# USE OF HIGHWAY CROSSING STRUCTURES BY KIT FOXES

PREPARED FOR THE CALIFORNIA DEPARTMENT OF TRANSPORTATION


Prepared by:
Samantha Bremner-Harrison[1], Brian L. Cypher[1], Craig M. Fiehler[1],
Anthony P. Clevenger[2], and David Hacker[3]

*[1]California State University, Stanislaus*
*Endangered Species Recovery Program*
*1900 N. Gateway #101, Fresno, CA 93727*

*[2] Western Transportation Institute*
*University of Montana, Bozeman, MT, 59717*

*3 California Department of Transportation*
*50 South Higuera, San Luis Obispo, CA 93401*


August 2007

## EXECUTIVE SUMMARY

San Joaquin kit foxes (*Vulpes macrotis mutica*) are Federally Endangered and California Threatened, primarily due to profound habitat degradation and loss. Roads potentially contribute to habitat fragmentation by creating barriers to animal movements. However, structures such as culverts, underpasses, and overpasses could mitigate fragmentation effects by providing road crossing opportunities for foxes.

We conducted a field investigation from 18 July 2005 to 21 June 2006 to determine (1) whether kit foxes use existing structures to cross highways, and (2) whether foxes exhibit any preferences among structure designs. The overall goal of this effort was to provide the California Department of Transportation with information that would contribute to mitigating impacts to kit foxes from four-lane divided highways. Data were collected at 3 study sites in Kern County: a 2-mile segment of Interstate 5 (I-5), a 20-mile segment of State Route 14 (Rte 14), and an 8-mile segment of State Route 58 (Hwy 58). Eight structures were monitored along I-5, 17 along Rte 14, and 21 along Hwy 58. Use of structures by kit foxes and other species was monitored using track stations established at the ends of structures and motion-activated digital cameras placed within structures. Additionally, hair sampling traps were deployed in each study site to collect genetic samples and weekly surveys were conducted at each site to locate any animals killed by vehicles on the roads.

In 1,542 track-station-weeks, kit fox tracks were detected 12 times at Hwy 58 and 7 times at I-5. However, kit fox tracks were always detected at only one end of a structure indicating that the foxes had not crossed through the structure. Tracks of at least 16 other species were detected as well. In 1,227 camera-station-nights, at least 9 species were detected within crossing structures, but no kit foxes were detected. No kit fox hair samples were collected in 248 trap-weeks. One vehicle-killed kit fox was found at Hwy 58 and another was found at Rte 14.

Kit fox presence was confirmed on all 3 study sites. However, during the 11-month period of data collection, no kit foxes were detected using crossing structures at any of the sites. We hypothesize that kit foxes may associate increased predation risk with the structures because of the relatively confined space within most structures. One caveat is that we were not able to effectively monitor very large structures, such as areas under bridges that crossed over large drainages, and it is possible that foxes use these crossing structures.

The two vehicle-killed kit foxes in conjunction with the lack of detections in the crossing structures indicated that foxes appear to be avoiding the structures and simply attempting to cross the roads. No exclusionary fencing or median barriers were present at the study sites to inhibit crossing attempts. Despite the two dead foxes, it is highly likely that some foxes successfully cross the roads, particularly because the foxes are nocturnal and likely attempt most crossings at night when traffic volumes are lower. Thus, these highways may not be functioning as barriers to genetic flow, and if mortality from vehicles is not excessive, then demographic flow is being maintained as well.

Plans to expand 2-lane roads to 4-lane divided highways within the range of the San Joaquin kit fox commonly include the installation of median barriers, which could trap foxes in traffic if they attempt to cross these highways. Along these highways, fencing is

recommended to prevent foxes from accessing the roads and also to direct foxes to crossing structures. Optimal crossing structure designs for kit foxes are still unknown, but generally such structures should be as large as feasible and provide an unobstructed view of habitat on the opposite side. Also, artificial dens should be installed within structures and near entrances to provide escape cover for kit foxes. Additional research is recommended to determine whether kit foxes indeed are routinely crossing 4-lane highways successfully or are primarily avoiding crossing attempts.

## ACKNOWLEDGEMENTS

Funding for this project was provided by the California Department of Transportation (Caltrans). We appreciate assistance from Gregg Erickson and Jennifer Gillies at Caltrans. We also appreciate field assistance from ESRP staff Stephen Harrison, Alex Brown, and Christine Van Horn Job. Cheryl Johnson of the Kern Water Bank Authority provided access to the Kern Water Bank property and monitoring reports. Scott Phillips of ESRP prepared the figures for this report and assisted with final formatting.