National Center for Sustainable Transportation

POLICY BRIEF

Understanding Wildlife Behavioral Responses to Traffic Noise and Light to Improve Mitigation Planning

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Issue

Traffic moving on transportation corridors affects wildlife connectivity. Many wildlife species move across road surfaces, or through culverts and bridges, with varying levels of success depending on species, infrastructure and traffic levels. As roads and other developed land uses proliferate, the resulting habitat fragmentation and loss of wildlife connectivity hinder animals' ability to forage, establish new territories, and maintain genetic diversity. Wildlife crossing structures such as culverts and bridges theoretically can reduce these impacts by allowing species to effectively cross highways. However, the physical roadway barrier may not be the only deterrent. Previous research has shown that traffic presence and density can disrupt wildlife use of highway crossing structures, and that noise and light from human activities can affect animal behavior.

Researchers at the Road Ecology Center at the University of California, Davis measured traffic noise and light levels and placed motion- and heat-triggered cameras at 26 bridges and culverts along four interstate highways, 11 state highways and one major county road spread across California (Figure 1). The presence and behavior of animals at these highway crossing structures were compared to those detected at sites unaffected by roads to understand the effects of noise and light from a highway on wildlife behavior.

Key Research Findings

Certain species appear more sensitive to traffic disturbance than others. While fewer species in general were observed near roadways than in quiet "background" habitat areas, certain species were less frequently observed in the vicinity of wildlife crossing structures than others when compared to background observations. At one particular site (Liberty Canyon), bobcats almost completely avoided areas above a noise threshold of 58 dBa (A-weighted decibels) (Figure 2). Other animals did not show the same sensitivity. This could result in uneven use of crossing structures and changes in predator-prey and other interactions.

Figure 1. Example of an image captured by motion- and heat-triggered cameras placed at wildlife crossing structures along highways.

Less animal activity was observed near very loud wildlife crossing structures. The lack of activity suggests that these structures are not effectively facilitating wildlife movement and reducing fragmentation.

Different species showed different levels of vigilant behavior in the presence of noisier wildlife crossing structures. Mule deer spent less time being vigilant in noisier areas with continuous traffic, potentially because of lower predation risk due to predators being more sensitive to noise. This suggests that species such as predators with greater wariness may be less willing to use certain structures.

Wildlife crossing structures will be most successful in areas with noise, light, and traffic levels below key thresholds. Noise levels above 55 dBa, illuminance above about 100 mlux (1/1000 lumens/square meter), and traffic levels above 10,000 cars per day were correlated with significantly reduced wildlife use of crossing structures.

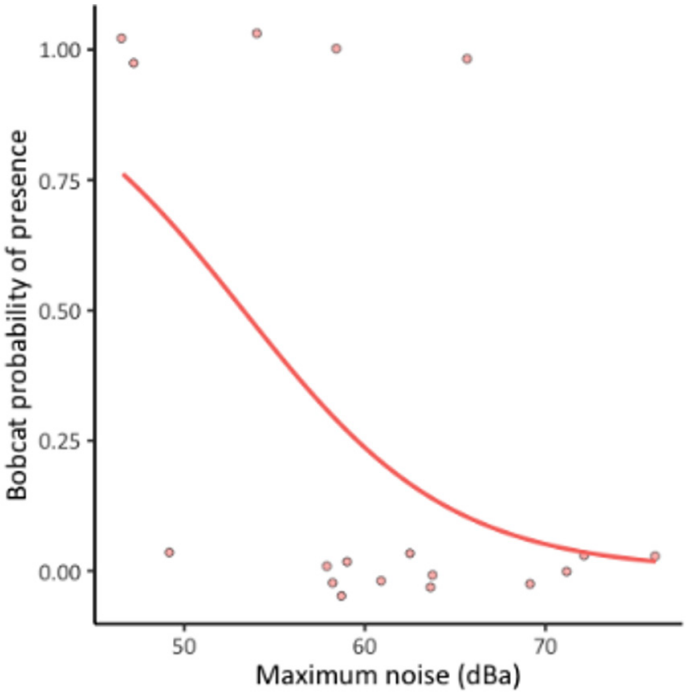

Figure 2. Relationship between bobcat presence and maximum noise. Red circles represent data from the 18 camera locations, and whether the bobcat was present (probability of presence = 1) or absent (probability of presence = 0).

Policy Implications

These results suggest that wildlife crossing structures are partially effective at moving species across highways. To improve their effectiveness, Departments of Transportation should consider 55 dBa as a noise-level threshold to guide design of wildlife crossing structures. Scalar illuminance of 90-100 mlux may be an appropriate light-level threshold.

Existing structures that exceed these recommended thresholds can be retrofitted using quiet pavements, light and sound walls, or earthen berms where possible. New crossing structures can be located and designed with these thresholds in mind to minimize noise and light disturbance for wildlife, thereby improving their effectiveness and maximizing cost effectiveness. The research team is applying findings from this study to the design of the Liberty Canyon wildlife overpass planned for U.S. 101 in the western San Fernando Valley to solve persistent wildlife problems.

More Information

This policy brief is drawn from "Understanding Behavioral Responses of Wildlife to Traffic to Improve Mitigation Planning," a report from the National Center for Sustainable Transportation, authored by Fraser Shilling, Amy Collins, and Winston Vickers of the University of California, Davis, and Travis Longcore of the University of California, Los Angeles. The full report can be found on the NCST website at https://ncst.ucdavis.edu/project/understanding-behavioral-responses-wildlife-traffic-improve-mitigation-planning.

For more information about the findings presented in this brief, please contact Fraser Shilling at fmshilling@ucdavis.edu.

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