# RESTORATION

Proactive Management for Velvet Mesquite Encroachment in Sonoran Grasslands

THE UNIVERSITY OF ARIZONA

Mesquite (*Prosopis spp.*) is common in drylands across the southwestern U.S. and Northern Mexico. Velvet mesquite (*Prosopis velutina*) cover has increased in Sonoran grasslands over the last 100 years. Mesquites can outcompete native grasses for water resources, which can reduce grass cover and increase erosion. Common mesquite encroachment management techniques, such as herbicides and mechanical methods, are reactionary and cost land managers vital time and money. Researchers at the University of Arizona studied the factors that lead to mesquite encroachment into grasslands. This knowledge helps landowners identify areas at risk of future encroachment and develop proactive management techniques.

Project Location

Study site at the Santa Rita Experimental Range/Jeff Gillan/UA
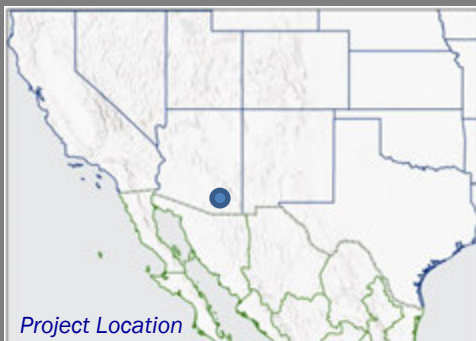
KEY ISSUES ADDRESSED

Managers currently have limited access to tools that evaluate the risk of future mesquite establishment in grasslands. Additionally, there is little research on the ecological conditions that favor establishment of mesquite seedlings. There is also a lack of research on how grazing and predation by wildlife impacts mesquite seedling establishment in grasslands. Research on the impact of cattle grazing has mainly focused on seed dispersal, little on resource competition. Impacts of rodent and ant predation on mesquite establishment are largely unknown. Improving our understanding of how environmental factors and seedling predation controls mesquite establishment can help develop proactive management strategies.

PROJECT GOALS

- Develop the Shrub Encroachment Early Detection System (SEEDS) model to help predict areas at highest risk of encroachment
- Understand the ecological drivers of mesquite seedling establishment in grasslands
- Study mesquite seed and seedling predation by rodents and ants, and the impacts of cattle on mesquite seedling establishment

MESQUITES BEAT DROUGHT

Mesquite can establish even during drought because it is the number of consecutive days of rain, not total rainfall over the season, that determines mesquite establishment.
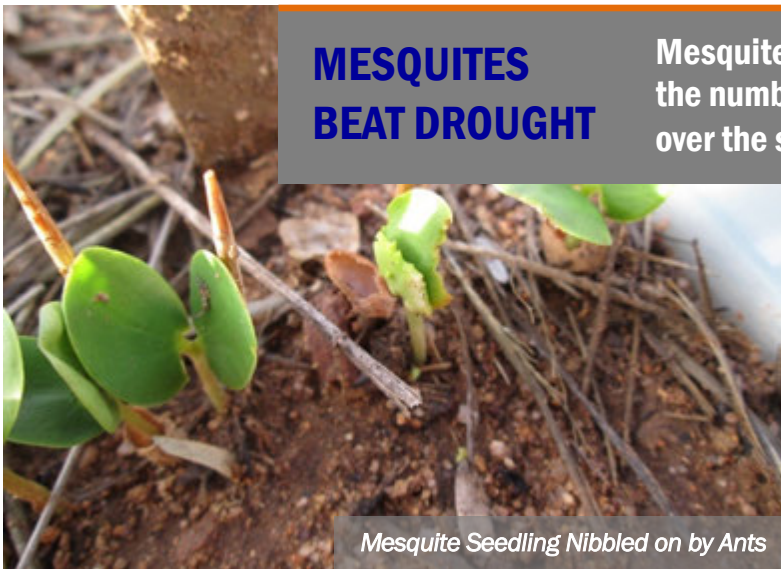
Mesquite Seedling Nibbled on by Ants

PROJECT HIGHLIGHTS

Computer Models to get Ahead: Researchers developed a new model called SEEDs that assessed environmental conditions to learn where mesquite encroachment was high and identify areas at risk for future mesquite encroachment.

Evaluate Mesquite Cover Risk: Across the study region, 45% of the land area was at moderate to high risk of mesquite encroachment. Areas with high-clay soils and low precipitation prevented the most mesquite encroachment. Areas with the highest mesquite cover were near mountain foothills and washes.

Mesquite Seedling Establishment: The most important factor for mesquite establishment was having more than 8-10 consecutive days of rain during monsoon season.

Impacts from Rodents and Ants: Seedling establishment was lowest when rodents and ants were able to forage the seedlings, but foraging of mesquite by seedling predators was not enough to prevent mesquite establishment on its own.

Grazing Impacts: Researchers simulated the impacts of grazing on the seedlings by clipping surrounding grasses short, but this did not change seedling establishment .

Collaborators

- University of Arizona
- Altar Valley Conservation Alliance
- The Nature Conservancy
- Pima County

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LESSONS LEARNED

Managers and landowners must plan for the continuous establishment of mesquite on their land. Typical dryland ecosystem dynamics suggest plants establish during the wettest periods, but mesquite can establish even during drought. Mesquite prefers areas of moderate rainfall and soils lower in clay content, especially near washed, but can establish readily in upland areas. Periodic control and management are needed regardless of environmental conditions. A deeper understanding of abiotic and biotic site conditions can highlight what techniques to use and when. For example, SEEDs modeling at the landscape-scale indicated mesquite shrubs can re-establish relatively quickly post-fire (5-10 yrs). Also, fire can prove useful to kill young seedlings. Using SEEDs, landowners can evaluate a treatment like prescribed fire and it's effective timing to achieve specific conservation goals. Proactive management is financially beneficial in the long term. The model's 'risk categories' take environmental data from the past and present landscape and help identify areas of future mesquite growth. SEEDs can pinpoint areas that need more attention. The foresight can reduce the cost of mesquite management by allowing managers to prioritize where to allocate resources.

NEXT STEPS

- Expand the geographical range of SEEDs to incorporate more information relevant to the entire region
- Develop a web app so landowners can use SEEDs data to evaluate their land and plan appropriate management strategies

For more information on this project, contact Austin Rutherford: **arutherford@email.arizona.edu**

Mesquite Seedling Protected from Rodent and Ant Herbivory