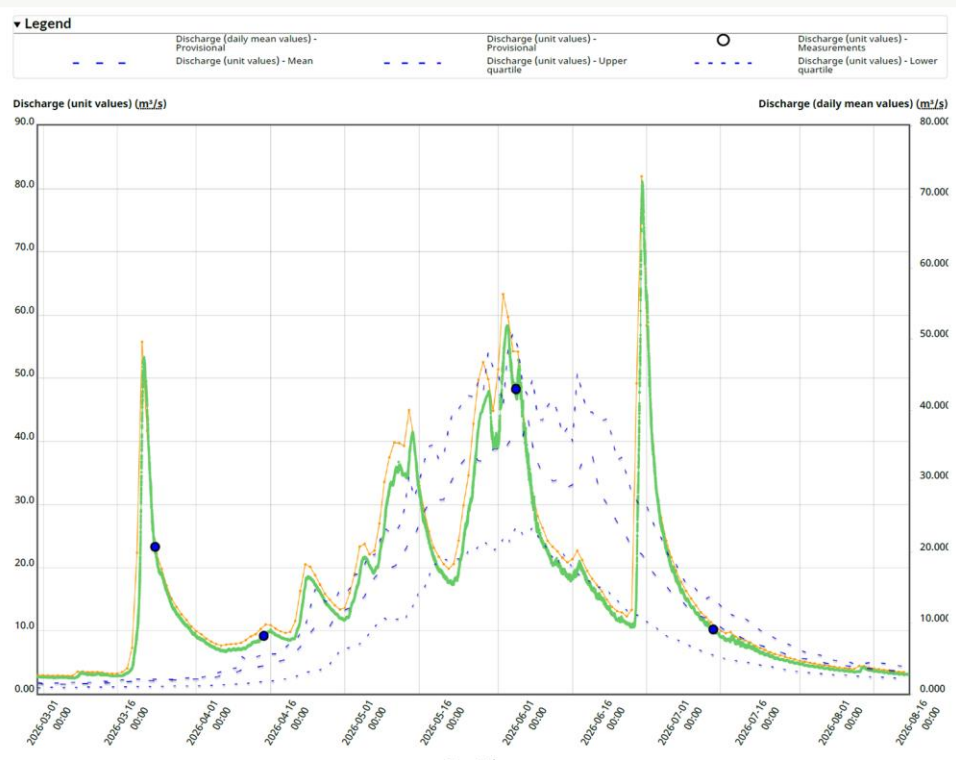


Operational monitoring exists, but high-elevation process observations remain limited

Water Survey of Canada

Castle River at Ranger Station

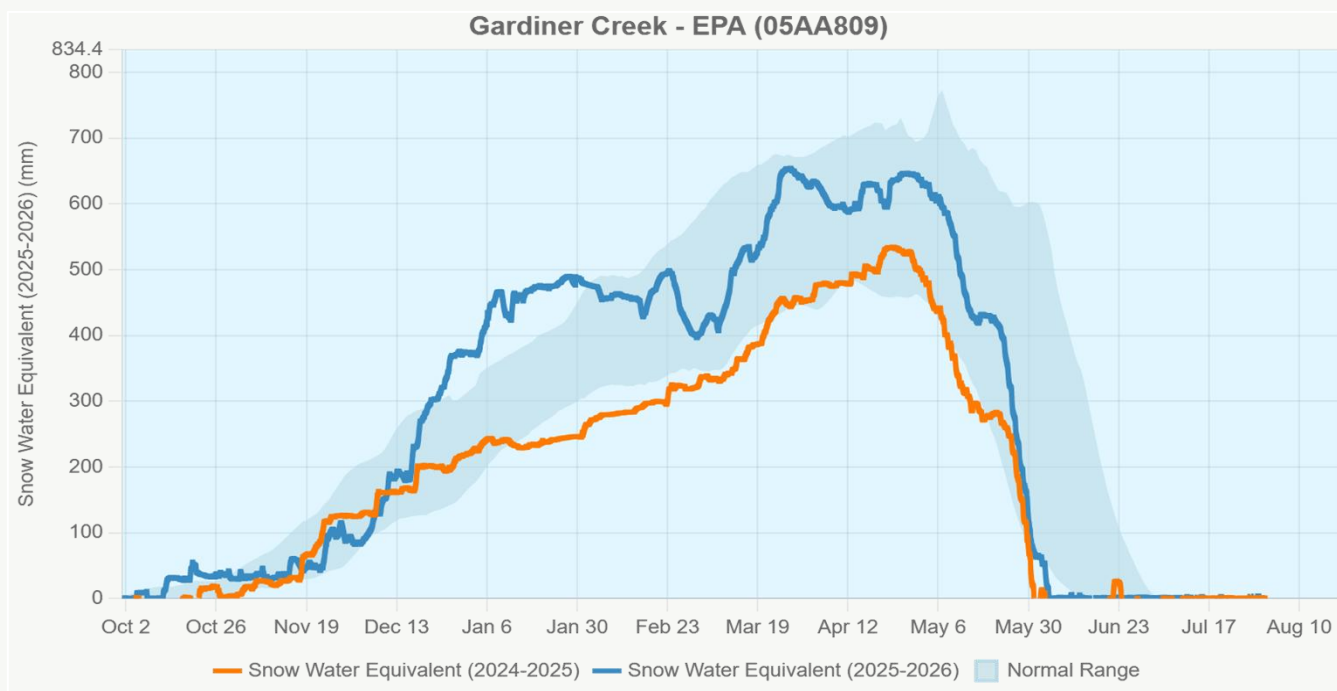
374 km² drainage area • record 1967–2026



