



# THE LABORATORY OF TREE-RING RESEARCH

presents a talk by

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## *Using tree-ring chronologies to calibrate a forest gap model in Denali National Park*

Wednesday, October 27, 2021 - 12:00pm to 1:00pm

Room: Zoom Only

Merging robust statistical methods with complex simulation models is a frontier for improving ecological inference and forecasting. However, bringing these tools together is not always straightforward particularly with tree-ring data. Matching tree-ring data with model output, determining starting conditions, and addressing high dimensionality are some of the complexities that arise when attempting to incorporate tree-ring data with mechanistic models directly using sophisticated statistical methods. To illustrate these complexities and pragmatic paths forward, we present an analysis using tree-ring basal area reconstructions in Denali National Park (DNPP) to constrain successional trajectories of two spruce species (*Picea mariana* and *Picea glauca*) simulated by a forest gap model, University of Virginia Forest Model Enhanced -- UVAFME. Through this process, we provide preliminary ecological inference about the long-term competitive dynamics between slow-growing *P. mariana* and relatively faster-growing *P. glauca*. Incorporating tree ring data into UVAFME allowed us to estimate a bias correction for stand age with improved parameter estimates. We found that higher parameter values for *P. mariana* minimum growth under stress and *P. glauca* maximum growth rate were key to improving simulations of coexistence, agreeing with recent research that faster-growing *P. glauca* may out-compete *P. mariana* under climate change scenarios. The implementation challenges we highlight are a crucial part of the conversation for how to bring simulation models together with tree-ring data to improve ecological inference and forecasting.