



Arctic riparian shrub expansion indicates a shift from gaining to losing streams

Anna Liljedahl (1), Ronald Daanen (2), Gerald Frost (3), and Ina Timling (4)

(1) University of Alaska Fairbanks, Institute of Northern Engineering, Water and Environmental Research Center, Fairbanks, United States (akliljedahl@alaska.edu), (2) Division of Geological and Geophysical Surveys, Alaska Department of Natural Resources, Fairbanks, United States (ronald.daanen@alaska.gov), (3) ABR, Inc. Environmental Research & Services, Fairbanks, United States (jfrost@abrinc.com), (4) Institute of Arctic Biology, University of Alaska Fairbanks, Fairbanks, United States (itimling@alaska.edu)

Shrub expansion has been observed across the pan-Arctic in recent decades and is particularly pronounced in riparian corridors. Increasing air temperatures are often cited as the primary driver of shrub increase, which in turn has been shown to warm soils in winter due to increased snow accumulation. Complex interactions between shrubland development and permafrost conditions raise the question of whether Arctic shrubs are initiating shifts in ground temperature and hydrologic regime, or simply taking advantage of improved conditions brought on by climate change. Here we present late summer and winter field measurements of vegetation, hydrology, permafrost, and soil microbial communities along stream corridors in the foothills region of the North Slope, Arctic Alaska. Our results show higher leaf area index (LAI), shrub canopy height, and distinctive soil microbial communities along stream sections that lose water to the ground (i.e. influent creeks), compared to gaining (effluent) stream sections with shallow permafrost. LAI was linearly correlated to changes in streamflow, with dense canopies (LAI > 2) coinciding with losing stream sections. Considering the circumpolar scale of modern shrub expansion, our findings suggest that talik formation and the resultant hydrological shifts from gaining to losing discharge regime are occurring across the Arctic.