

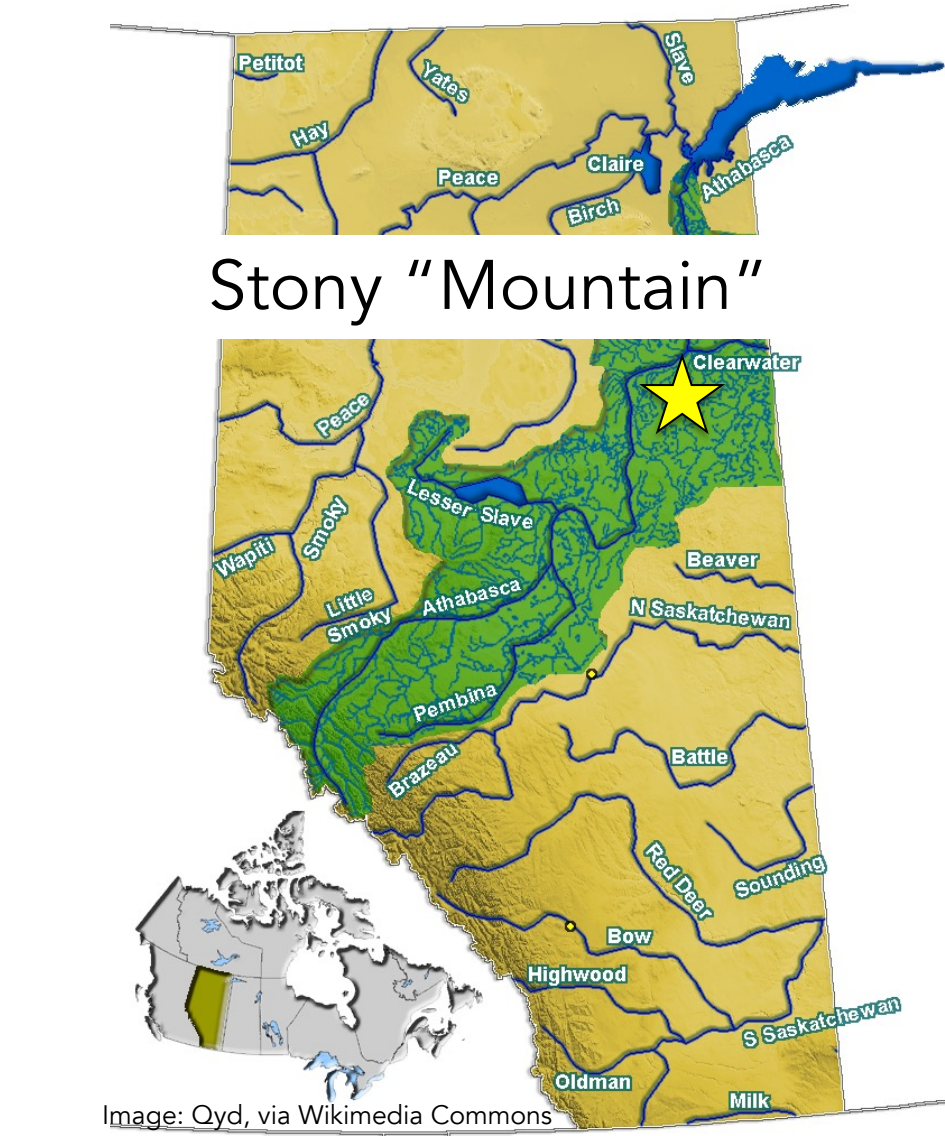
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Context