Alberta snow monitoring

Gardiner Creek snow pillow

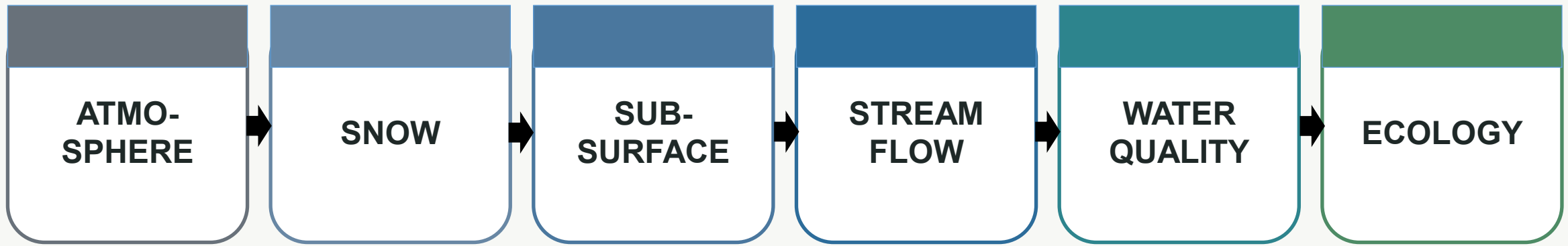
~1,970 m elevation • record since 1986





The Southern Alberta Mountain Observatory (SAMO)

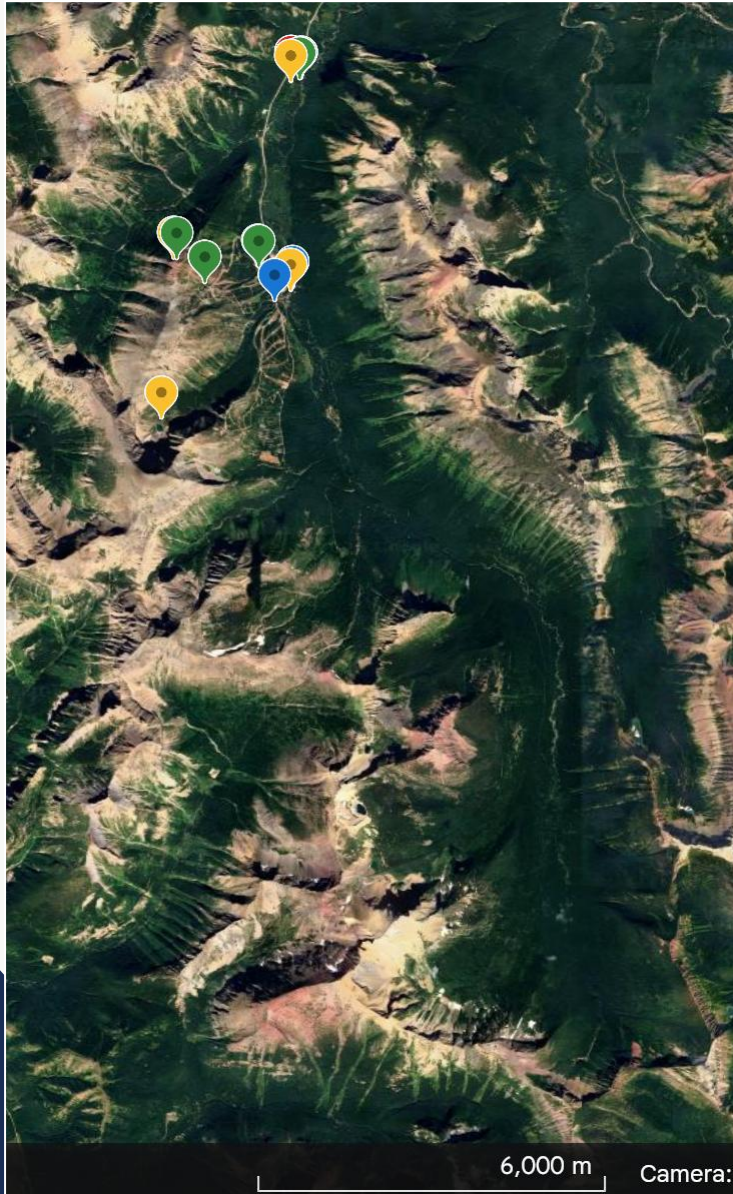
Integrating mountain observations across disciplines to advance water security in Southern Alberta.



