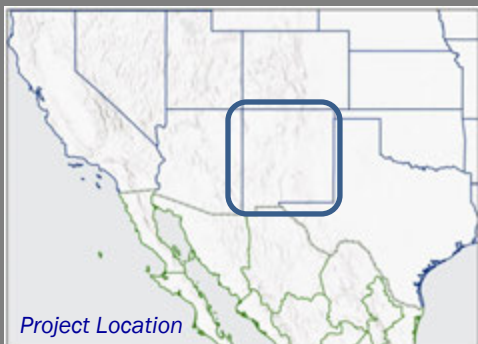


RESTORATION

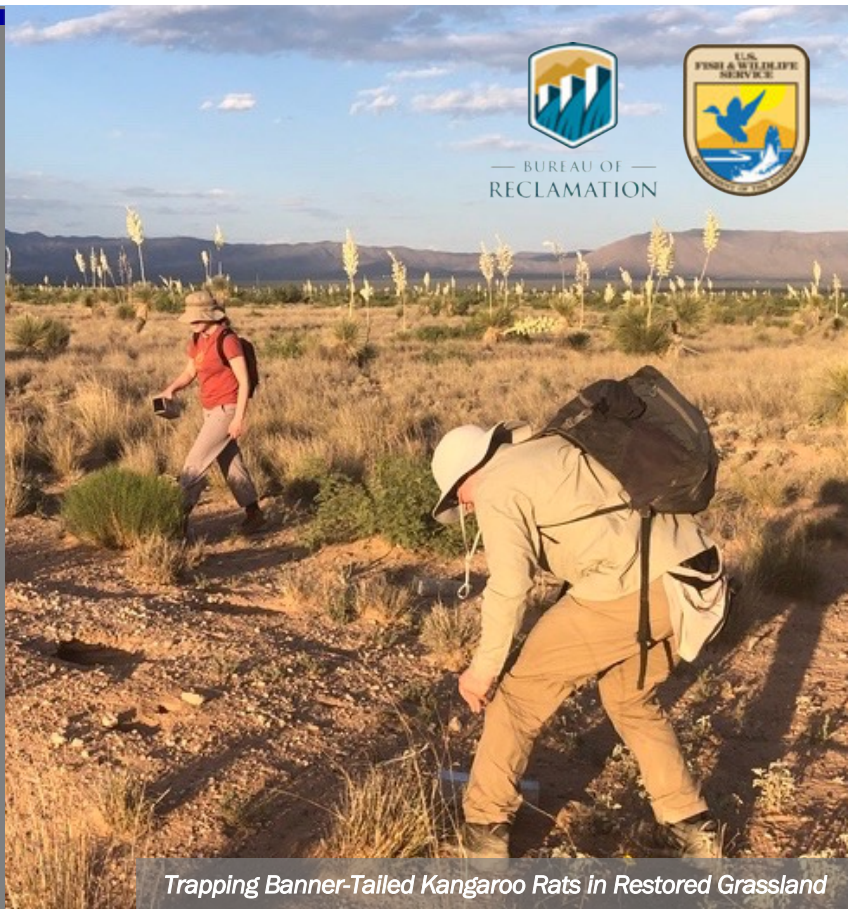
Restore New Mexico: Effects of Grassland Restoration on Banner-Tailed Kangaroo Rats



Banner-tailed kangaroo rats (*Dipodomys spectabilis*) inhabit New Mexico's Chihuahuan Desert. Listed as Near Threatened by the IUCN Red List, banner-tailed kangaroo rats are important in maintaining Chihuahuan Desert grasslands as a keystone species and ecosystem engineers. Shrub encroachment caused by overgrazing, reduced fire frequency, and drought has reduced banner-tailed kangaroo rat populations. The Bureau of Land Management (BLM) initiated the Restore New Mexico (RNM) Collaborative Monitoring Program in 2005 to restore the Chihuahuan Desert's grasslands using shrub-specific herbicide treatments. Researchers leveraged these treatments to determine if and why banner-tailed kangaroo rats returned to treated areas.