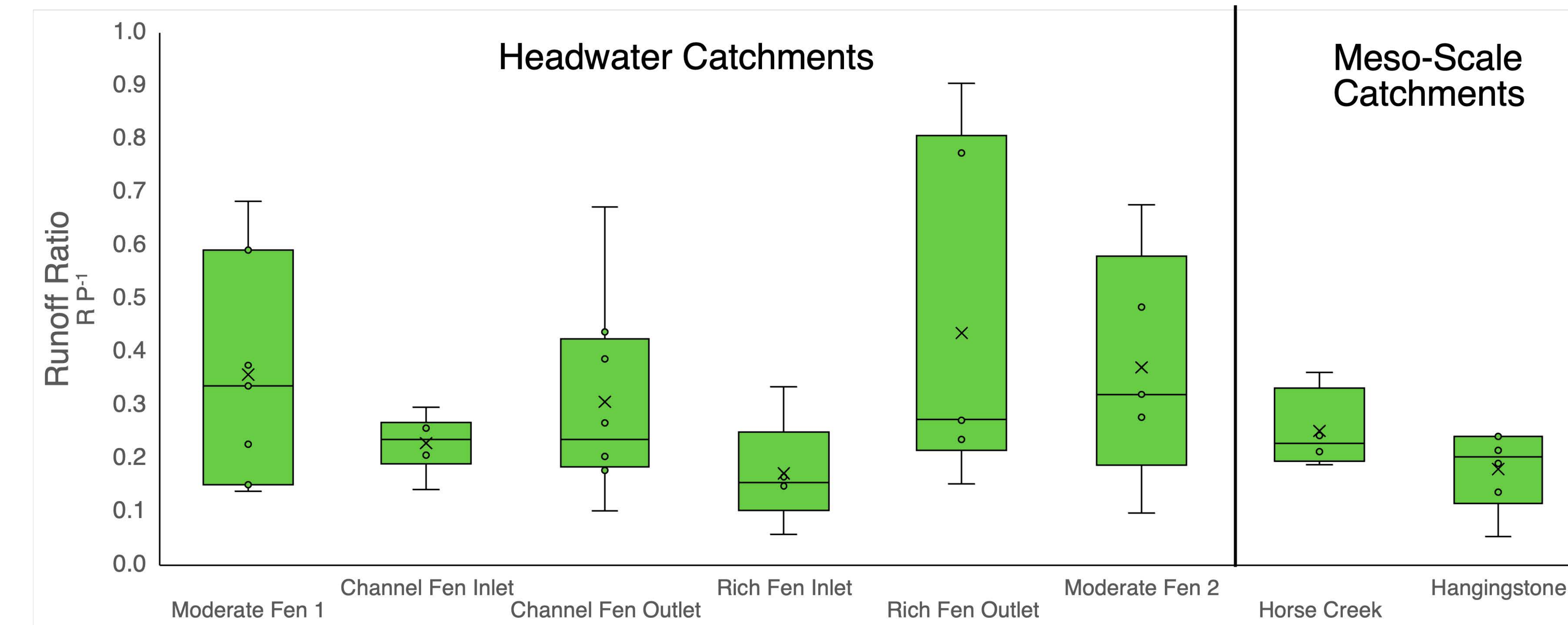
- Wetlands (mostly peatlands) cover up to 50% of the landscape within the Western Boreal Plain
 - Play an important ecological and hydrological role
- Regional sub-humid (dry) climate
- Variable but typically low catchment runoff and efficiencies



The Athabasca River Basin

- Drains vast areas of Canada's Boreal Plain
- Volumetric flow increases, yet less productive (per-area basis) in the mid-to-low reaches
- Understanding processes controlling water movement that ultimately contributes to streamflow is very important