Across elevation: valley floor → mid-mountain → ridge / alpine



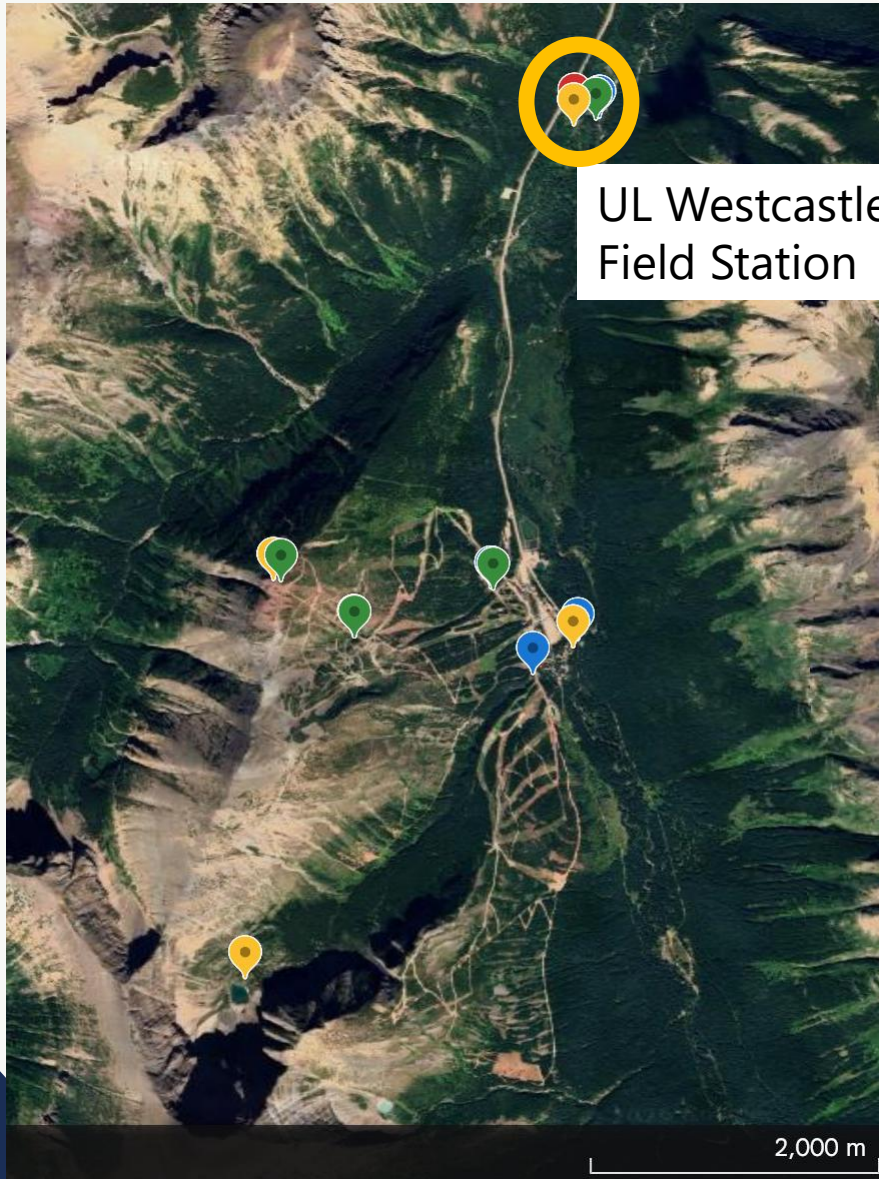
SAMO in the Castle River Headwaters



- 87 km² basin
- ~1,400–2,300 m elevation range
- Annual snowfall: ~4.7 m at 1,410 m and ~7.4 m at 2,040 m
- Winter temperatures are highly variable, with frequent Chinook (mid winter melt) events
- Substantial snow redistribution at exposed alpine sites.



