Plasticity elicits resilience to future climatic changes in early establishment traits of a riparian tree

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Ecosystem restoration targets are increasingly citing higher resilience and adaptive capacity as desired project outcomes in response to the challenge posed by rapid climate change. One strategy to increase climate resilience in restored communities is to selectively harvest and transplant seed from regions that are historically similar in climate space to the projected future climate of the restoration site (assuming adaptation to local conditions). Here, to investigate the potential for climate-adaptive seed sourcing in the Warren Catchment of south-west Western Australia, we used a full reciprocal transplant experiment of the riparian tree, Eucalyptus rudis, to identify mechanisms of observed trait differentiation in natural populations across a 1200-550 mm per annum (mmpa) rainfall gradient. We reared seedlings under greenhouse conditions using seed sourced from across the rainfall gradient, before transplanting them to six sites where survival, growth and leaf traits were measured post-transplant (after six and 18 months). We show that E. rudis responds plastically when transplanted to drier climates: seedlings from high rainfall sites indistinguishable from low-rainfall sourced seedlings. Under wetter conditions, however, we identified inheritance of conservative growth traits in low-rainfall sourced seedlings. This effect was only detected in individuals transplanted 400 mmpa greater than their source, a shift in climatic space which exceeds projections to 2090 for our restoration sites. We demonstrate that while a dry-adapted provenance exists with the potential to enhance adaptive capacity in our restored sites, naturally high plasticity in early establishment traits elicits substantial resilience to future climatic changes without intervention.