



Growth responses of Scots pine (*Pinus sylvestris* L.) to extreme droughts: How do they vary across a 2800 km latitudinal gradient in Europe?

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Global climate change has increased the frequency and severity of extreme droughts. The effects of droughts on trees are difficult to study because of the complexity associated with drought characteristics, and the effects of drought might be modified by tree traits, which in turn are affected by long-term site, tree growth and management legacies, and the interaction between droughts and affected trees. Using a network of tree-ring collections of one of the world-wide most widely distributed tree species Scots pine (*Pinus sylvestris* L.) along a 2800 km transect ranging from southern Spain to northern Germany, we determined the magnitude and the temporal changes of tree-level tolerance (resistance, recovery, and resilience) to extreme droughts. Our results showed that Scots pine displayed greater resistance to drought but poorer recovery in moist relative to dry sites. However, the magnitude of recovery and resilience to extreme droughts decreased from the period 1980-1999 to the period 2000-2011 at dry sites. The tree-level resistance and resilience to extreme droughts were driven by a tree's fitness (i.e. the magnitude of growth) and plasticity (i.e. the variability in growth) prior to drought, and not by the latitudinal position within the gradient. Moreover, trees that experienced more frequent droughts over the long-term were less resistant to extreme drought, and drought duration was negatively associated with tree resilience. These results indicate that a tree's physiological potential for acclimation to extreme drought might be constrained by its growth predisposition prior to drought, and more frequent and longer drought periods could further deteriorate the acclimation potential.