Project Location



Trapping Banner-Tailed Kangaroo Rats in Restored Grassland

KEY ISSUES ADDRESSED

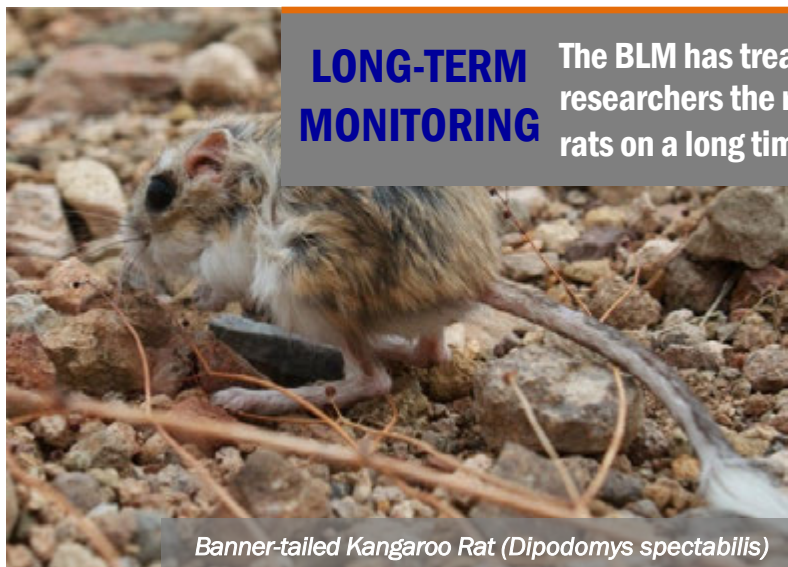
Banner-tailed kangaroo rat populations have declined due to ongoing shrub encroachment and several factors limit their ability to return to treated areas. Sandy soils and lack of abandoned mounds are small-scale constraints; sandy soils do not have structure to hold mounds together, and banner-tailed kangaroo rats prefer to use abandoned mounds over building a new one. The distance between shrub treatments is an important large-scale constraint because kangaroo rats have low dispersal ability and require high connectivity between old and newly restored areas. There can be a 10-year time lag or longer between treatment and return of banner-tailed kangaroo rats, who may also experience genetic founder effects due to dispersal from small source populations.

PROJECT GOALS

- Assess constraints on kangaroo rat response to restoration and time to return to treated areas
- Understand the role of banner-tailed kangaroo rats as keystone species and ecosystem engineers
- Communicate importance of banner-tailed kangaroo rats as indicators of restoration success to project partners

LONG-TERM MONITORING

The BLM has treated areas with herbicide since the 1980s, giving researchers the rare opportunity to research banner-tailed kangaroo rats on a long time-scale.



Banner-tailed Kangaroo Rat (*Dipodomys spectabilis*)

PROJECT HIGHLIGHTS

Ecosystem Engineers: Researchers found that banner-tailed kangaroo rats are important for the functioning of the overall grassland ecosystem by creating habitat heterogeneity, or diversity, with their mounds and selective consumption of seeds and grasses. Habitat heterogeneity allows more species to coexist in the same area, increasing species diversity.

Keystone Species: Researchers found that banner-tailed kangaroo rats are a keystone species and indicators of restoration success because of their interactions with other species. For example, mounds provide shelter for grassland lizards, whose populations are low at restoration sites with few mounds.

Connectivity and Treatment Age: The density of banner-tailed kangaroo rat populations is dependent on grassland connectivity and treatment age. The highest density is at older treated areas with high connectivity to other treated areas and source populations of banner-tailed kangaroo rats, meaning populations will benefit from increased connectivity over time. Further, there is no evidence of genetic founder effects.

Partnership with BLM: Researchers conducted their banner-tailed kangaroo rat research in partnership with the BLM's ongoing RNM project. They established plots for long-term monitoring and communicated their findings directly to the BLM.

Collaborators

- See online for full list of Collaborators

Brianna Flood, Northern Arizona University, March 2022. Photos courtesy of Bradley Cosentino/Hobart & William Smith Colleges. For more information on CCAST, contact Genevieve Johnson (gjohnson@usbr.gov) or Matt Grabau (matthew_grabau@fws.gov).

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LESSONS LEARNED

Designing this experiment with a multi-scale perspective was important in understanding how RNM herbicide shrub removal treatments are influencing banner-tailed kangaroo rat populations. Researchers observed small- and large-scale constraints on the ability of banner-tailed kangaroo rats to return to treated areas and kangaroo rat populations at restoration sites up to 29 years old. Without long-term monitoring, researchers would not have realized the 10-year time lag between treatment and return of banner-tailed kangaroo rats.

Researchers reframed what successful restoration looks like. Most treated areas have some remaining shrub cover, creating savannah-like habitat instead of a grassland habitat. Researchers accepted this new habitat as restoration success because banner-tailed kangaroo rats still responded positively to it.

It was important for researchers to have meaningful connections and engagement with the BLM, which allowed them to conduct their research on banner-tailed kangaroo rats in partnership with RNM shrub treatments. Further, they informed BLM managers on the importance of banner-tailed kangaroo rats as indicators of the program's relative success.

NEXT STEPS

- Research behavioral constraints affecting the return of kangaroo rats to treated areas
- Investigate the potential effects of treated shrub "skeletons", the remains of dead shrubs, on the return of kangaroo rats to treated areas
- Project how climate change could affect kangaroo rat distribution over time

For more information on this project, contact Robert Schooley: schooley@illinois.edu



Shrub Encroached Grassland After Herbicide Treatment