Castle headwaters: Established infrastructure and partnership

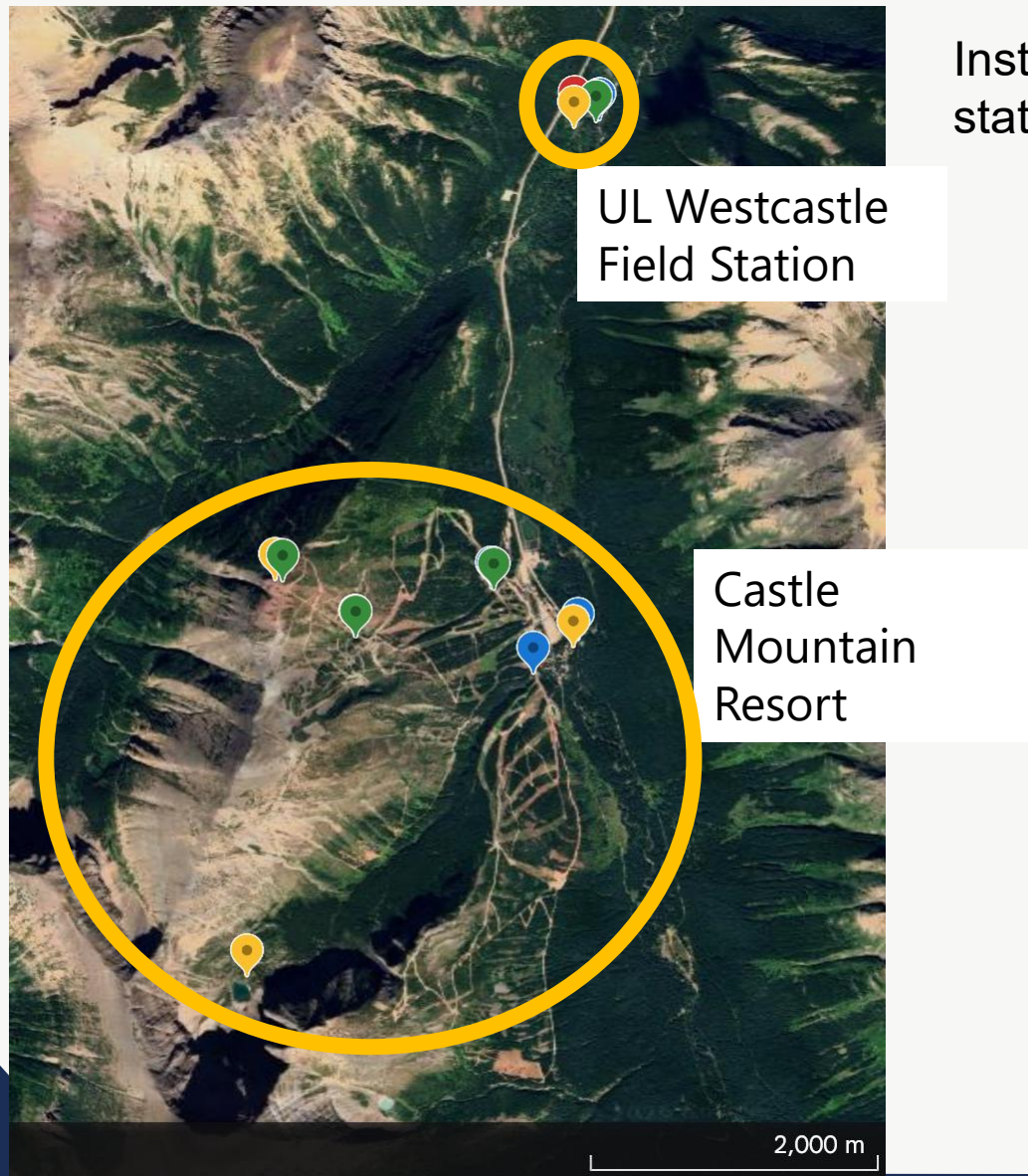


Instrumentation centered on University of Lethbridge field station





Castle headwaters: Established infrastructure and partnership

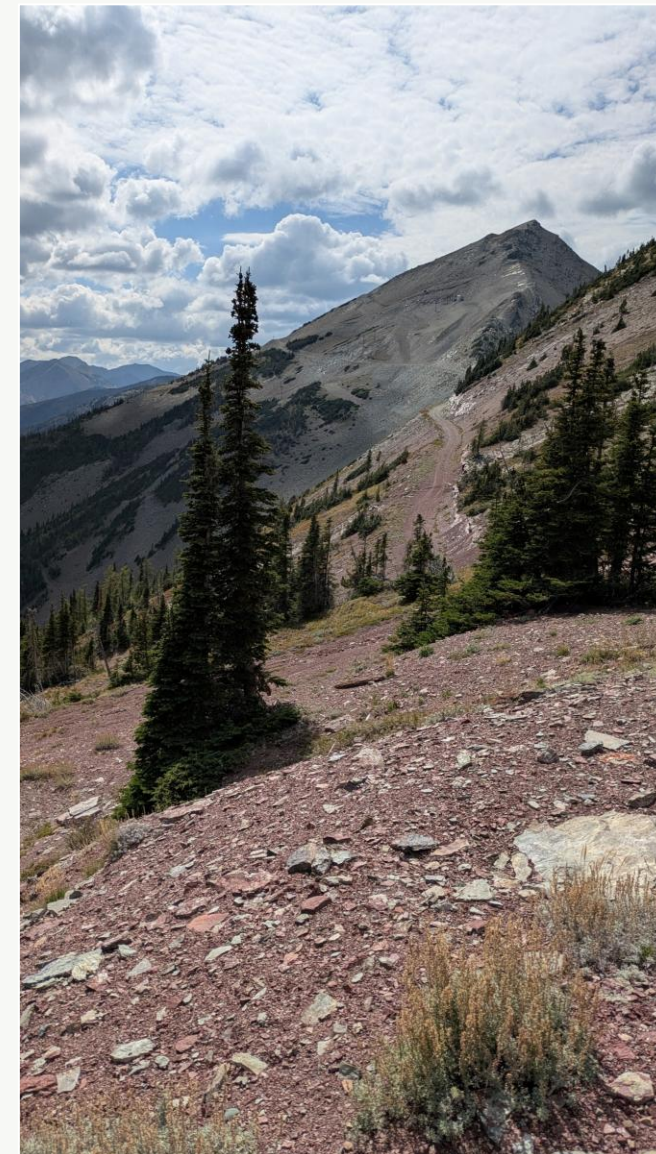
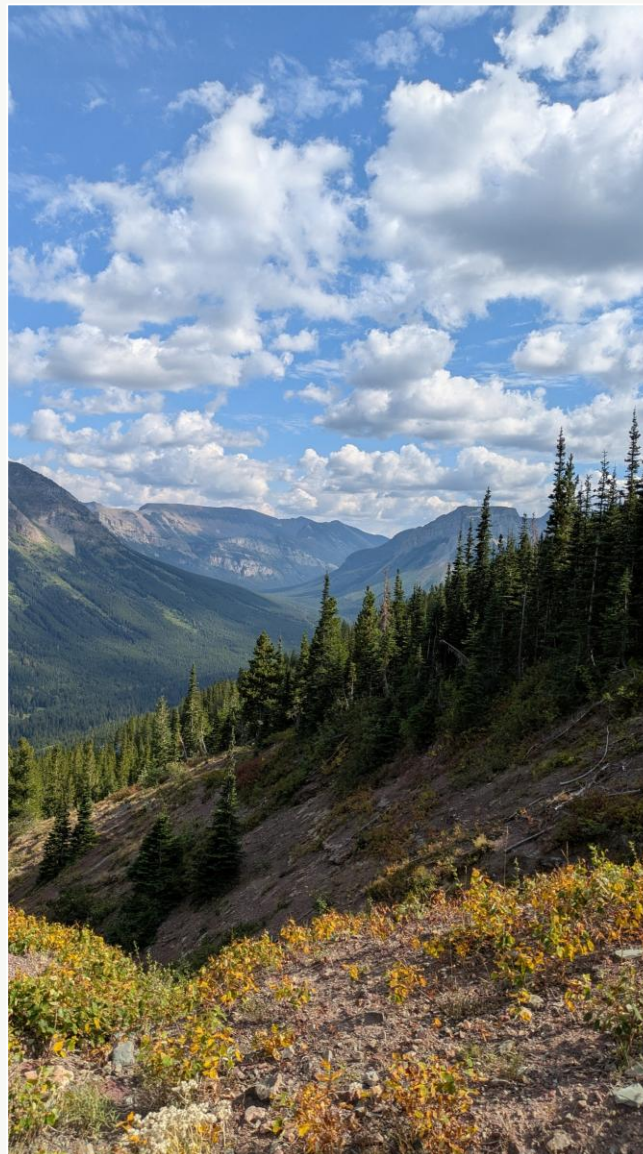
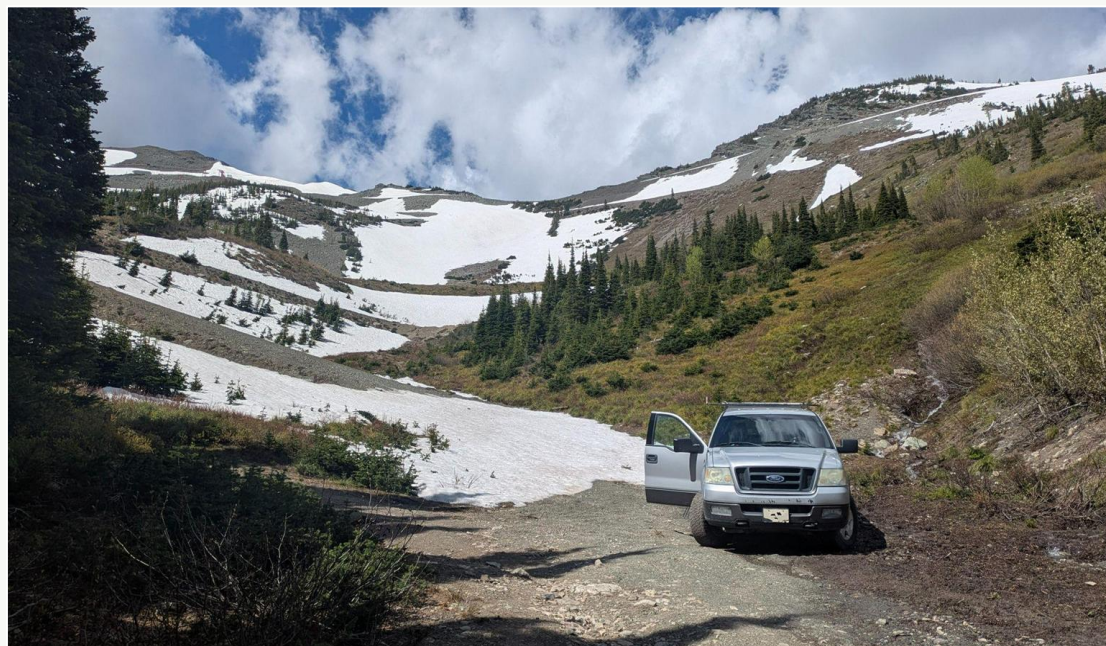


