Drought Predictions and Spatial Models as Tools for Prioritizing Riparian Habitat Restoration

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ABSTRACT

Several models predict rising global temperatures will cause greater climatic variation in the southwest and increase drought severity. In the face of these changes, land managers need tools to coordinate conservation and restoration projects that will maximize benefits to biodiversity by enhancing migration corridors and maintaining viable populations of dominant forest trees. In the west, the impact of drought on native riparian forests is being aggravated by spatial competition with a variety of drought tolerant exotic species. This study combined field observations of population dynamics of cottonwoods (Populus angustifolia, P. fremontii, and P. deltoides, and hybrid crosses) during drought with potential niche models created under a variety of increased temperature and decreased precipitation regimes to create management suggestions to mitigate risks. Our method revealed the following 3 patterns: 1) We identified the most drought resilient and most susceptible areas across four states. This enables the identification of likely drought refugia deserving special protection, and vulnerable areas needing proactive attention. 2) Hybrid zones, areas of high genetic and associated community diversity, show greater drought tolerance than zones with parental species only. 3) The exotic tree Tamarisk (Tamarix spp.) is detrimentally impacting the distribution of cottonwood trees in a manner similar to climate. We argue that proactive management should coordinate across a large region to maintain corridors of native species, preserve areas capable of acting as climatic refugia, and mitigate compounding pressures in the most sensitive areas. Conservation water rights to maintain restoration projects through drought periods should be secured before remaining water resources are allocated to competing domestic and industrial applications.