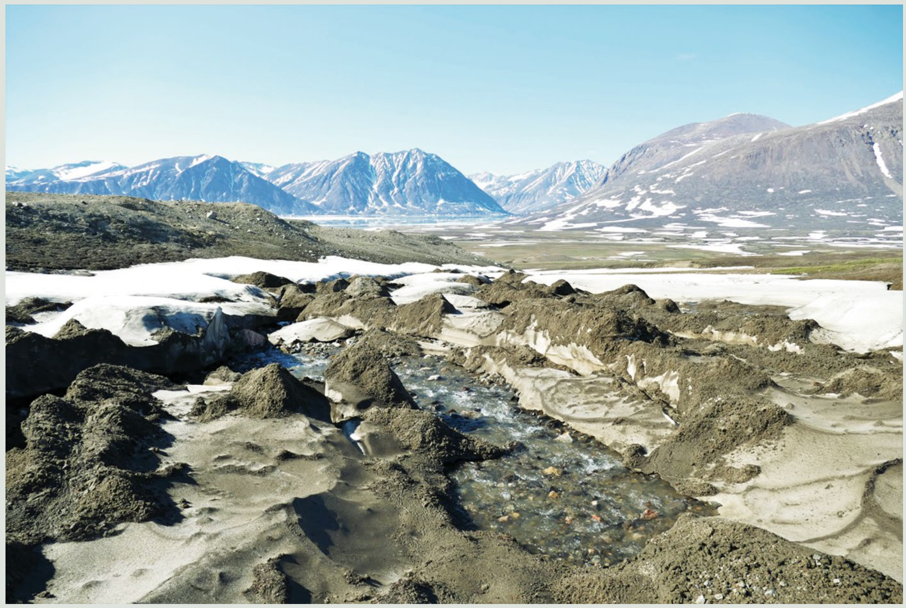
ANNIVERSARY RETROSPECTIVE

Arctic streams in murky waters

The frozen vastness of the high Arctic during winter can seem a desolate and inhospitable environment. But during summer, the snow melts and the frozen ground thaws to transform the landscape into a lush expanse of rivers, lakes and wetlands teaming with aquatic insects, fish and migratory birds. However, a changing climate is bringing warmer air temperatures, retreating glaciers, new precipitation regimes and the thawing of deeper frozen ground. This is steadily altering the tight link between the frozen earth and freshwater ecosystems in the high Arctic.

To understand the impact of a warming climate on Arctic landscapes, Chin and colleagues set out to assess the influence of thaw slumps on Arctic stream ecology (*Glob. Change Biol.* **22**, 2715–2728; 2016). Thaw slumps are permafrost mass wasting events similar to landslides that typically occur on hillslopes and are caused by land destabilization after the frozen ground thaws. Thaw slumps are increasing in frequency and magnitude due to a warmer and wetter climate and have significant potential to alter Arctic river ecosystems by releasing previously unavailable water, solutes and sediment.

The authors compared habitats and aquatic insect communities in northwest Canadian streams with and without upstream thaw slumps. They found that both nutrient concentrations and suspended sediment loads were highest in streams affected by thaw slumps. Increased nutrient availability is known to increase aquatic insect abundance by bolstering primary production—and thus food availability for insects—in Arctic streams. However, in the studied streams, increased nutrient availability was counteracted by increased sediment input, which negatively impacts aquatic insects in streams by methods including smothering eggs and damaging eyes and gills.



The study by Chin and colleagues provided a breakthrough in my PhD research. My aim was to understand how a changing climate might alter habitat conditions and biological communities in northeast Greenlandic snowmelt streams. I found a clear difference in aquatic insect abundance between my study streams that could not be explained by hydrological variables alone. Chin et al. inspired me to investigate cascading interactions between landscape processes, hydrology and ecology. Instead of thaw slumps, I found that snowpack size was driving variations in sediment load across my streams. Large snowpacks accumulate more water and sediment over the winter months. During spring melt flood events, both water and sediment enter the stream en masse, which destabilizes nearby unconsolidated ground, further increases stream sediment load and reduces aquatic insect abundance.

Chin and colleagues highlighted the importance of studying the drivers of suspended sediment load in Arctic streams in the face of a changing climate, as well as their impacts on Arctic biological communities. Both winter snowfall and air temperature are projected to increase in northeast Greenland in the coming decades, which may lead to larger snowpacks and spring floods. Thus, climate change is murking the waters and impacting the biodiversity of northeast Greenland's snowmelt streams. ❐

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