Instrumentation centered on University of Lethbridge field station and Castle Mountain Resort



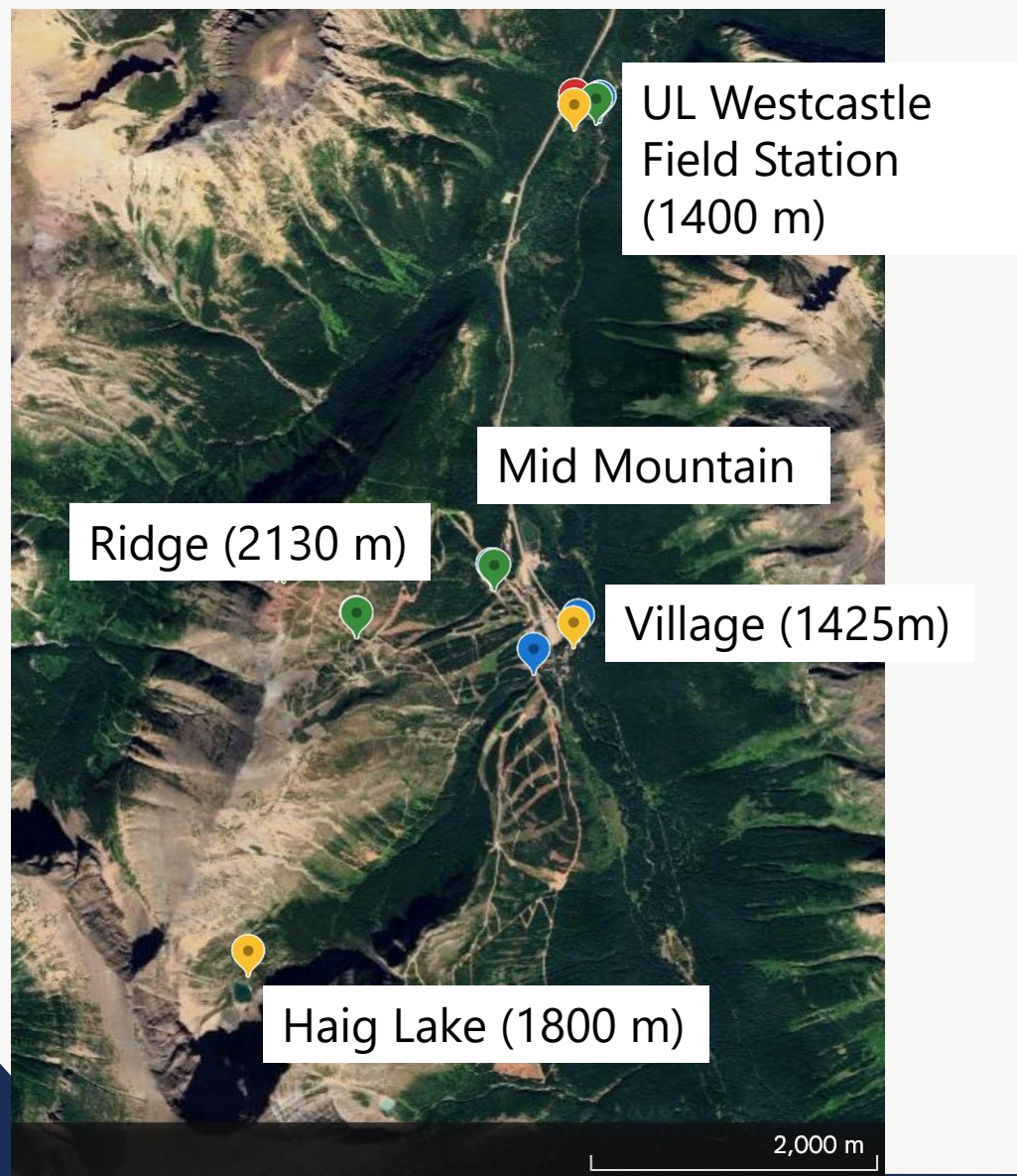


Accessible alpine field sites in complex topography across steep elevation gradient





AWS: Three legacy + one new + one defunct/projected



UL Westcastle Field Station (1400 m)

Legacy AWS established ~2013



Ridge (2130 m)



Legacy data: archived subset, broader record in progress

A subset of the legacy weather record is already archived and citable.

Hopkinson & Barnes (2022)

Total precipitation gauge and supplemental weather-station data for three Oldman River headwater locations in SW Alberta

