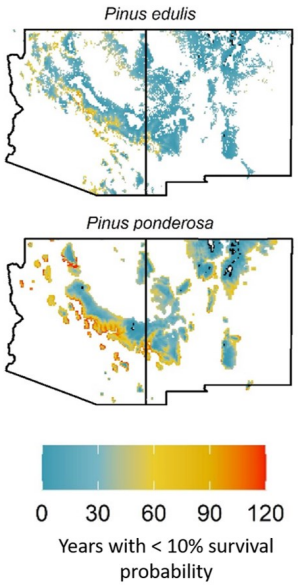
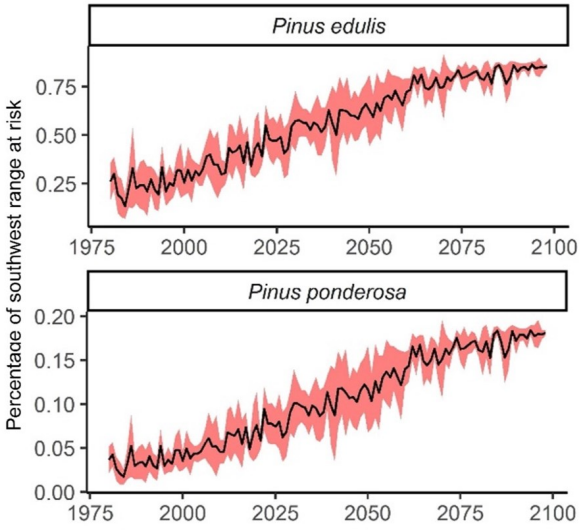
Earth Systems Ecology Lab





Climate change portends challenges for conifer establishment

Climate change and high-severity wildfire are restructuring forests in the southwestern US and altering the ecosystem services they provide. Conifer regeneration in both disturbed and undisturbed forests is highly variable and thought to be controlled by a combination of dispersal limitation and climate. Planting can overcome dispersal limitations, but the interaction of climate and physiology can be an important limitation to post-disturbance forest recovery efforts.

We examined how the survival of one-year seedlings of five southwestern United States conifer species changed in response to low moisture availability, high temperatures, and high vapor pressure deficit in incubators. The species distributions range from warmer and drier woodlands and forests to cooler and wetter subalpine forests

Our results show that these conditions will generally cause range contractions in the southwest. At-risk areas will initially be concentrated on southern aspects and at lower elevations. While species normally found in hotter and drier areas are more tolerant of heat and drought, climate conditions in their ranges are already hotter/drier and additional heat and drought stress may cause the largest reductions in range.

However, the potential exists within these contracting areas for seedlings to establish. Landscape position and post-fire vegetation can reduce temperature and moisture related mortality of seedlings. Successful planting within areas that may experience hotter/drier conditions is still possible if planting locations are chosen with consideration of mitigating factors.

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Management Implications

• Hotter and drier conditions likely to kill conifer seedlings in the southwestern United States are more likely in the 21st century, especially for species that already occupy hotter and drier locations.

• The sensitivity of seedlings to these conditions suggest large-scale potential for changes in conifer species distributions

• Mitigating these conditions by planting in favorable landscape positions and with shrubs that can buffer temperature and aridity extremes can increase survival .

Publication:

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