



Research Package 2:  
Description and  
Objectives

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# Research Package 2



- Title: ***Integrated Surface-Subsurface Hydrologic Modeling of Sites Undergoing Permafrost Transition***



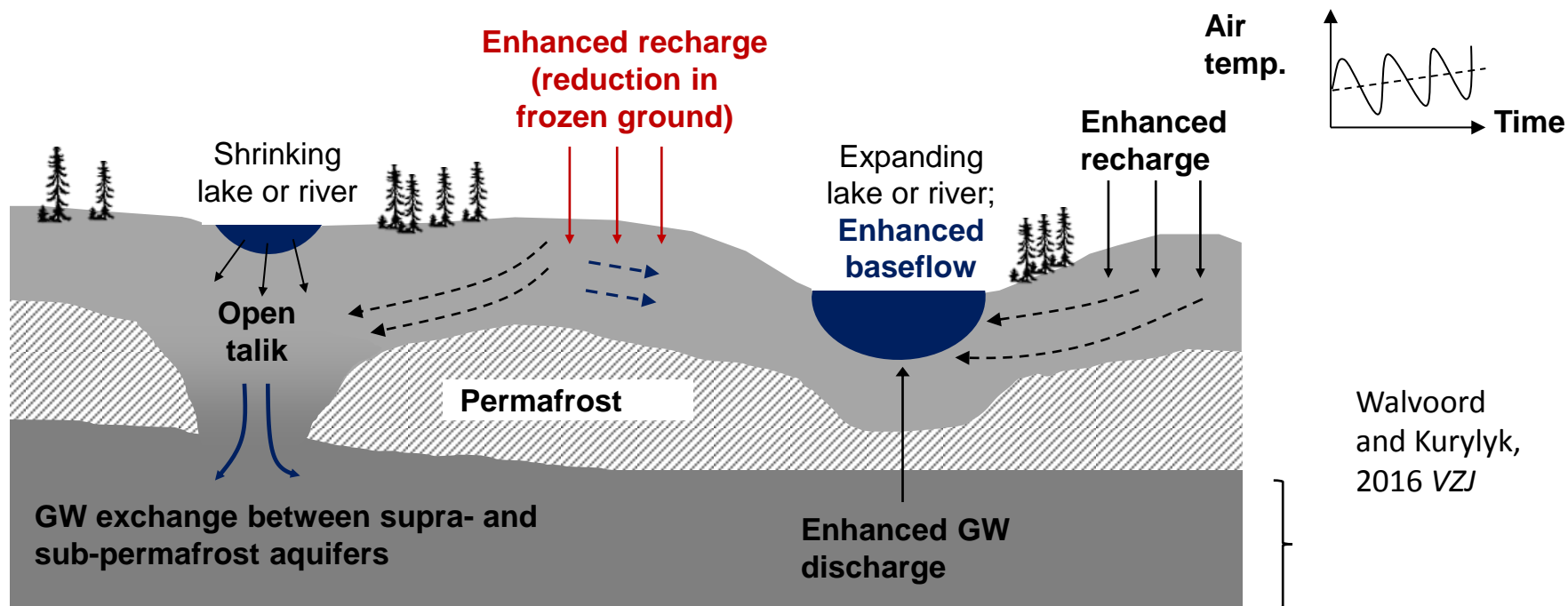
- Partner Organizations: NWMO (Canada), McGill University and Dalhousie University



- Personnel: Jeremy Chen (NWMO), Jeff McKenzie (McGill), Barret Kurylyk (Dalhousie), and ?