FRDR • DOI: 10.20383/102.0551

Broader West Castle records are being consolidated, documented and prepared for reuse.

```
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```

Precipitation gauge and supplemental weather station data for three Oldman River headwater locations in SW Alberta

Contact Dataset Administrator

Description: Geonor totalising precipitation gauge and supporting meteorological variable data collected by the University of Lethbridge, ARTeMiS Laboratory for the 2018 to 2021 hydrological years are provided for three valley to ridge weather stations in headwater locations of the Canadian Rockies in SW Alberta.

Notes: Item exited embargo and became publicly available on 2022-06-09

Authors: Hopkinson, Christopher D.; University of Lethbridge; [ORCID: 0000-0002-3998-4778](#)
Barnes, Celeste; University of Lethbridge; [ORCID: 0000-0001-6638-0059](#)

Keywords: Geonor
Precipitation
Quality Control
Canadian Rockies
Waterton
Castle



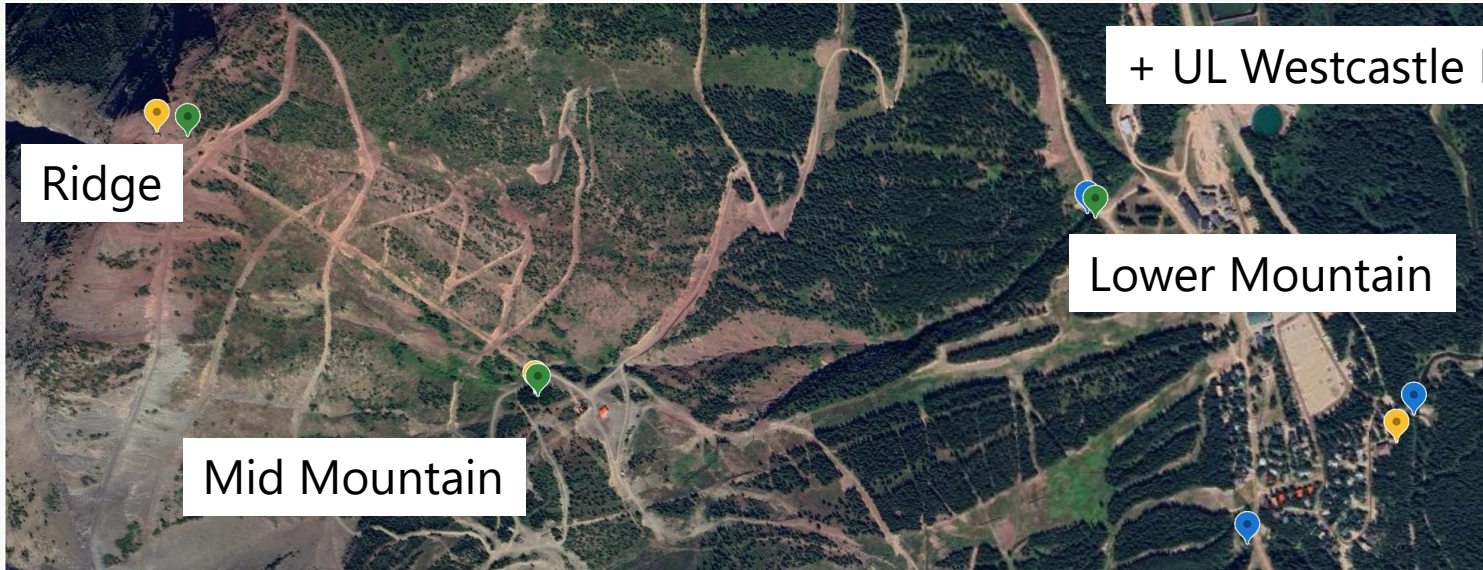
New AWS: At Haig Lake, head of undisturbed sub-watershed