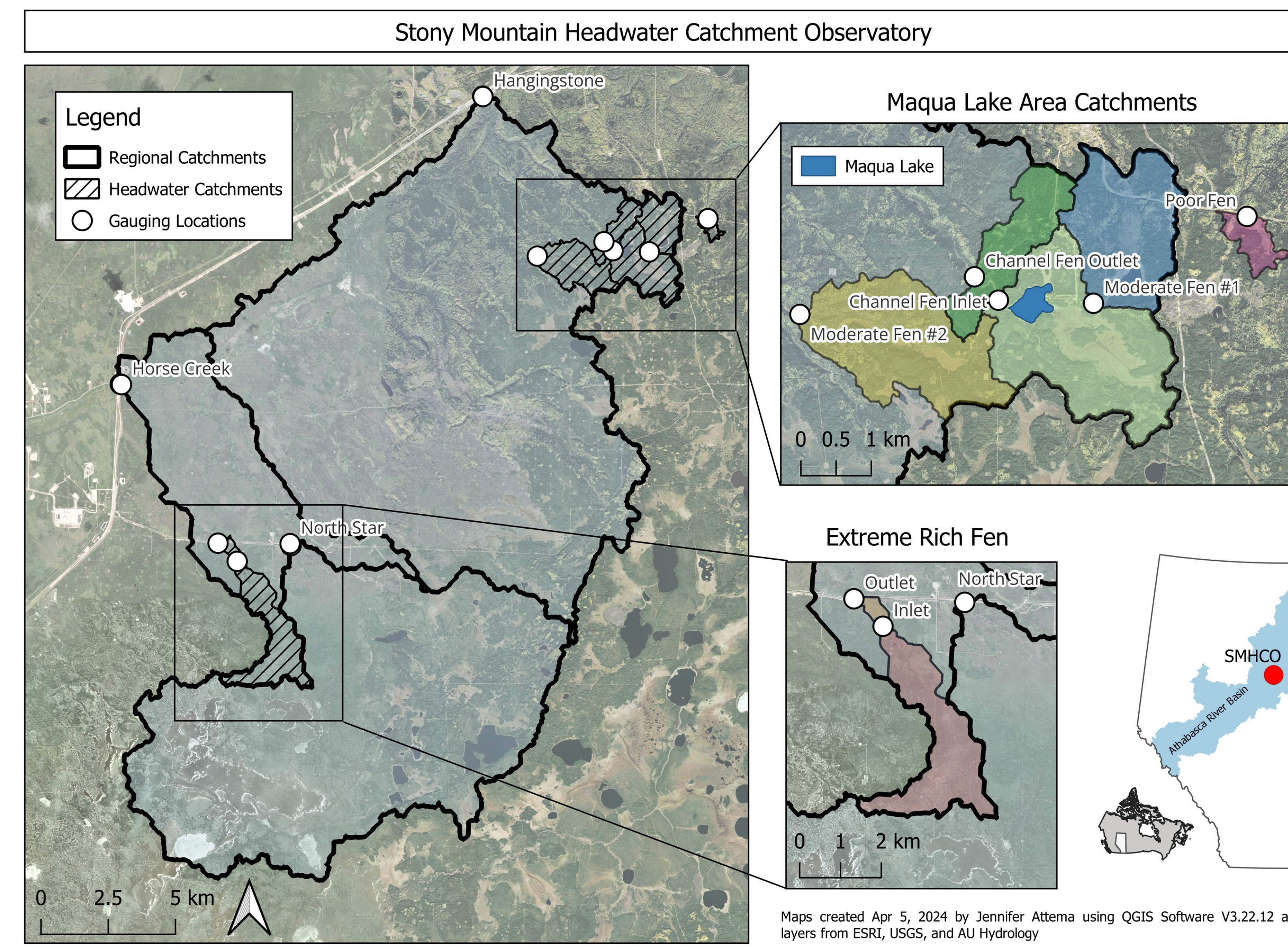
KEY MESSAGE: Headwater catchments have higher runoff efficiencies & are important regions for water supply



- Runoff generation highly variable, both among catchments and with time
 - Headwater runoff ratio: 0.9 to 0.1; Average: 0.32
 - Meso-Scale runoff ratio: 0.36 to 0.1; Average: 0.21

