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Finding climatologically teleconnected sites with a network of tree ring chronologies

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Finding Hydrologically Teleconnected Sites With a Network of Tree Ring Chronologies

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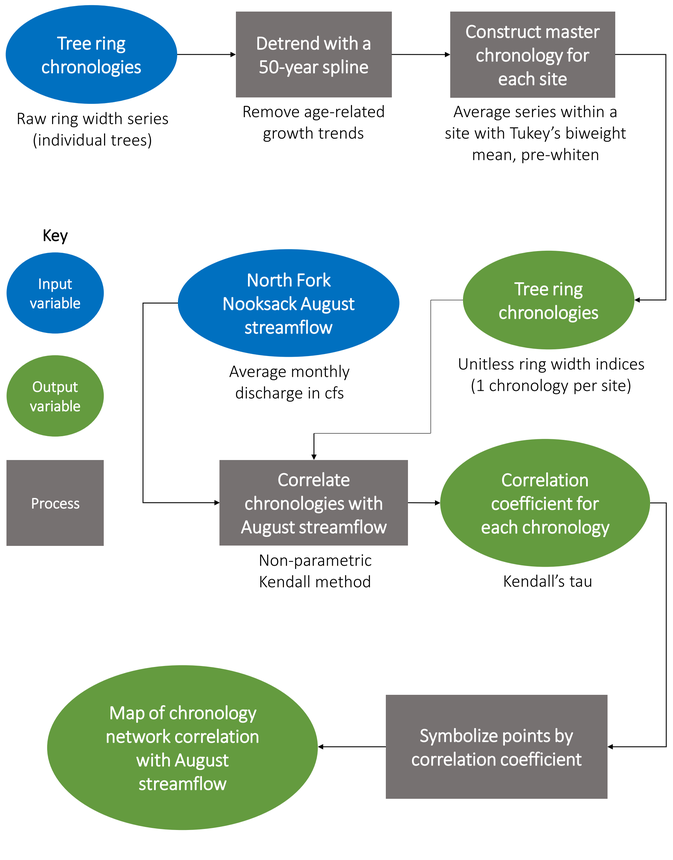
Objective

- Identify existing tree ring chronologies that correlate with August streamflow of the North Fork Nooksack River.