- ATV access to the lake site (~4 km; ~400 m elevation gain)
- Co-located with near-lake water-quality sensing





Subsurface monitoring



Four sites across the elevation gradient measure:

- Infiltration timing (volume?)
- Soil moisture
- Air temperature
- Shallow groundwater response (2/4)

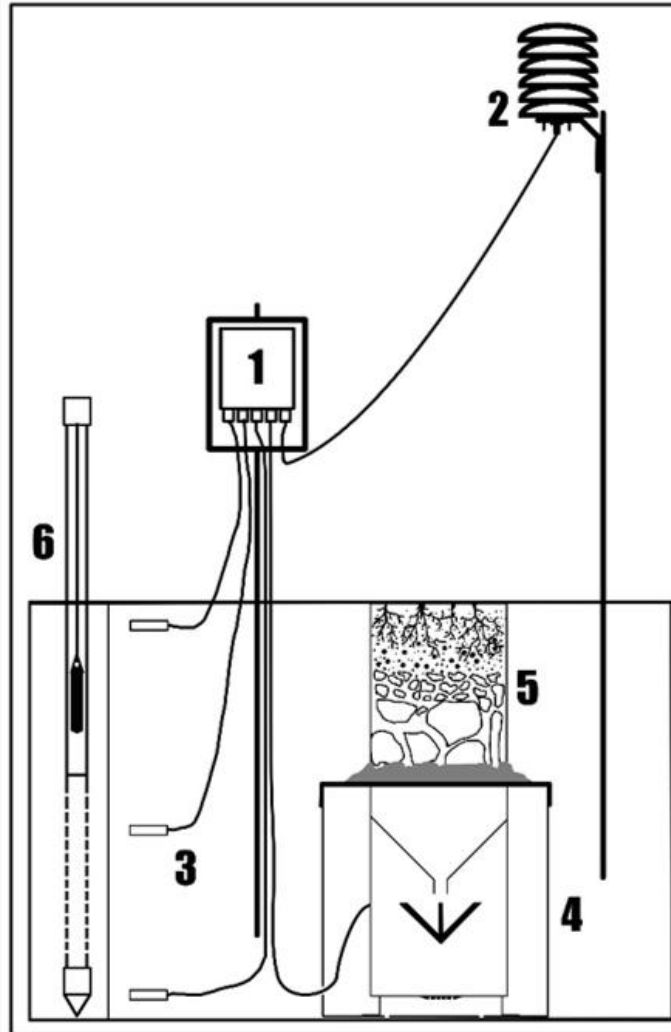




Subsurface: shallow storage

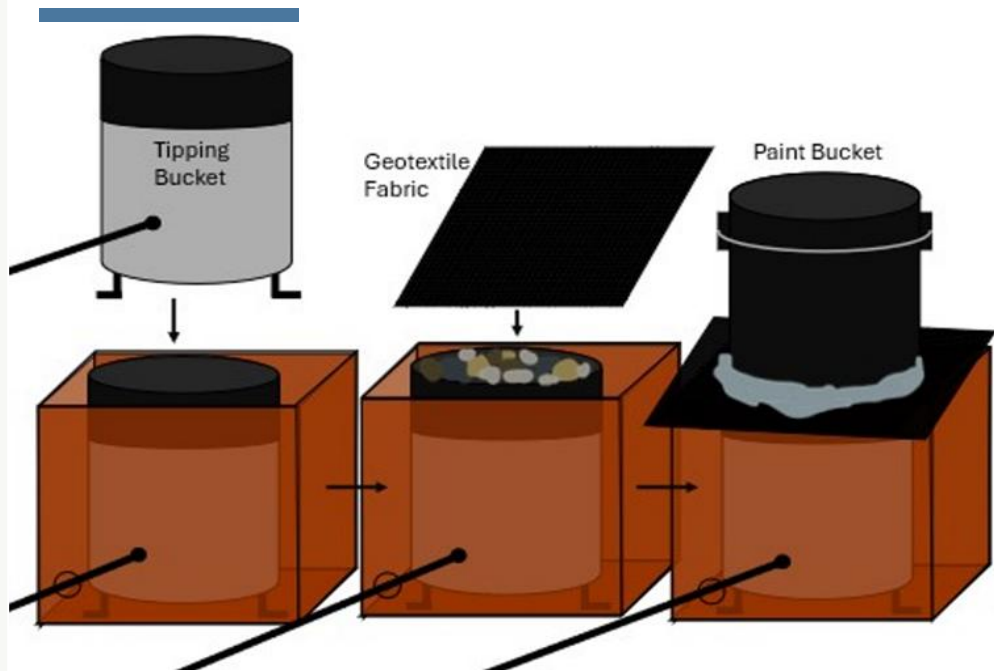
Key questions

- Where does meltwater go after it leaves the snowpack?
- How does shallow subsurface storage connect snowmelt to streamflow?

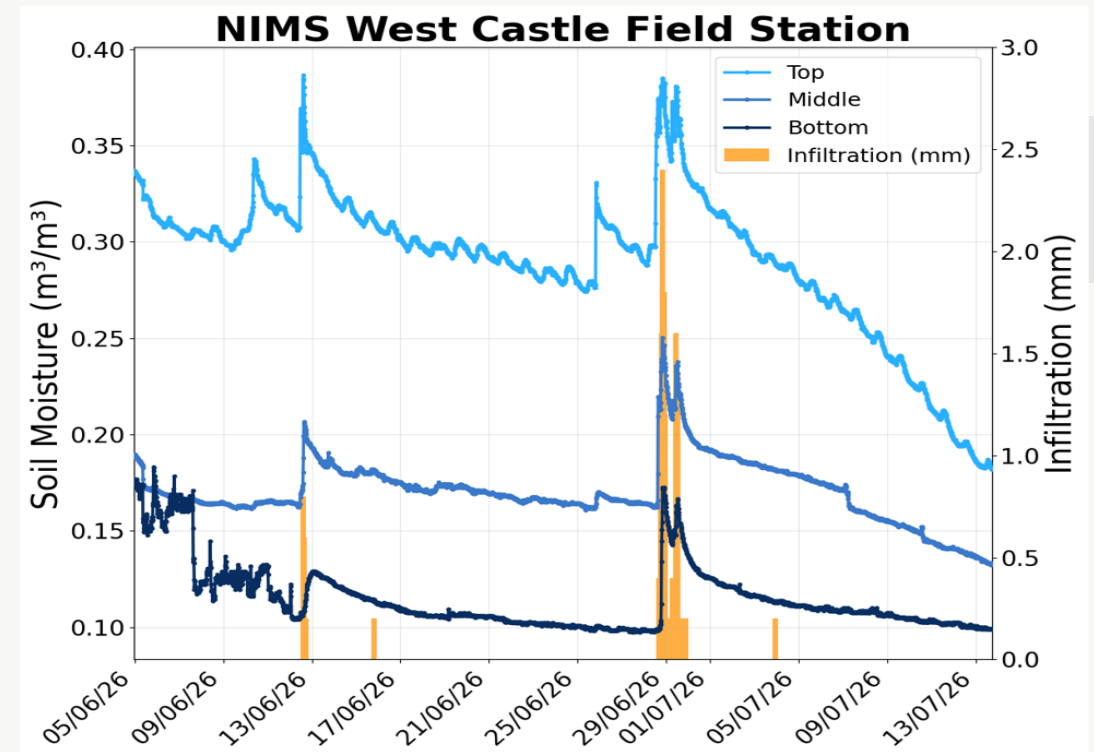




Field experiment: infiltration measurements



Preliminary summer data indicate it might work, but we will have to wait until next summer to know





Shallow groundwater wells

Installed so far:

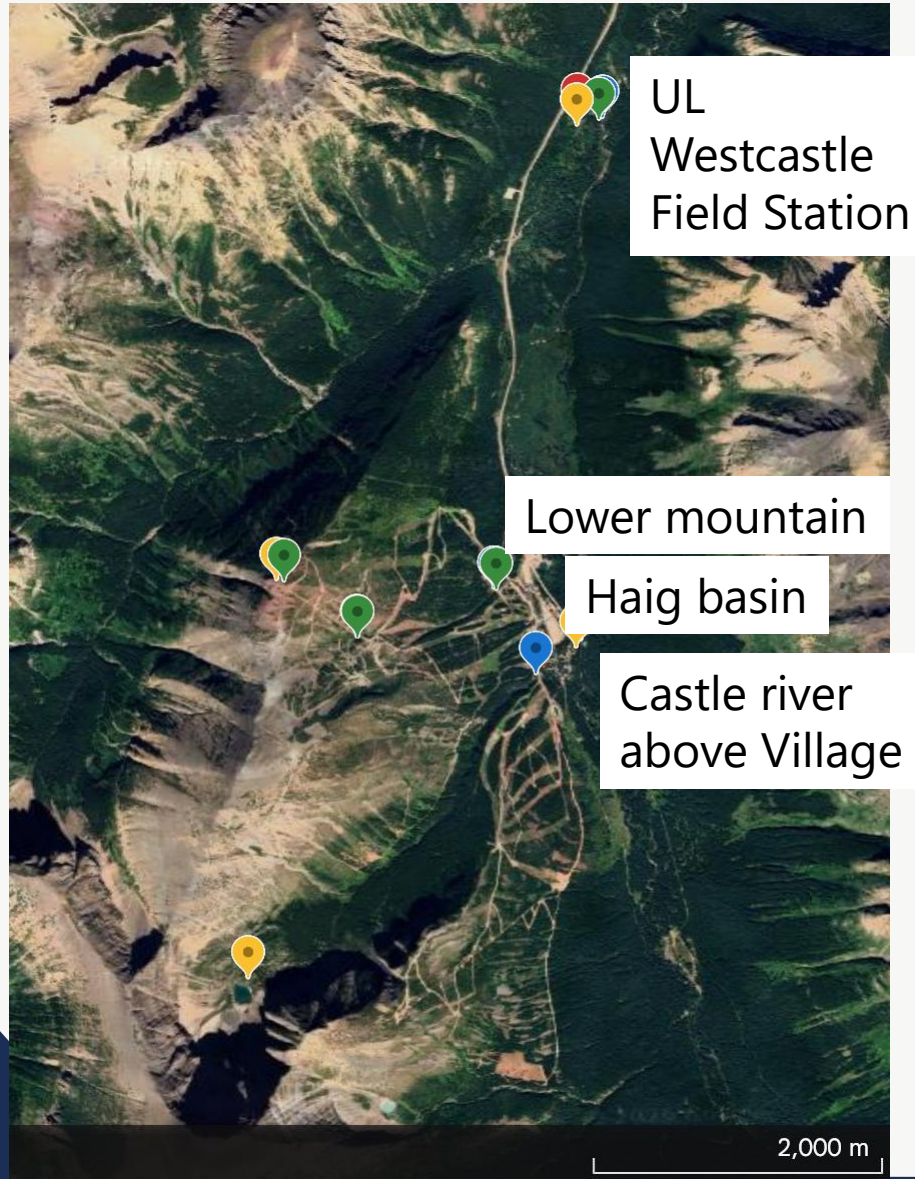
- Valley-bottom well at WFS: ~4.5 m
- Mid-mountain well: ~1.5 m

One additional site is planned before winter.





Stream gauging: Four nested basins



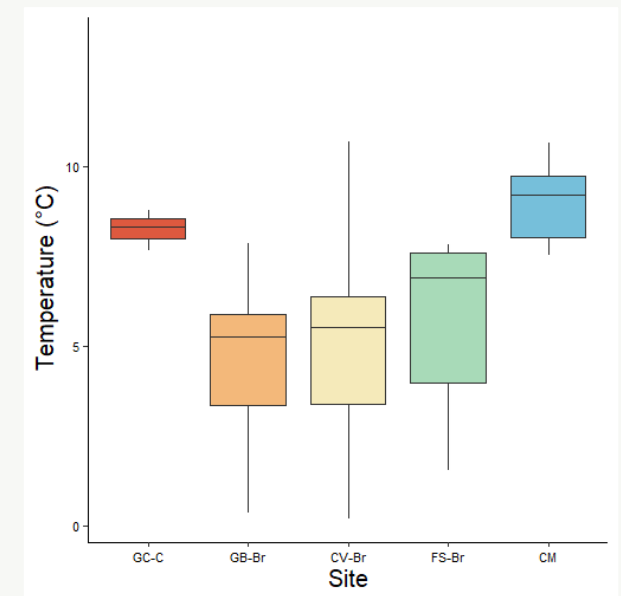
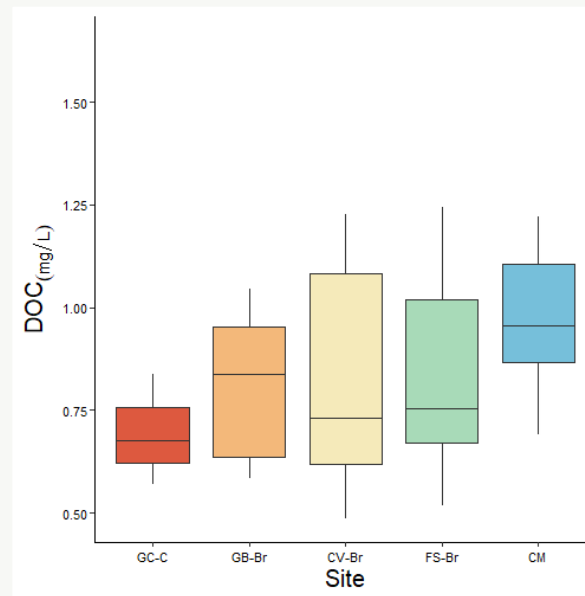