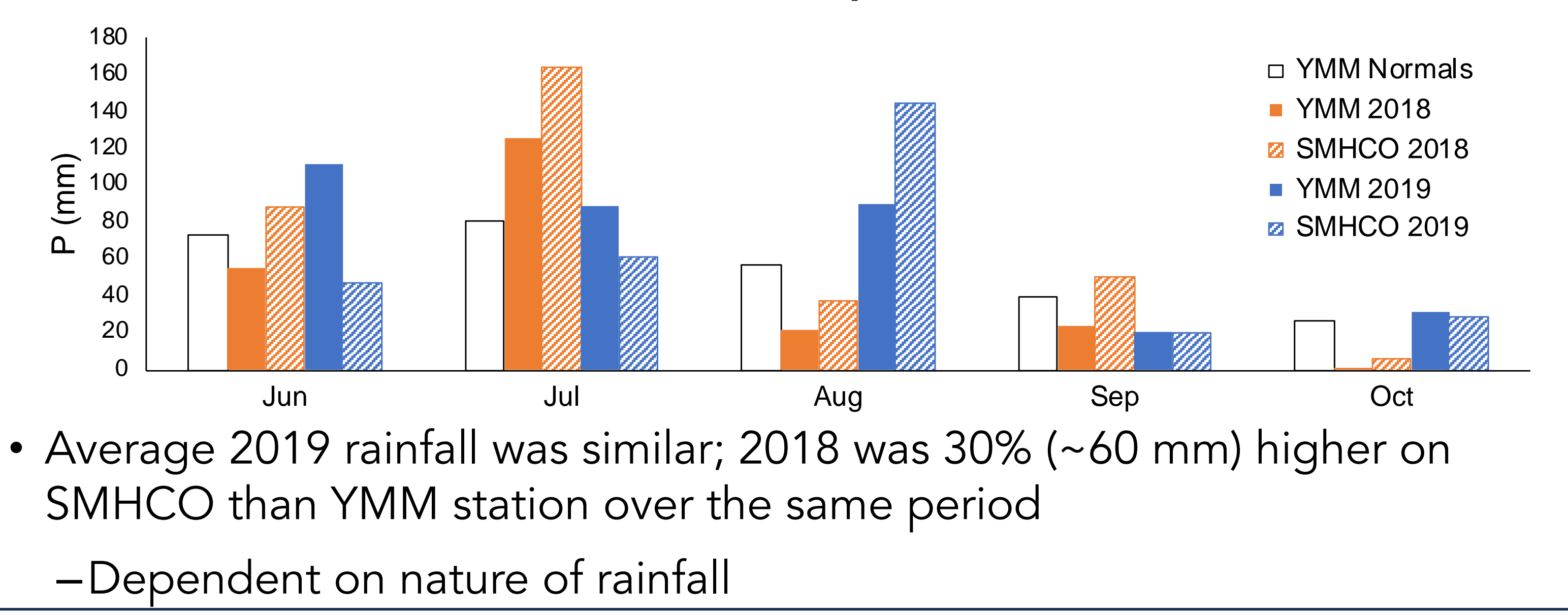
Runoff ratio is the proportion of rainfall that is produced as runoff

Central Research Goal: Understand freshwater generation in headwater systems and the importance for down-gradient ecosystems and regional rivers



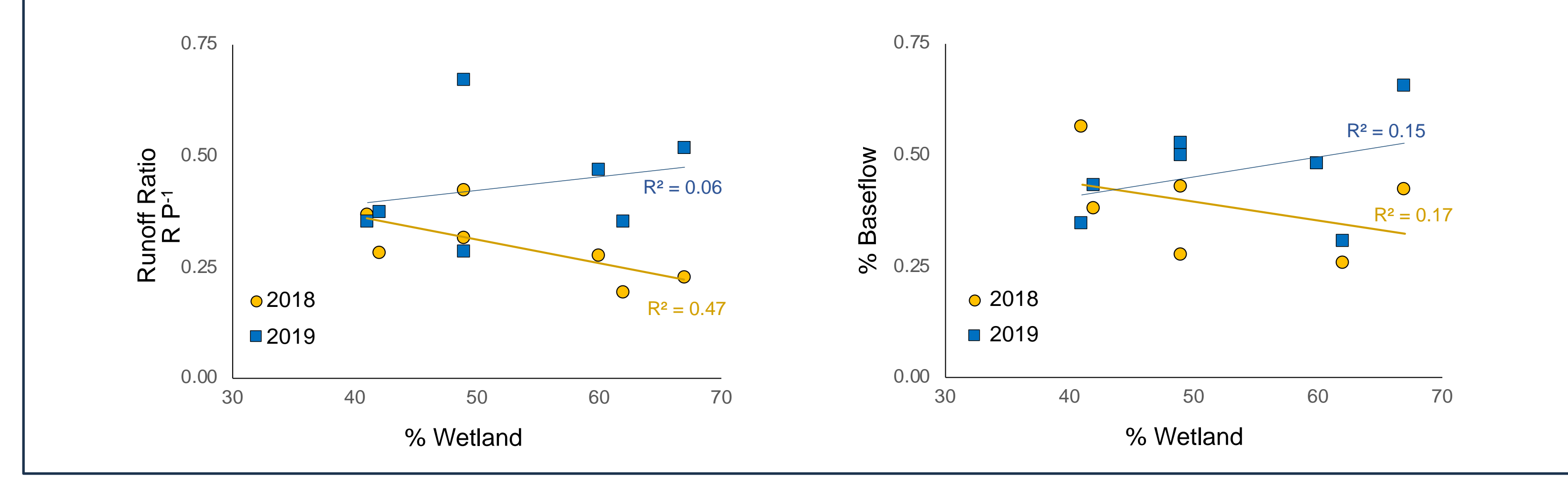
Stony Mountain Headwater Catchment Observatory
SMHCO consists of 6 headwater (0.5–9 km²) and 3 meso-scale (125–200 km²) catchments on the Stony Mountain Boreal upland landform in Alberta, Canada. Each headwater catchment has a central wetland flanked by forested uplands.

