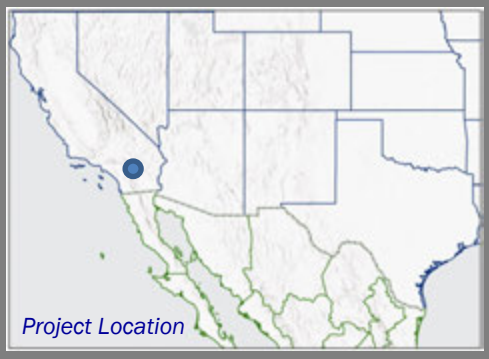
ACTIONABLE SCIENCE

Identifying Restoration Opportunities Under Mesquite Canopies

THE UNIVERSITY OF ARIZONA

Grasslands in southeastern Arizona and northern Mexico are threatened by climate change, drought, human development, overgrazing, and encroachment of invasive species including mesquite (*Prosopis* spp.) and Lehmann lovegrass (*Eragrostis lehmanniana*). However, the canopies of mesquites may also facilitate seedling growth by offering more nutrients for seedlings than areas outside canopies (Frost and Edinger 1991) and reducing competition with invasive grasses. Using long-term monitoring data from 2011, '14, and '17, University of Arizona researchers wanted to learn which plants grow best under mesquite canopies and how canopies impact abundance of Lehmann lovegrass at the Santa Rita Experimental Range (SRER) in southern Arizona.



Mesquite Savannah at Santa Rita Experimental Range/Elise Gornish/UAZ

KEY ISSUES ADDRESSED

Grassland managers and restoration practitioners lack empirical data on native grass growth under mesquite canopies. This limits restoration opportunities despite evolutionary theory and observational data supporting restoration potential. There is a lack of information on how landscape disturbances, like grazing and precipitation, impact opportunities to leverage mesquite canopies to restore native grasslands. Lehmann lovegrass appears to grow in reduced populations under mesquite, allowing native grasses to grow in greater densities. However, more data is needed for restoration practitioners to understand how mesquite canopies impact growth of native and invasive grasses.

PROJECT GOALS

- Better understand how mesquite cover impacts grasses, shrubs, and forbs
- Identify opportunities to leverage the effects of mesquite canopies on native plants for restoration purposes
- Compare the presence of Lehmann lovegrass under and outside of mesquite canopies

Native Grasses and Forbs in Grassland/ Linda Kennedy/Audubon

LOW GRAZING IMPACT

While other studies found that grazing impacts native grass growth, this study did not find a difference between grazed and ungrazed areas, possibly due to the moderate numbers of cattle on the land.

PROJECT HIGHLIGHTS

Lovegrass Does Not Love Canopies: Overall, researchers found Lehmann lovegrass in lower densities under mesquite canopies than they were outside of it.

Rare Species Found Under Mesquite: Due to less Lehmann lovegrass, rare plant species tend to be found in greater proportion under mesquite canopies.

Not Every Plant Likes Mesquite: Some plants, such as large spike bristlegrass (*Setarai macrostachya*) and burrow goldenweed (*Haplipappus tenuisectus*), were found in greater quantities under mesquite but decreased once they reached a density of 35%. Canopies are only so helpful for certain plants.

Grasses and Shrubs Benefit the Most: Researchers found forbs under mesquite in 3.5% of cases compared to grasses and shrubs (95.1% and 83.7% under mesquite respectively).

Mesquite Increases Diversity, Decreases Biomass: Although mesquite canopies can provide a beneficial environment for rare plants and native grasses, total herbaceous production decreased as canopy cover increased. Short rooted annuals may fare better under mesquite canopies, especially as plant density decreases with mesquite growth over time.

Collaborators

- University of Arizona
- Santa Rita Experimental Range

LESSONS LEARNED

Leveraging mesquite canopies for grassland restoration is particularly applicable to smaller landscapes. Seeding methods used for large areas, like aerial seeding, cannot use a different seed mix under canopies versus in the spaces between mesquites, making leveraging canopies difficult.

Researchers suggest that when considering what to plant under canopies, start with what you see. The use of empirical data can help reinforce observations about the best plants to use when planting grasses under mesquite canopies.

Factors other than the presence of mesquite canopies, like precipitation, may influence restoration success. If there is no rain, then plants will be unable to grow. When researchers tried to use experimental data to support long-term observational data, drought prevented any seeds from establishing.

Long-term data from the SRER is available to all and can be a powerful tool to help managers make informed decisions. With the right analytical expertise, long-term data can help managers see beyond seasonal trends and develop restoration techniques for long-term results.

NEXT STEPS

- Conduct experiments that test seeds under mesquite to supplement long-term data findings.
- Test seeding methods using seed balls versus naked seeds in restoration. Canopy conditions could mitigate the need for seed balls, but further testing is needed.
- Determine best density of mesquites to maximize opportunities for grassland restoration success.

For more information on this project, contact Elise Gornish: egornish@arizona.edu

Researchers Using a Quadrat in the Field/Steve Sesnie/USFWS

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