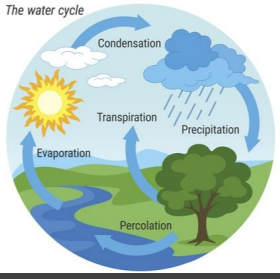
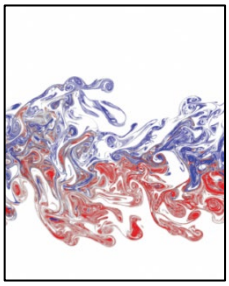
Boase Seminar Series in Hydrology and Water Resources Engineering

Department of Civil, Environmental and Architectural Engineering





Declining Headwater Streamflow in the Thawing Arctic

Dr. Josh Koch

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Zoom: https://cuboulder.zoom.us/j/93058839188

(passcode: water)

Abstract:

Climate change has the potential to impact headwater streams in the Arctic by thawing permafrost and subsequently altering hydrologic regimes and vegetation distribution and productivity. Permafrost thaw and increased subsurface flow have been inferred from the chemistry of large rivers, but there is limited empirical evidence of the impacts to headwater streams. Here we demonstrate how changing vegetation cover and soil thaw alter headwater catchment hydrology using water budgets, stream discharge trends, and chemistry across a gradient of ground temperature in northwestern Alaska. Colder, tundra-dominated catchments shed precipitation through stream discharge, whereas in warmer catchments with greater forest extent, evapotranspiration and infiltration are substantial fluxes. Forest soils thawed earlier, remain thawed longer, and display seasonal water content declines, consistent with greater evapotranspiration and infiltration. Streambed infiltration and water chemistry indicate that even minor warming leads to increased infiltration and subsurface flow. Additional warming, permafrost loss, and vegetation expansion in the Arctic will deliver water back to the atmosphere and to subsurface aquifers, while drastically reducing in headwater streams, with important implications for aquatic and riparian ecosystems.

Speaker Bio: Dr. Joshua Koch is a research hydrologist at the U.S. Geological Survey Alaska Science Center. He conducts research throughout Alaska, using hydrologic methods and chemical tracers to study water resources, biogeochemistry, and ecosystems, and how they are changing as Alaska warms and thaws.