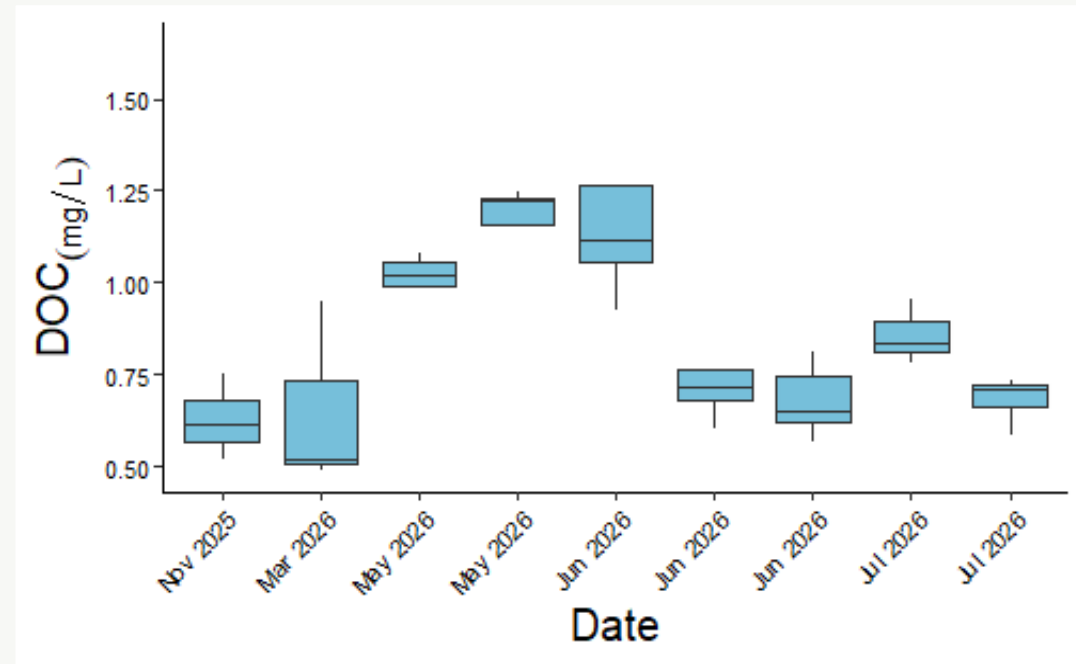
- Castle River at Ranger Station (WSC): 374 km²
- West Castle Field Station: 87 km²
- West Castle River above Village: 73 km²
- Haig Creek: 4.4 km²
- Lower mountain: ~1 km²





Water quality

- DOM quantity and composition
- pH and water temperature
- Interpretation alongside discharge and groundwater response





A team effort: research groups, partners and users



- Bogard Aquatic Biochemistry Lab
- Chris Hopkinson/Artemis Lab
- Castle Mountain Resort staff

SAMO in a nutshell

Key (hydrology) science questions

- How does snowmelt move through the catchment?
- When and where does subsurface storage sustain streamflow?
- How does a warmer, more event-driven snowpack change melt timing and runoff pathways?

SAMO as a research platform

- ~1.5 h from U of L, with resort access and field station.
- A field testbed for new measurements, process studies, and model development
- Hands-on training for students, with opportunities for cross-disciplinary research across mountain systems.