More Precipitation!



- Average 2019 rainfall was similar; 2018 was 30% (~60 mm) higher on SMHCO than YMM station over the same period
 - Dependent on nature of rainfall

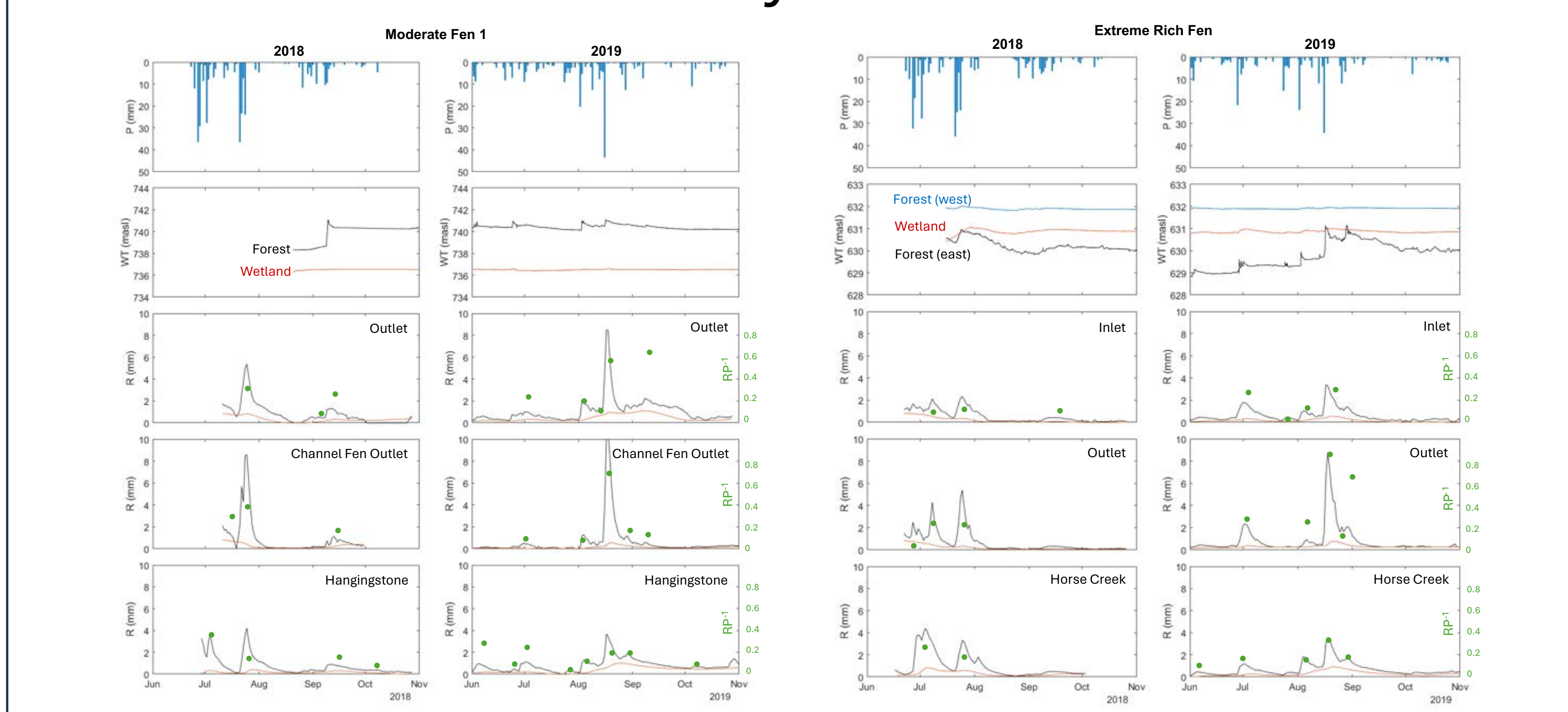
Runoff Analysis



