

Using Multiple Proxies to Explore the Tree Ring Divergence Problem at the Firth River in Alaska

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The backdrop for this investigation is the “divergence problem,” a northern-latitude phenomenon in tree ring studies. Annual tree ring widths are showing a different relationship, or a weakened relationship, to rising temperatures in the past 60 years than they were in the record prior to this time, which was dominated by a positive relationship between ring-width and temperature. While it has been suggested that drought stress is the cause at multiple sites, this theory does not fit the Firth River site, as it has been demonstrated that the white spruce (*Picea glauca*) are experiencing an increase in growth rate instead of a decrease. The objective of this study is thus to explore proxies beyond ring-width measurements to understand which climactic factors are currently limiting tree growth at the Firth River site. Ring width values and their relationships to temperature and precipitation suggest that neither of the factors are limiting. While maximum latewood density shows a significant positive relationship to temperature, suggesting late summer growth is still limited by temperature, an approximation of whole ring density did not, suggesting that the relationship is restricted to this late summer growth. Initial results from stable carbon isotope analysis suggest that the white spruce are not undergoing drought stress after 1950, while further oxygen isotope analysis may be able to shed light on the source of water the trees are using.