**Radial Growth Responses among Naturally-Occurring Western U.S. Conifers under Changing Environmental Conditions**

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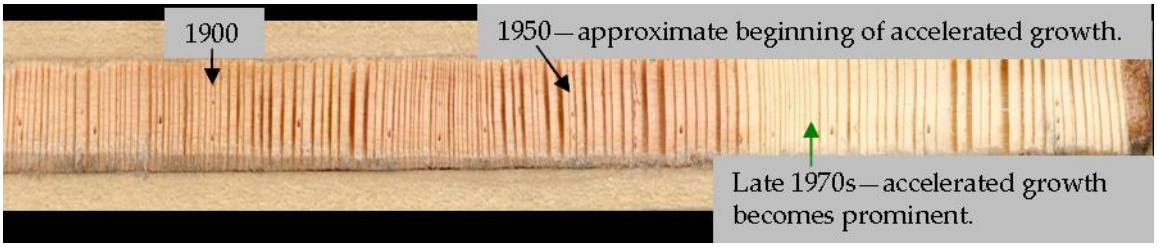
This is a collaborative project with Dr. Peter Soulé of Appalachian State University in which we will collect dendroecological data from Douglas-fir and ponderosa pine forests of the Northern Rockies. Our project investigates the growth responses of two co-occurring and economically important western USA conifers growing under natural conditions, but where the trees have experienced an increasingly CO2- rich atmosphere and a warmer and drier climate. Radial growth rates of Douglas-fir (DF) and ponderosa pine (PP) trees will be compared at nine sites in Idaho and Montana, where the trees are co-dominant, confounding growth factors are minimized, and between-site environmental variability is maximized. Matched DF and PP tree-ring chronologies, which show the average rate of tree growth annually, will be developed and radial growth patterns examined prior and after atmospheric CO2 concentrations became significantly elevated using growth/climate regression models, carbon isotope analysis, and analyses of growth rates during various levels of drought severity. The purpose of this research is to determine if: 1) rates of intrinsic water-use efficiency (iWUE) of both DF and PP are trending significantly upward during the past 200 yearsbecauseof decreased

An example of a Douglas-fir and ponderosa pine woodland in Montana were we will collect data.

Sampling from an old-growth Douglas-fir in Montana in summer 2007 during the pilot-study phase of this project.

stomatal conductance associated with increasinglevels of CO2; 2) increasing iWUE is positively impacting the radial growth rates of these two tree species growing in water-limited environments; 3) the influence of drought on the radial growth rates of DF and PP has decreased over the time period of instrumental climatic records (1895-present); 4) there are both differential responses to CO2 fertilization between the species and spatial variation in these responses; and 5) radial growth rates of old-growth DF and PP are not significantly less than younger DF and PP growth rates and thus, old-growth forests may serve as important carbon sinks. Current climate models predict that the NR study area will experience more frequent and severe summertime droughts. Thus, a greater understanding of issues facing future ecosystems under increased CO2 and warmer, drier conditions is critical.




A cross-section of a Douglas-fir sample collected at the Ferry Landing Research Natural Area in western Montana, August 2007. The radial growth pattern is atypical as average ring widths often decline with age