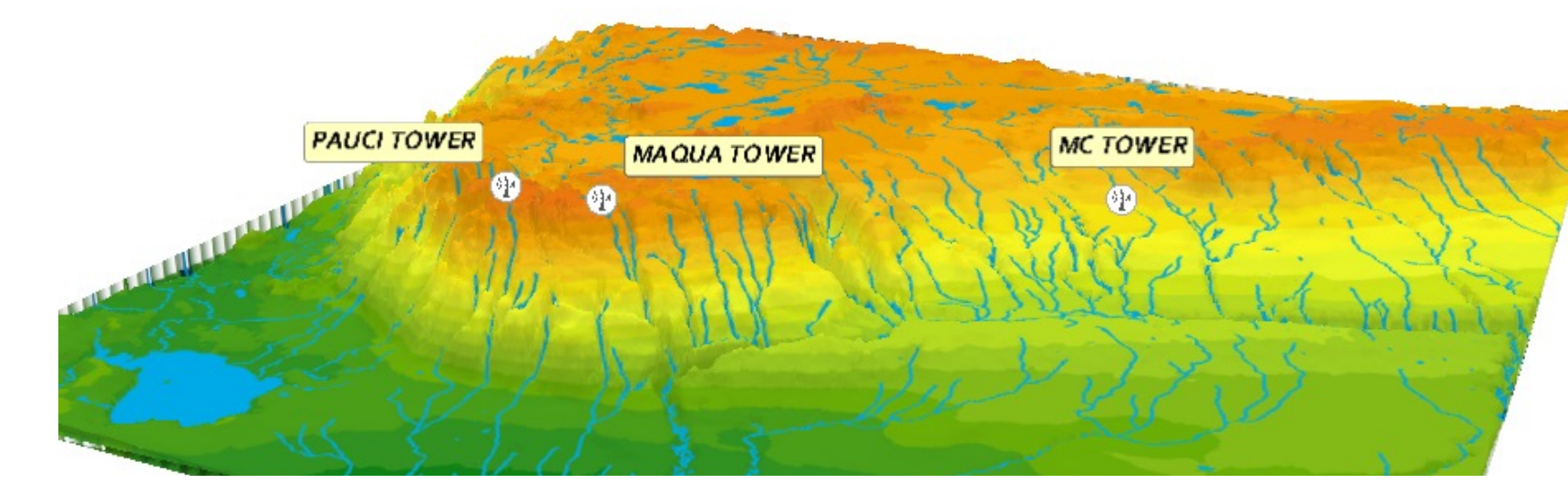
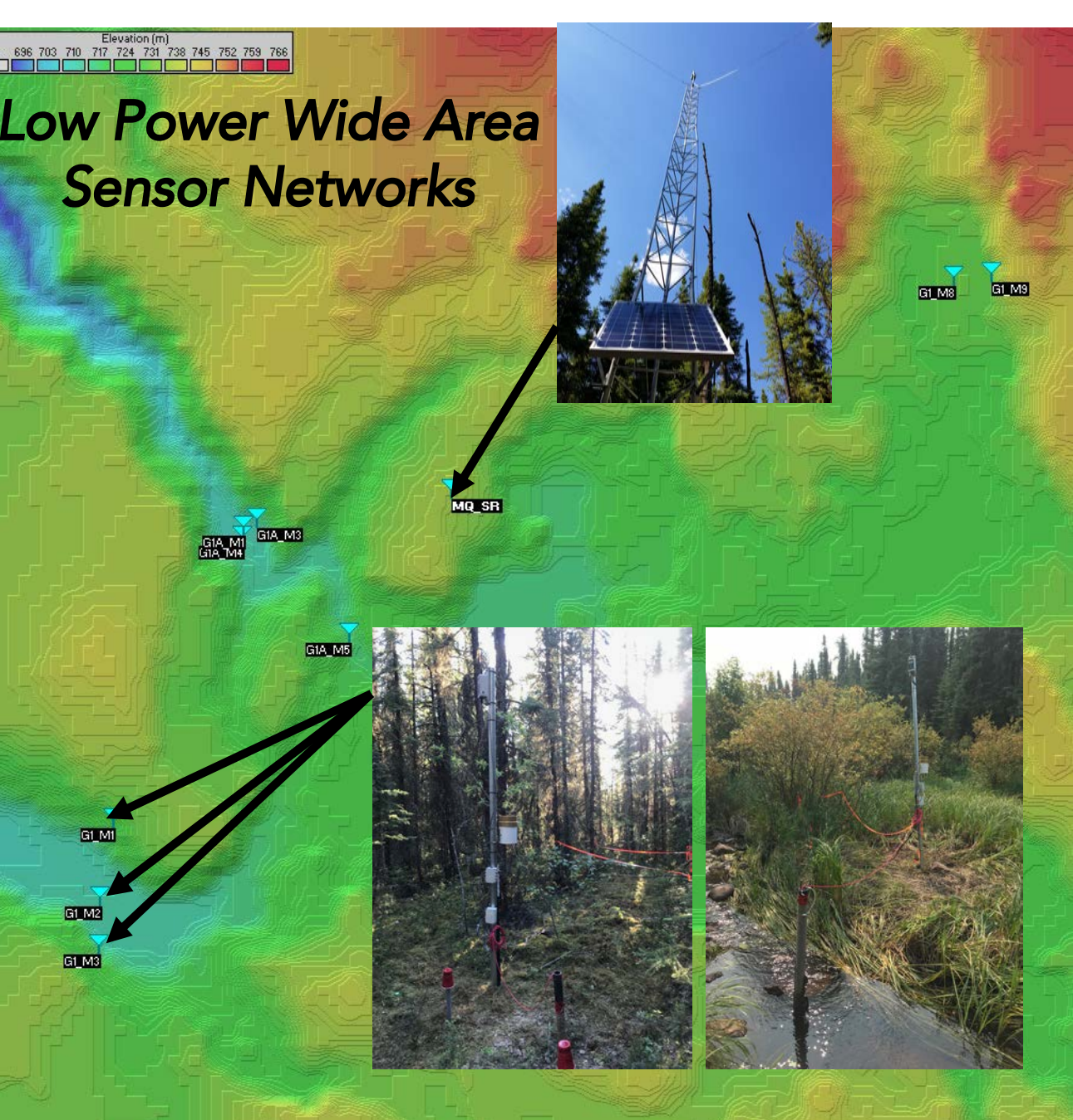
• 65 rainfall – runoff events analysed using HydRun (Matlab)
– Year-to-year variability among catchments highlights importance of antecedent conditions on runoff generation

