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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.

