



Winter Habitat Selection and Movement Behavior of Scaled Quail in the Trans-Pecos

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Photo by JD McCleary

Scaled quail face a challenging environment during winter in the Chihuahuan Desert due to reduced food, cover, and periodic climate extremes that threaten hypothermic exposure.

Scaled quail (*Callipepla squamata*) is a species susceptible to seasonally limiting environments. Occupying grassland-shrub habitats of the Chihuahuan Desert and its adjacent regions, scaled quail hold ecological and economic significance as a prey item in grassland trophic communities and as a contributor to local revenue through hunting. Unfortunately, scaled quail have experienced declines since the 1960s, primarily due to habitat degradation from historic overgrazing and changing land use practices.

Scaled quail populations are heavily influenced by precipitation, driving vegetation growth that supports reproduction and survival. This effect is tied to the boom-and-bust population trend for scaled quail, where populations increase following above-average rainfall and decline during drought. The scaled quail's ability to maximize the benefits of rainfall and withstand drought is compromised when the habitat becomes degraded.

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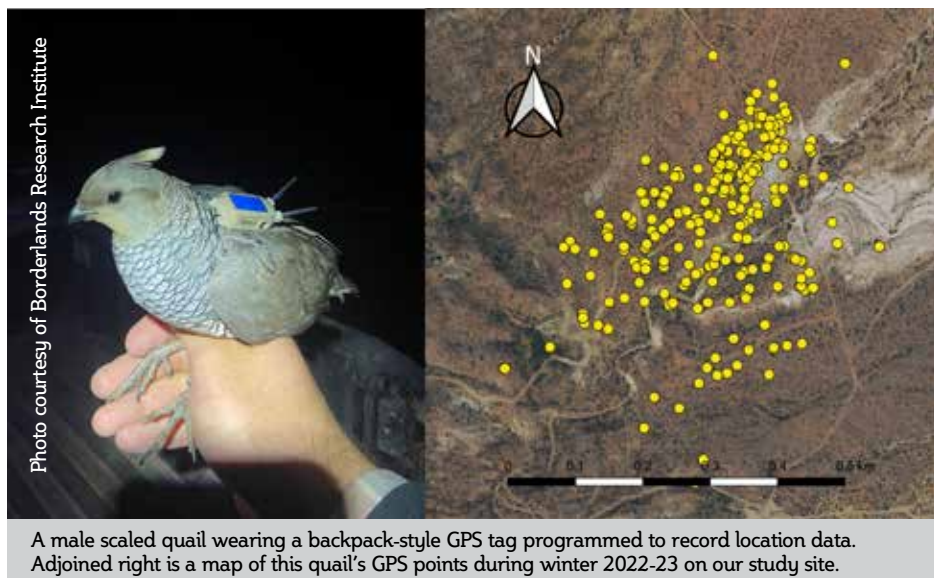


Photo courtesy of Borderlands Research Institute

A male scaled quail wearing a backpack-style GPS tag programmed to record location data. Adjoined right is a map of this quail's GPS points during winter 2022-23 on our study site.

Desertification, woody shrub encroachment, and invasive grasses have altered the magnitude of the positive and negative conditions scaled quail experience. This makes population “booms” less eruptive and population “busts” more severe, resulting in declines.

Habitat quality becomes critical in resource carryover from the growing season into winter. Chihuahuan Desert winters are characterized by low moisture, reduced plant growth, and periodic winter storms. This presents scaled quail with reduced food and cover amid occasional extreme temperatures, increasing predation, starvation, and climatic exposure risks.

As native grassland-shrub ecosystems are degraded, the impact of these challenges increases, exaggerating seasonal limitations beyond scaled quail's adaptive tolerance. This raises questions regarding how scaled quail respond to this challenging seasonal period.

Literature on other quail species suggests habitat selection and movement behaviors reflect their responses to winter conditions. Monitoring these behaviors has captured reduced movement during winter storms, use of supplemental resources, and selecting microhabitats that enhance habitat quality.