Site Name	Drainage Area (km ²)	Elevation Range (masl)	Elevation Change (m)	Wetland Cover (%)	Downstream Catchment
Headwater Catchments					
Poor Fen	0.42	739 - 768	29	12.4	Milton's Creek
Moderate Fen #1	2.83	724 - 766	42	48.9	Channel Fen Inlet
Channel Fen Inlet	7.26	719 - 760	41	48.9	Channel Fen Outlet
Channel Fen Outlet	8.88	713 - 765	52	40.6	Hangingstone River
Moderate Fen #2	3.68	699 - 744	45	47.2	Hangingstone River
Extreme Rich Fen Inlet	5.99	671 - 690	19	61.6	Extreme Rich Fen Outlet
Extreme Rich Fen Outlet	6.41	650 - 671	21	67.0	Horse Creek
Regional Catchments					
North Star	122.12	650 - 725	75	68.5	Horse Creek
Horse Creek	167.31	555 - 705	150	59.7	Athabasca River
Hangingstone	197.41	495 - 770	275	42.2	Clearwater River

Runoff Variability and Water Table



- Catchment runoff response related to forestland-wetland connections
 - Strong runoff responses observed when forests and wetlands connect



Read about the innovative deployment of a 'Low Power Wide Area Sensor Network' at SMHCO here:



Beautiful Treaty 8 Lands
Athabasca University respectfully acknowledges that we are on and work on the traditional lands of the Indigenous Peoples (Inuit, First Nations, Métis) of Canada. We honour the ancestry, heritage, and gifts of the Indigenous Peoples and give thanks to them.

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Learn more about the AU Hydrology Research Group!