Kit Fox Surveys and Distribution in the Trans-Pecos

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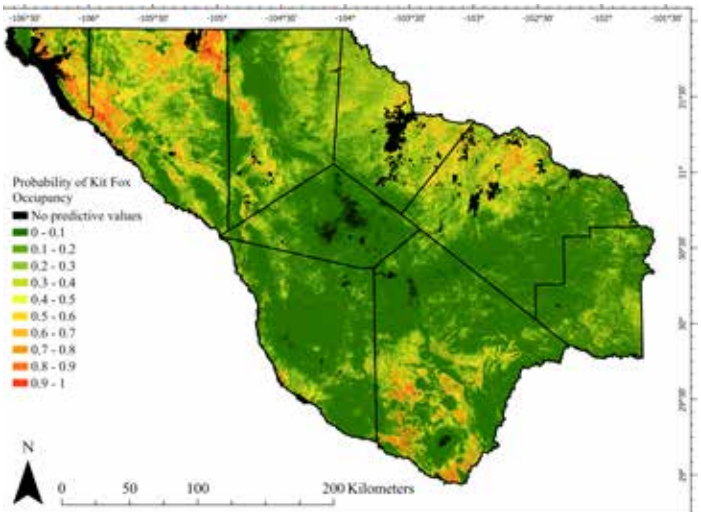

Preliminary map of the predicted distribution of kit fox in Texas' Trans-Pecos region based on the results of camera trap surveys and occupancy models.

The kit fox (*Vulpes macrotis*) and the closely related swift fox (*V. velox*) are among the smallest members of the American canids. Adults of both species weigh in at approximately 5 pounds and are noticeably smaller than the more common gray fox (*Urocyon cinereoargenteus*), which averages about 8 pounds.

While similar in appearance, kit and swift foxes are separated geographically. Kit foxes occupy the arid regions of the western United States (from southwestern Oregon through California and eastward through Nevada, Utah, Arizona, New Mexico and western Texas) and northern Mexico, whereas swift foxes occupy the shortgrass and mixed-grass prairies of the Great Plains, including the Texas Panhandle.

Despite their wide distribution across the American southwest, very little research has been conducted on kit foxes in Texas, resulting in a lack of knowledge on their distribution, density, habitat preferences and population health. This information gap has largely contributed to the suspicion that kit fox populations in the Trans-Pecos may be declining similar to the trends of the more studied swift fox populations in the Texas Panhandle.

In historical surveys, swift foxes occupied 79 counties in the state; however, in surveys from the late 90s and again from 2005 to 2007, swift foxes were only found in two counties. This drastic decline is thought to be the result of the loss and fragmentation of habitat due to urbanization and crop development, as well as the effect of coyote predation. Because of the similarities between the kit fox and swift fox, in terms of reported habitat preferences from other populations and the close proximity of the two populations in Texas, biologists echoed concerns that the kit fox population in Texas may also be experiencing population declines.

To help fill some of the gaps in knowledge, the Borderlands Research Institute (BRI) in collaboration with Texas Parks and Wildlife Department (TPWD) conducted a study to investigate the distribution of kit foxes in the Trans-Pecos. We surveyed for the species using motion-triggered trail cameras in areas most likely to be occupied (grasslands with less than 5 percent slope) on private and public lands across the nine Trans-Pecos counties.

From March 2018 to March 2020, we conducted 772 baited camera surveys that averaged 14 days each, totaling over

Kit fox detected by a motion-triggered camera trap. The stake serves as a size reference in photos when identifying species, as well as an elevated platform for the predator scent lure.

10,000 trap nights. We collected 339 one-hour independent photos of kit foxes (photos of kit foxes taken within the same hour were only counted once) that spanned across seven counties: Culberson, El Paso, Hudspeth, Jeff Davis, Pecos, Presidio and Reeves.

We used the observations from photos along with the environmental and temporal covariates in occupancy models to estimate kit fox detection and occupancy at survey sites. We chose this analysis because survey techniques, including spotlight surveys or camera trap surveys, are imperfect in their ability to detect a species, meaning that a non-detection does not necessarily mean the species was absent. Strategically placing survey cameras along trails, in suitable habitat, or deploying scent lures can increase the chances of detection, but animals in the area may still go undetected.

Occupancy models allow us to compensate for imperfect detection by estimating the species "detectability" using the presence/absence data obtained over repeated occasions within a survey. The model then incorporates the estimated detection probability to more accurately estimate the probability that the species occupies the site. Additionally, different factors may influence the detection of a species (time since a site was baited) or may influence the probability that a species occupies a site (amount of shrub cover); occupancy models also allow users to incorporate the potential influence of such aspects into the model.

We used a temporal dataset representing the number of three-day periods that had passed since survey setup to estimate kit fox detection and spatial datasets representing terrain slope, elevation and both the height and density of vegetation to estimate kit fox occupancy. We found that the probability of detecting a kit fox was greatest at the beginning of the survey, possibly due to the scent lure losing its effect over time or the novelty of the camera site decreasing over time.

The probability of kit fox occupancy increased as all four environmental factors decreased, meaning that kit fox are more likely to occupy flat areas at lower elevations that have shorter and less dense vegetation. These results align with those found during similar kit fox surveys in other states. Based on these parameters, we predicted the potential distribution of kit foxes across the Trans-Pecos. The resulting distribution map can be used by TPWD biologists to better understand where kit foxes are most likely to be found in the region, what habitats they are likely to occupy and the spatial distribution of those habitats.

Survey efforts for this project were widely distributed across the Trans-Pecos region. Large-scale efforts such as this teach us about the overall distribution of the species but leave many finer-scale questions about kit foxes unanswered. Based on the success of our surveys and predicted occupancy model, we now know that kit fox range widely throughout the Trans-Pecos. However, there is still much to learn about these small, unique desert animals, including their local densities, how urbanization and habitat changes affect their local distribution, and how they co-exist with other species. Understanding these aspects will allow biologists to monitor population changes over time and focus management efforts where they will have the greatest impacts.