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Microclimatic buffering in forests of the future: The role of local water balance
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The journal, Ecography, produced this quick vid:
<<https://www.youtube.com/watch?v=wvlKxvK6F2M>>
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Abstract
?Forest canopies buffer climate extremes and promote microclimates that may function as refugia for understory species under changing climate. However, the biophysical conditions that promote and maintain microclimatic buffering and its stability through time are largely unresolved. We posited that forest microclimatic buffering is sensitive to local water balance and canopy cover, and we measured this effect during the growing season across a climate gradient in forests of the northwestern United States (US). We found that forest canopies buffer extremes of maximum temperature and vapor pressure deficit (VPD), with biologically meaningful effect sizes. For example, during the growing season, maximum temperature and VPD under at least 50% forest canopy were 5.3°C and 1.1 kPa lower on average, respectively, compared to areas without canopy cover. Canopy buffering of temperature and vapor pressure deficit was greater at higher levels of canopy cover, and varied with water balance, implying that buffering effects are subject to changes in local hydrology. We project changes in the water balance for the mid-21st century and predict how such changes may impact the ability of western US forests to buffer climate extremes. Our results suggest that some forests will lose their capacity to buffer climate extremes as sites become increasingly water limited. Changes in water balance combined with accelerating canopy losses due to increases in the frequency and severity of disturbance will create potentially non-linear changes in the microclimate conditions of western US forests.

Keywords: climate extreme, forest, microclimate, microclimate buffering, microrefugia, water balance