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Tree-ring stable isotope and growth impacts of climate variability: future implications for prairie-forest ecotones

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Shifts in prairie-forest ecotones are expected with forecasted global climate change. Understanding how co-occurring tree species respond to environmental variability may help in understanding species responses and potential retraction of tree species under future climate conditions. Contrasting growth-climate relationships derived from tree-rings among co-occurring *Quercus macrocarp*a, a predominant tree species along the North American prairie-forest ecotone, and *Q. rubra*, a species generally found in more mesic conditions, suggests a constant growth-climate relationship throughout the life of the tree. For example, no significant difference ($P > 0.05$) was found between residuals from regression of tree-ring basal area increments and Palmer Drought Severity Index (PDSI) in early or later years of either species, as derived from increment cores. These findings contrast with recent evidence of declines in drought sensitivity in *Q. macrocarpa* as this species ages, which may be linked to increased atmospheric carbon dioxide levels, and emphasize the need for further understanding of prairie-forest ecotone dynamics. Utilization of δ^{13}C data from α-cellulose will provide further insight into the changing water-use and carbon dynamics in response to climate variability. Used in conjunction with growth-climate relationships, δ^{13}C data may also assist in predicting future drought sensitivity and forest retraction in trees in prairie-forest ecotones. Continued sensitivity to drought regardless of the age of a tree remains an important concern in predicting future species ranges and prairie-forest species composition in the future.