

Climate change-adaptive participatory field gene banking for a California endemic oak

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Climate change and ongoing drought is causing extensive mortality of the endemic California blue oak (*Quercus douglasii*). Blue oaks form the foundational species in California oak woodlands and support over 300 wildlife species. Losing even individual trees from the southern edge of their range threatens the genetic diversity of this iconic species and may limit possibilities for future climate-adaptive restoration. Innovative restoration approaches are required for this species because acorns do not survive long-term seed banking. As the climate changes, the northern part of the blue oak range is likely to become a stronghold for this species' persistence.

We evaluated a novel approach to conserve drought-adapted blue oak genotypes through field gene banking in partnership with working ranches. In 2018 and 2019, we collected blue oak acorns from the southern edge and locations in the northern part of their range. To establish the gene bank and study the

efficacy of this novel technique, we paired southern edge plantings with acorns at 12 northern ranches where we collected the local acorns. We evaluated seedling performance after the first growing season by noting survival, measuring height and indications of leaf disease and herbivory.

Overall, translocated seeds survived well but had lower survival and growth relative to locals, yet they also experienced lower levels of leaf disease and herbivory, traits that could confer an adaptive advantage in a dryer, hotter future. The substantial early survival of translocated seeds suggests that field gene banking offers an effective means of preserving trailing edge genetic diversity for oaks, thereby maintaining genetic resources that could be critical for future climate change-adaptive restoration. We plan to steward and monitor the seedlings long-term to confirm survival and evaluate evidence of local adaptation.

Main Points

Climate change and drought threaten the endemic CA blue oak at the southern edge of its range.

High initial survival of translocated acorns at northern planting locations demonstrated the viability of field gene banking.

Initial survival was lower for southern edge seedlings, indicating possible mismatch in climate suitability, but resistance to disease and herbivory was higher.

McLaughlin, B., A Fogg, KK Ennis, G Halstrom, A Herrera, P Quadri. 2021. [Climate change-adaptive participatory field gene banking for a California endemic oak](#). Restoration Ecology doi: 10.1111/rec.13573