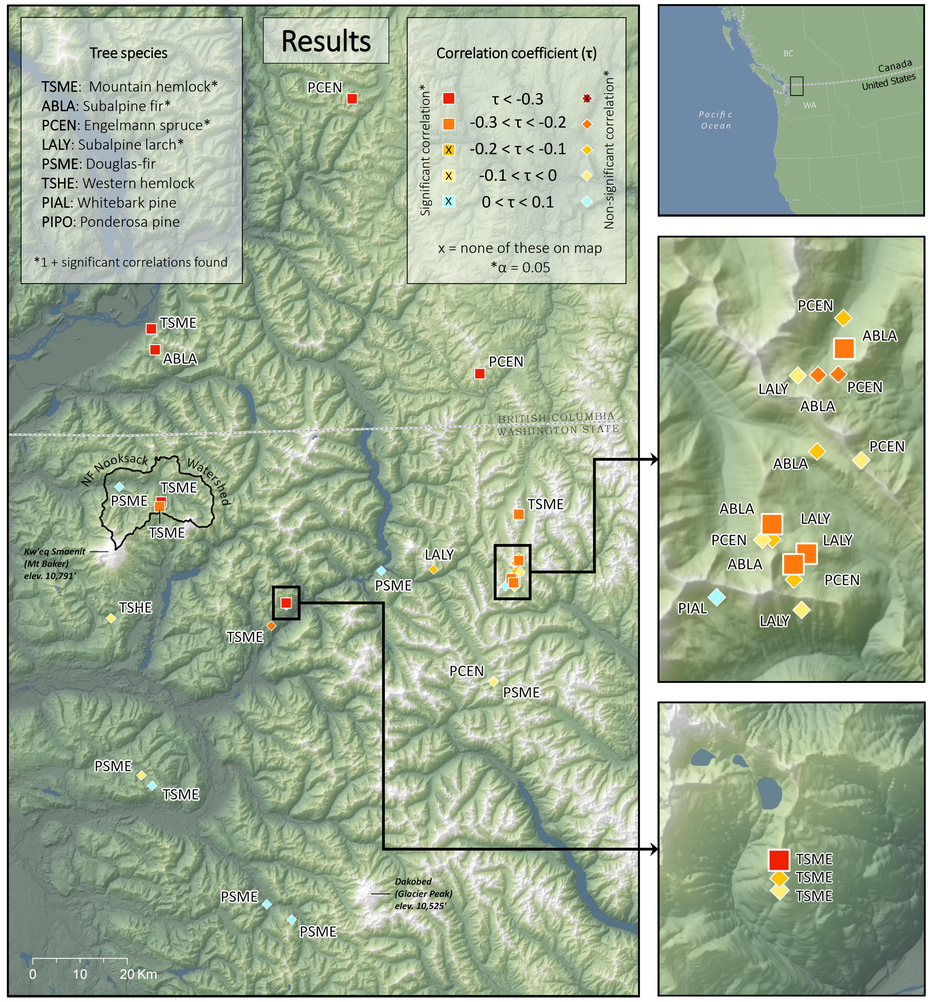
Background

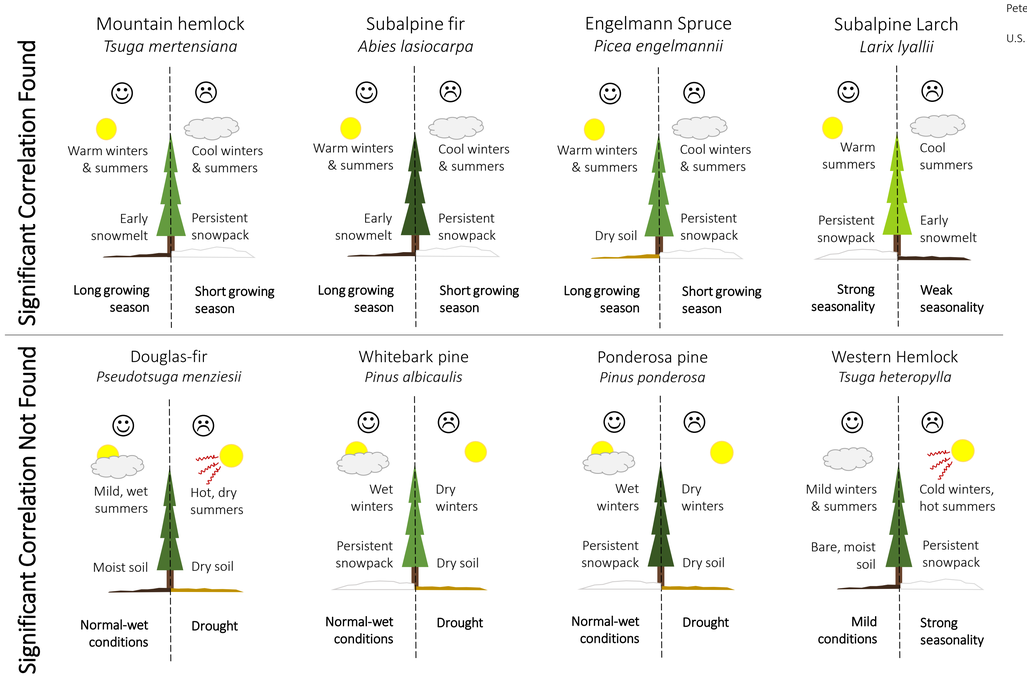
- Trees act as proxy climate records, allowing us to reconstruct past climate and climate-driven phenomena like streamflow. In the Pacific Northwest, dendrochronologists can extend records hundreds of years into the past, providing vital context for present and future conditions.
- Each tree species responds to climate fluctuations in a unique way.
  - Including multiple species in reconstruction models allows us to explain more variance in paleorecords, increasing the accuracy of these records.
- This study identifies existing tree ring chronologies within 100km of the North Fork Nooksack watershed and assesses their viability for dendrochronological reconstruction of North Fork Nooksack August streamflow.
  - I include 37 tree ring chronologies available from the International Tree Ring Data Bank, consisting of 8 tree species.

Methods



Results





Conclusion

- Chronologies of certain species near the North Fork Nooksack watershed correlate with August streamflow inside the watershed.
  - These trees respond to the same large-scale climate conditions that drive streamflow of the North Fork Nooksack.
  - Significant correlations with August streamflow were found with mountain hemlock (*Tsuga mertensiana*) chronologies, subalpine fir (*Abies lasiocarpa*) chronologies, Engelmann spruce (*Picea engelmannii*) chronologies, and one subalpine larch (*Larix lyallii*) chronology.
  - All significant correlations were negative, meaning there was reduced growth in years of high August streamflow.

Snowcover is likely the major growth-limiting factor of these trees and the major factor driving August streamflow in the North Fork Nooksack.

Future Work

- Reconstruct August streamflow of the North Fork Nooksack and Sholes Glacier Mass Balance with tree ring chronologies identified in this project plus additional I collect this summer.
- Reconstructed streamflow and mass balance records will be inputs to the Distributed Hydrology Soil Vegetation Model, informing present and future hydrological conditions in the North Fork Nooksack watershed.

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A tree core from a mountain hemlock *(Tsuga mertensiana).*

Mount Baker from Ptarmigan Ridge, near Heather Meadows
Tsuga mertensiana chronology.

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