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Climatic Resiliency of Red Spruce in New England

Abstract:

Climate change is quickly altering abiotic factors in every ecosystem on Earth, far too quickly for most species to adapt and survive in the new conditions. For decades the atmospheric conditions in New England temperate forests have been veering from stable norms, and it is becoming increasingly apparent that the biological components of this ecosystem are struggling under the stress. Many studies have been conducted on monitoring the growth of certain tree species, such as the red spruce, and comparing those findings to previous weather trends to better predict future alterations due to climate change. Red spruce are ideal for this approach because of their relatively greater longevity and vivacity when released from stress. They are also great indicators of exactly when a winter injury event takes place. In this study, cores were taken from red spruce in 60 different stands across Vermont, New Hampshire, and Massachusetts from a range of elevations. Dendrochronological trends can be compared to the normal maximum temperature, average precipitation, and elevation at each stand using GIS to observe the influence of climatic conditions on growth. The climatic variation between elevations are also illustrated; higher elevations tend to have cooler temperatures and more precipitation. The latter is partially because snowmelt is included in the measurements, with cooler areas retaining snow later into the growing season. Because of the climatic variation between elevations, red spruce and their respective ecosystems will respond differently to future change. The next step is to compare these spatial climatic trends to those recorded in the tree rings.