National Center for Sustainable Transportation

Do Roads Affect Coyote and Gray Fox Movement Equally? A Case Study in Northern California

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POLICY BRIEF

Issue

Roads can have unintended effects on wildlife populations, such as causing direct mortality through animal collisions with cars, changing animal behaviors or distributions from traffic disturbance (e.g., noise, lighting), and fragmenting habitat.[1] Roads may also act as barriers to wildlife movements, which prevents populations on either side from exchanging genes. Over time, wildlife populations isolated by barriers will lose genetic diversity, a process associated with an increased risk of extinction.

Recent studies have explored the effect California highways have on wildlife genetic diversity. In 2016, a team from the University of California Davis (UC Davis) examined movements of coyotes across the I-80 and SR 50 highways in the Sierra Nevada and the I-580 and I-680 highways in the Bay Area.[2] This study found no evidence that the highways were limiting exchange of genes for coyotes in either of the two regions. However, a study published in 2006 examining coyote movements across U.S. 101 in Southern California did find evidence that the highway serves as a significant barrier to coyote gene flow.[3]

Other studies have shown that a road can have different effects on different species. For example, the same stretch of the Trans Canada Highway acts as a significant barrier for grizzly bears but not for black bears because grizzly bears are more likely to avoid human disturbances associated with roads.[4] To better understand this dynamic in Northern California, UC Davis recently completed a study examining whether State Route 49 (SR 49), a road initially constructed during the Gold Rush era, acts as a barrier to movements of two similar species with different tolerances to human activity, the coyote and gray fox. Coyotes are habitat generalists, meaning they can thrive in many habitats including urban settings.[5, 6, 7] Gray foxes, on the other hand, are habitat specialists that are restricted to mid-elevation scrublands.[8, 9] To determine whether SR 49 was a barrier to gray fox and coyote movements, genetic samples were collected from 19 coyote and 90 gray fox on either side of SR 49 between the cities of Auburn and Grass Valley (Figure 1).

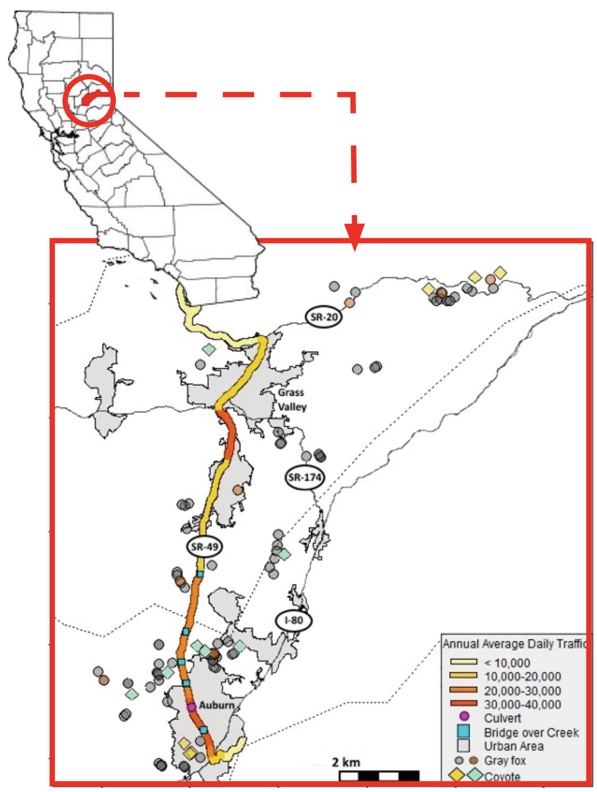

Figure 1. Map of study area, Annual Average Daily Traffic volumes along State Route 49, and sample collection locations of genotyped gray foxes and coyotes. Colors indicate the genetic cluster assigned during the STRUCTURE analysis.

Key Findings

The UC Davis-led study found high genetic diversity for both coyote and gray fox on either side of SR 49. There are no genetic differences between coyote or gray fox sampled on opposite sides of the highway, suggesting that SR 49 does not act as a barrier to gene flow for the disturbance-tolerant coyote or the disturbance-averse gray fox. In fact, gray fox was found to be abundant throughout the study area, even in urban areas, suggesting that the species may be less tied to undisturbed habitat than previously thought.

There are several possible explanations for these results. First, coyotes and gray fox may be able to traverse SR 49 under bridges or cross the road surface directly during times of low traffic. Alternatively, SR 49 and other Sierra Nevada highways studied in 2016 might be barriers to dispersal but haven't been in place long enough for signatures of population structure to be detectable. Also, there is more available habitat for coyotes and gray fox in the SR 49 study area compared to the study area in Southern California. Therefore, migrant coyotes in the SR 49 study area may be able to reproduce which would reduce signals of population isolation. In the U.S. 101 study in Southern California, coyotes were able to cross the highway but migrants could not breed successfully due to territorial conflicts. Lastly, time lags between barrier imposition and impacts on genetic diversity are more likely for species with large historic population sizes and high genetic diversity[10], like coyote[11] and gray fox.[12]

Policy Implications

State and federal laws require that environmental disturbances from construction and operation of transportation systems be minimized. Although coyotes and gray foxes appear to successfully cross the stretch of SR 49 between the cities of Auburn and Grass Valley, future increases in traffic volume and loss of habitat due to continued urban development might eventually reduce wildlife connectivity and genetic flow, which can result in eventual extinction. Therefore, wildlife movements across SR 49 and other California highways running through important wildlife habitats should be monitored as human disturbance increases so that action can be taken to mitigate barrier effects before genetic diversity among wildlife populations is affected.

Further Reading

This policy brief is drawn from the *Using Noninvasive Genetics to Compare How a California Freeway Affects Gene Flow in a Disturbance-Averse Versus a Disturbance-Tolerant Species* research report prepared for the California Department of Transportation (Caltrans) by Andrea Shreier and Amanda Coen (University of California, Davis), which can be found here: https://ncst.ucdavis.edu/project/using-noninvasive-genetics-to-compare-how-a-california-freeway-affects-gene-flow/.

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