



The Power of Rocks

Ecohydrology Improvements for Scaled Quail Habitat Restoration

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Photos courtesy of **BORDERLANDS RESEARCH INSTITUTE**



Undergrads from Sul Ross State University helped BRI researchers construct trincheras at a private property in Brewster County. Nearly 150 of these structures were set and assessed during 2022 and 2023.

The scaled quail, also known as blue quail, is an iconic game bird species found within the desert grasslands of the Southwest United States and Northern Mexico. In Texas' Trans-Pecos region, scaled quail are a vital indicator species of healthy rangelands.

Unfortunately, their numbers in Texas have declined over the past decades. Efforts have been made to improve scaled quail populations, primarily by providing food using feeders and water from artificial sources. However, these management actions only address two components of the scaled quail's requirements, and uncertainty remains about whether or not these are sustainable methods to address population stability and survival, leading us to investigate additional strategies.

Good habitat conditions provide the necessary quantity and quality of food for quail, including a seasonal variety of seeds, lush and rich vegetation, and insects. Insects are essential for quail during egg laying and brooding season because they are a good source of protein and help with the birth rate and development of new offspring.

Additionally, proper vegetation provides shelter from predators and protec-

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After two years, a significant amount of sediments were trapped by the trincheras. Monitoring will continue to assess plant cover changes and soil accumulation patterns.

tion from extreme high and low temperatures. The most desirable habitat for scaled quail provides a diverse combination of shrubs, forbs, and grasses with a variety of food and shelter options.

Rangeland degradation is one of the leading causes of the decline in scaled quail populations. Overgrazing and changes in land use are the leading causes of rangeland degradation in the Trans-Pecos region of the Chihuahuan Desert. Habitat mismanagement has reduced plant cover that would otherwise protect the soil from sun radiation and intense rainfalls.

These environmental agents promote removing topsoil layers that contain nutrients and sediments the plants need. These processes increase sediment runoff, reducing soil moisture and preventing water infiltration. The eroded material is transported downstream to creeks, rivers, and other water bodies, most likely creating pollution problems.

To improve habitat conditions for scaled quail, we must address soil erosion by controlling the movement of soil sediments and increasing surface water availability. Soil erosion control techniques implemented in arid rangelands include reseeding and using K-lines, wattles, and terraces.

To treat riparian areas, trincheras, which means rock dams in Spanish, have become popular because of their simple construction. They are constructed from materials found at the restoration site without using heavy equipment.

Trincheras are simple. Instead of relying on a perfect design, they are functional. Their presence triggers a resilient process that may improve the system's ecohydrological interactions and enhance plant growth and cover.



Although trincheras have been used along the western United States and Northern Mexico, research is needed to estimate their benefits. When constructing trincheras, we want to understand which areas are more likely to increase in soil sediment retention and plant cover, as well as what drives these outcomes.

To answer some of these questions, the Borderlands Research Institute (BRI) is conducting research on a private ranch in Brewster County, Texas, where nearly 150 trincheras have been built. We assessed soil accumulation at the trinchera sites for two years from 2022 through 2023 during the August to September rainfall season.

Construction of the 150 trincheras started upstream and went downstream. It was important to choose areas where rock was abundant, available, and easy to transport to the riparian areas. Additionally, we ensured that no material was taken from the creek's channel because those rocks were stabilizing the channel. We established the rock structures across the channel, putting

bigger rocks first and smaller ones on the outer and upper portions of the structures, reaching a height of nearly 1.5 feet.

To measure soil capture, we installed six rebars at each trinchera, four on the upstream side and two on the downstream side. Each bar was separated from the other by 1.5 feet.

This alignment of rebars created a 10-foot straight line with gauge stations crossing the trincheras on both sides. Rebars were buried 4 inches below the surface and exposed 20 inches above the surface. In this manner, we can measure if the rebar is being covered by sediments or exposed due to soil removal by the runoff.

After data were collected and analyzed, we found significant sediment accumulation at distances up to and beyond 6 feet upstream from the trincheras. At these upstream locations, average sediment accumulation was around 5 inches.

Also, we observed negligible loss of sediments downstream to a distance of 1.5 feet from the trincheras, less than 0.5

inch on average. Variability in the capture of soil sediments may be related to stream features like slope, soil type, and channel size.

While this study will help us better understand how trincheras can enhance soil retention and aid in establishing plants, two years of monitoring is likely not long enough to see tangible changes in plant cover in the influenced areas. In arid rangelands, scarce annual precipitation slows plant growth and recovery.

This study can guide placement and expectations of ecohydrology improvements, leading to more effective scaled quail habitat restoration. Trincheras are a tool to promote soil retention, plant production, and ground cover by increasing soil deposition in riparian areas.

People have used rocks for thousands of years for many things including building shelters and making tools. Thanks to their widespread availability, abundance and low cost, rocks still have something to offer us in this modern world. 🌍



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