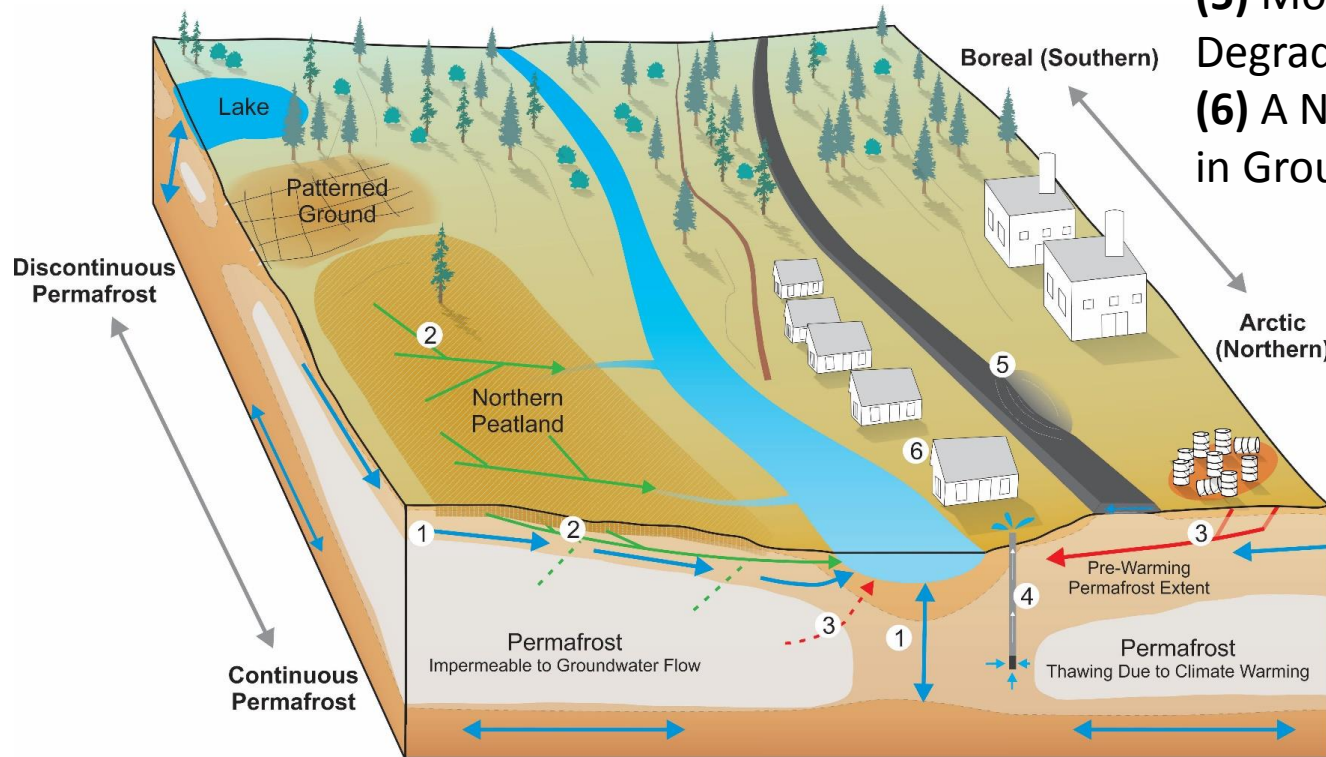
# Context

- Most recent cryohydrogeology research has focused on (1) permafrost warming/thaw, (2) short-term projections, and (3) hillslope-scale systems



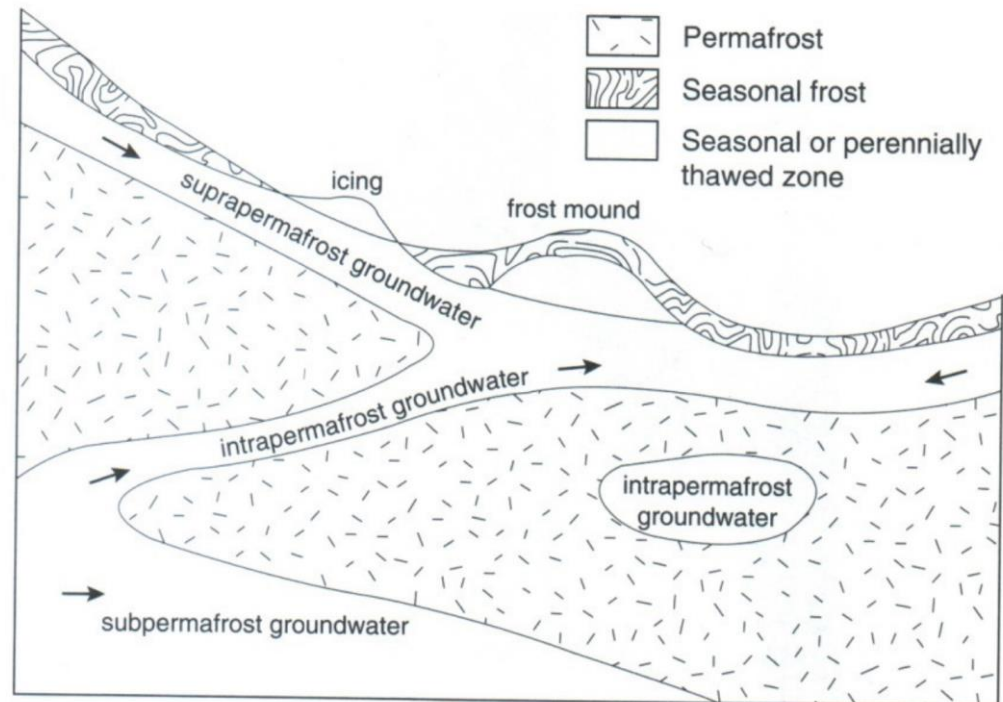
# As Permafrost Thaws, We Expect:

- (1) Increased Groundwater Flux
- (2) More Lateral Transport of Carbon by Groundwater
- (3) Higher Potential for Contaminant Transport
- (4) More Groundwater Resource Development
- (5) More Infrastructure Degradation by Groundwater
- (6) A Need for Planning and Policy in Groundwater Resources



# RP2 Research Question

- How does permafrost in transition impact groundwater-surface water interactions, hydrologic connectivity, and solute transport at landscape and catchment scales?



Woo, 2012

# RP2 Research Objectives

1. Choose/modify a numerical model, with capabilities in integrated modeling as well as solute transport;
2. Select 3+ northern field sites with both thermal and hydrologic data that represent a latitudinal gradient to enable a space-for-time substitution to consider the impacts of long-term climate change;
3. Compile field data for model calibration or assessment;
4. Conduct model simulations of the present climate at sites and form a comparison study to evaluate the relative and interrelated impacts of permafrost on hydro/hydrogeology;
5. Simulate evolution with long-term climate scenarios to investigate the role of permafrost transition on hydrologic connectivity at the watershed scale and the implications for nuclear waste management.



# Potential Sites

- Wolf Creek, Yukon, Canada (alpine discontinuous PF)
- Sanikiluaq, Nunavut, Canada (lowland, sporadic PF, coastal)
- Forsmark and Krycklan, Sweden
- Colder? Greenland?
- Other?

