

Proposal for Research

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Summary

Dendrochronology has long used tree ring width to study and reconstruct past historical conditions, including but not limited to precipitation and temperature. However, ring width is only one metric. By additionally considering grain angle and microfibril angle (MFA) for each ring, more information regarding current and historical conditions can be determined.

Methods

A disc at breast height will be cut from selected Ponderosa pine trees. Samples will be taken from a variety of age cohorts, ranging from sapling to pre-settlement old growth. 10-12mm cores will also be taken from historical structures. The Kaibab National Forest has expressed willingness to allow cores to be taken from select historical cabins made from Ponderosa pine logs. Samples will be prepared and dated. Spiral grain for each ring will be measured using local resources.

Samples will be sent to FPInnovations in Vancouver for MFA analysis. Scanning resolution is available at .1mm intervals, which should allow MFA to be measured for all but the thinnest rings. MFA analysis by FPInnovations includes density and ring width measurements. MOE measurements may also be possible.

If feasible, it may be desirable to take two data points per ring, one each for earlywood and latewood.

Site Location

The research location will be determined by availability of historical buildings and pre-settlement trees. Ideally, all samples would be from the same area. The location will likely be in the Kaibab National Forest.

Research Goals

- 1) Map the average spiral grain and MFA along the lifespan of Ponderosa pine. This could indicate preferred age for harvest.

- 2) Determine if a response to stress and/or resource scarcity can be detected. This would present itself by an above average change in grain angle or MFA in a tree of exceptional width or lack thereof.

- 3) By both mapping MFA/grain angle and determining if there is a response to changes in growing conditions, it may be possible to determine if the overall growing conditions have changed over the last few hundred years by comparing MFA/grain profiles among different age cohorts.

Pilot Study

The author proposes a pilot study with 2-3 samples in order to gain familiarity with sampling methods and to acquire additional funding for a complete study. Ideally this would include a juvenile, pre-settlement, and archeological sample.

Cost & Funding

FPIinnovations have quoted a price of CAN\$325 (USD\$245.02) per tree. The proposed pilot study would cost USD\$735.06 plus the cost to ship samples, totally an estimated USD\$900. The cost of the complete study cannot be known until a desired sample size is determined.