EGU21-13182, updated on 29 Nov 2022
https://doi.org/10.5194/egusphere-egu21-13182
EGU General Assembly 2021


# Using tree rings to assess the potential of thinning to alleviate drought stress in a dry forest of western Canada

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Increasing frequency of severe drought events under climate change is a major cause for concern for millions of hectares of forested land. One practical solution to improving forest resilience may be thinning. There may be several potential benefits, chief of which is that drought tolerance could be improved in the remaining trees due to lower competition for resources and increased precipitation throughfall. By improving resilience to drought, this may increase productivity of the remaining trees while lowering risks of mortality. Such potential benefits can effectively be quantified with data from statistically-sound, long-term field experiments, and tree rings provide a suitable avenue to compare treatments. We work with an experiment that applied different levels of tree retention to mature interior Douglas fir (*Pseudotsuga menziesii* var. *glauca*) in a dry ecosystem of western Canada. The treatments were applied in the winter of 2002/2003, coinciding with the aftermath of a severe natural drought event in 2002. We used tree-rings to quantify the extent to which thinning improves recovery and resilience of treated trees as compared to non-thinned controls. Tree-ring samples as well as height and diameter data were obtained from 83 trees from 8 treatment units of the randomized experimental design. Indicators for resilience to drought were calculated based on basal area increments. Thinning substantially increased basal area increments at the individual tree level, but more importantly, led to significantly higher recovery and resilience relative to the control. The results of this tree-ring analysis suggest that thinning may be a viable silvicultural intervention to counteract effects of severe drought events and to maintain tree cover.