Assessing Arctic and Subarctic Groundwater Vulnerability Factors

Selsey Stribling[1], Jeffrey McKenzie[1], David Rudolph[2]

[1]Earth and Planetary Sciences, McGill University
[2]Earth and Environmental Sciences, Waterloo University

Introduction

Although there is increased demand and usage of groundwater resources in Canada's Yukon and Northwest Territories, factors affecting groundwater vulnerability in Arctic/Subarctic regions are still poorly understood. Large-scale, climate change-driven processes negatively impact northern groundwater resources. Furthermore, groundwater vulnerability, the risk to a groundwater system after the introduction of a contaminant (NRC, 1993), is increasing though we lack an assessment method for permafrost environments.

The project's aim is to identify groundwater vulnerability factors in Arctic/Subarctic regions and to explore the relationships and collaborative impacts these factors have on each other.

Results

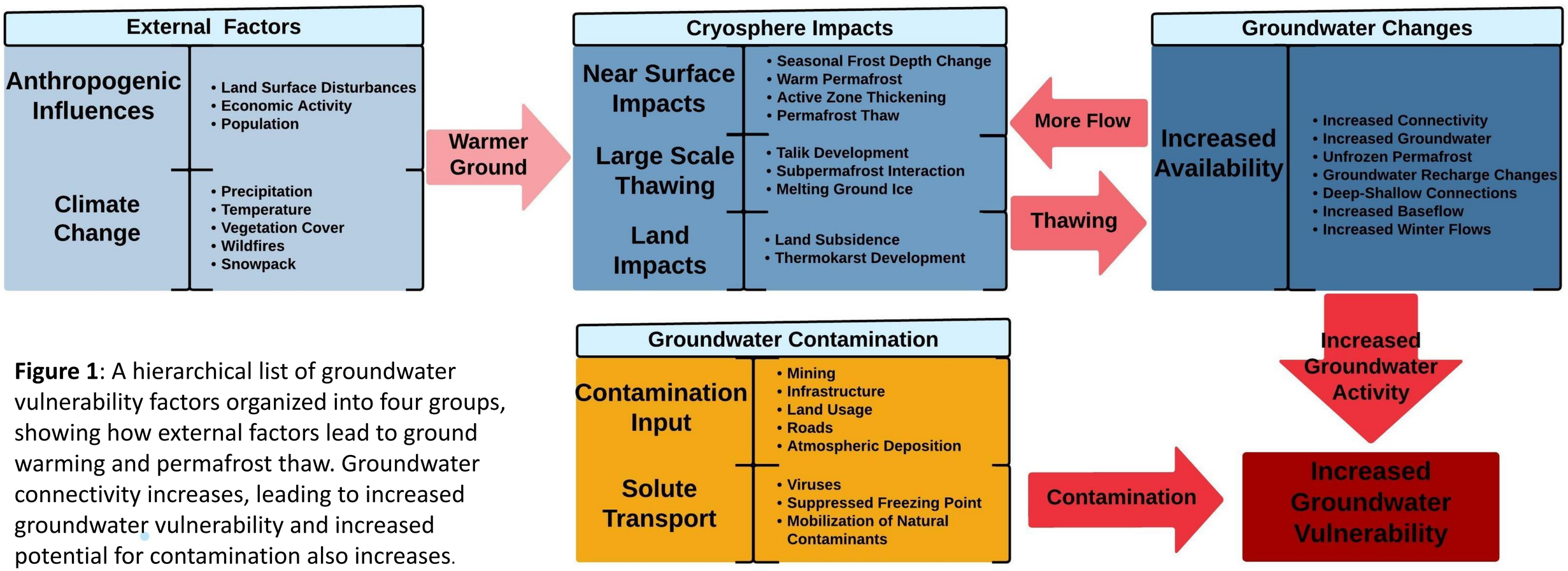

Figure 1: A hierarchical list of groundwater vulnerability factors organized into four groups, showing how external factors lead to ground warming and permafrost thaw. Groundwater connectivity increases, leading to increased groundwater vulnerability and increased potential for contamination also increases.

Conclusions

Northern groundwater vulnerability factors influence each other and compound over time as external environmental pressure increases.

At the community scale, human induced changes can escalate groundwater vulnerability.

Climate change will continue to increase the severity of all three vulnerability factor groups, thus increasing groundwater vulnerability potential.

Future work:
The groundwater vulnerability factors depicted in Figure 1 will be used in solute transport modeling with FEFLOW. Ultimately, this research will be used in the development of a groundwater vulnerability assessment method for Arctic/Subarctic regions.

Acknowledgments

We would like to extend our gratitude to Global Water Futures for their funding and support in this research. Additionally, thank you to McGill University.

Reference

"Executive Summary." National Research Council. 1993. *Ground Water Vulnerability Assessment: Predicting Relative Contamination Potential Under Conditions of Uncertainty*. Washington, DC: The National Academies Press. doi: 10.17226/2050.