

## Historical Tree Height Growth Associated with Climate Change in Western North America

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**Abstract :** The effect of climate change on tree growth in boreal and temperate forests has received increased interest in the context of global warming. However, most studies were conducted in small areas and with a limited number of tree species. Here, we examined the height growth responses of seventeen tree species to climate change in Western North America. 37009 stands from forest inventory databases in Canada and USA with varying establishment date were selected. Dominant and co-dominant trees from each stand were sampled to determine top tree height at 50 years breast height age. Height was related to historical mean annual and summer temperatures, annual and summer Palmer Drought Severity Index, tree establishment date, slope, aspect, soil fertility as determined by the rate of carbon organic matter decomposition (carbon/nitrogen), geographic locations (latitude, longitude, and elevation), species range (coastal, interior, and both ranges), shade tolerance and leaf form (needle leaves, deciduous needle leaves, and broadleaves). Climate change had mostly a positive effect on tree height growth. The results explained 62.4% of the height growth variance. Since 1880, height growth increase was greater for coastal, high shade tolerant, and broadleaf species. Height growth increased more on steep slopes and high soil fertility soils. Greater height growth was mostly observed at the leading range and upward. Conversely, some species showed the opposite pattern probably due to the increase of drought (coastal Mediterranean area), precipitation and cloudiness (Alaska and British Columbia) and peculiarity (higher latitudes-lower elevations and vice versa) of western North America topography. This study highlights the role of the species ecological amplitude and traits, and geographic locations as the main factors determining the growth response and its magnitude to the recent global climate change.

**Keywords :** Height growth, global climate change, species range, species characteristics, species ecological amplitude, geographic locations, western North America

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