Such monitoring could similarly capture scaled quail's response to winter conditions and identify properties of their preferred winter habitats. Unfortunately,

little research attention has been paid to scaled quail's spatial behavior during Chihuahuan Desert winters.

We monitored scaled quail in southern Brewster County, Texas, during the winter 2022-23 to describe their spatial response to winter landscapes. We fitted 37 scaled quail with backpack-style Global Positioning System (GPS) tags that collected a GPS location every two hours during daylight hours, giving us eight GPS locations daily.

These locations and the movements between them were then described using their underlying environmental variables. These include topography, vegetation greenness, distance to the nearest supplemental feeder, and ambient temperature.

Scaled quail selected for supplemental feeders, moderate values of greenness and slope, and concave landscape features such as drainage features during winter. Vegetation greenness had the largest effect on selection, as increases in greenness increased the odds of scaled quail selecting a location.

Movement behavior was impacted by distance to a quail feeder, which tended to reduce movements as scaled quail were closer to a feeder. Interestingly, our results do not suggest scaled quail's movement behavior was affected by cold temperatures. However, this could be a product of a mild winter and the coarse resolution of our climate data.

The effect of quail feeders on movement could suggest they offer fitness benefits. Winter food shortages prompt quail to expand their ranges and expend more effort locating food, producing energy deficits, and increasing the risk of detection by predators.



Photo courtesy of Borderlands Research Institute

An example of accounting for hydrology in habitat management for scaled quail. Here a straw wattle is placed in a drainage feature to slow runoff, increasing soil moisture to enhance prospects of native reseeding efforts.



Reduced movement near feeders suggests access to supplemental feed reduces feeding effort, improving foraging efficiency and reducing exposure to predators. While this infers fitness benefits, we did not examine the direct impact of feeders on survival in this study.

Despite low vegetation greenness during winter, scaled quail expressed a strong selection for moderate values of available greenness. As greenness measurements can represent a combination of vegetation vigor and density, this finding is consistent with scaled quail's known habitat preferences. The highest greenness values observed in our study represented dense brush stands, which scaled quail generally avoid due to their preference for lower shrub densities and sufficient bare ground to allow movement on foot.

Scaled quail's high selectivity for optimum greenness values reveals the importance of residual vegetation during winter, as high selection strength for a resource often reflects its low availability. It follows

that habitat degradation could have its highest impact during winter, manifesting in extreme resources reductions following winter vegetation phenology. This illustrates the importance of land use practices that conserve vegetation reserves during growth periods, as this helps secure habitats for scaled quail in winter.

Selection for drainage features reveals the topography's influence on winter habitats. Many of scaled quail's optimum greenness values overlaid hydrologic features on the study site. Features that concentrate runoff often can enhance habitat quality in desert ecosystems where moisture is limiting.


Greater vegetation growth along these features makes them conducive to greater carryover of food and cover into winter. Thus, drainage features could constitute microhabitats that improve habitat quality from the surrounding landscape.

Literature suggests microhabitats are becoming critical for the persistence of many species facing threats of habitat deg-

radation and changing climate. Hydrologic features could similarly facilitate microhabitats that support scaled quail amid the degradation of their native habitats.

Our results suggest land use practices that retain native grassland-shrub habitats can support scaled quail during winter. Such practices include light to moderate grazing, brush management, and invasive grass control. Additionally, providing supplemental feed in concert with habitat management could help mitigate the energy limitations scaled quail experience during winter.

Scaled quail managers should also consider local hydrology when conserving and enhancing habitat in arid landscapes. Using hydrology as a management tool, conservation efforts can be refined and directed to landscape features that will maximize the output of applied strategies by increasing available moisture. This can boost the potential of these efforts to provide habitats that support scaled quail through this challenging time of year. 🌱



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