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Comments: The findings reported here seem relevant to your concept that management actions will successfully maintain the current, familiar conifer species

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PRIMARY RESEARCH ARTICLE Free Access
Differential use of winter precipitation by upper and lower elevation Douglas fir in the Northern Rockies
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Abstract [open access]
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In temperate regions such as the American west, forest trees often exhibit growth sensitivity to climatic conditions of a particular season. For example, annual tree ring growth increments may correlate well with winter precipitation, but not with summer rainfall, suggesting that trees rely more on winter snow than summer rain. Because both the timing and character of seasonal western climate patterns are expected to change considerably over coming decades, variation in the importance of different seasonal moisture sources for trees can be expected to influence how different forest trees respond to climate change as a whole, with shifts in seasonality potentially benefitting some trees while challenging others. In this study, we inferred patterns of tree water use in Douglas fir trees from the Northern Rockies for 2 years using stable water isotopes, while simultaneously quantifying and tracking precipitation inputs to soil moisture across a vertical soil profile. We then coupled water source use with daily measurements of radial growth to demonstrate that soil moisture from winter precipitation accounted for 87.5% and 84% of tree growth at low and high elevations, respectively. We found that prevailing soil moisture conditions drive variation in the depth at which trees access soil water, which in turn determines which seasonal precipitation inputs are available to support tree growth and function. In general, trees at lower elevations relied more on winter precipitation sourced from deep soils while trees at higher elevations made better use of summer rains sourced from near-surface soil layers. As both the timing of seasons and phase of precipitation (rain vs. snow) are likely to change considerably across much of the west, such patterns in tree water use are likely to play a role in determining the evolution of forest composition and structure in a warming climate.

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