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Creating Dark, Quiet Paths for Wildlife to Approach Highway Crossing Structures

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Issue

Transportation and other agencies and organizations are increasingly planning and building under- and over-crossing structures to allow wildlife to traverse busy highways. Research has shown that traffic noise and light can impede wildlife species from using these structures. However, existing guidance in the field of wildlife crossing design inadequately addresses how structural and vegetation elements can be used to reduce such disturbance. If wildlife is hesitant to or refuses to approach structures due to noise, light, and other factors, then the structures may have a much lower benefit-to-cost ratio than expected.

To help address this gap in guidance for design, a research team led by UC Davis used field measurements and modeling of light and noise from traffic to inform and test wildlife crossing designs. The researchers developed wildlife-responsive designs using berms, barriers, and new paths for two crossings being considered by the California Department of Transportation: 1) the proposed Wallis-Annenberg wildlife over-crossing (WAOC) across US 101 in the city of Agoura Hills, and 2) a potential over-crossing across Interstate 15, south of the City of Temecula (TOC). The researchers identified key limitations and opportunities for each design approach and concluded that creating "dark and quiet paths" could increase the wildlife-responsiveness of the designs.

Key Research Findings

For both overcrossings, noise and light from traffic penetrated well beyond the highway right-of-way. The researchers took field measurements of traffic noise and light from the edge of the highway rights-of-way into the approach areas for the planned wildlife crossing structures. For both the WAOC (US 101) and TOC (I-15) wildlife over-crossings, they measured traffic-sourced noise and light more than 100 meters into the approach zones, which would potentially inhibit wildlife use of the structures.

Walls and earthen berms that block noise and light are important components of feasible designs to protect wildlife in their approach to crossing structures. Using available land elevation data, the researchers artificially manipulated the approach zones to the WAOC and TOC using design programs Rhino and Blender to create "dark and quiet paths." This was done by adding various combinations of walls, barriers, and berms to reduce traffic noise and/or glare propagation from US 101 and I-15 into the areas where wildlife would be expected to approach the crossing structures (Figure 1). The sides of the barriers facing away from the highway were back-filled with dirt to increase their sound-absorptive capacity.

Modeling tools showed that berms and barriers could effectively reduce noise and glare from traffic in the zones where wildlife would approach the crossings. The researchers used the Federal Highways Administration's

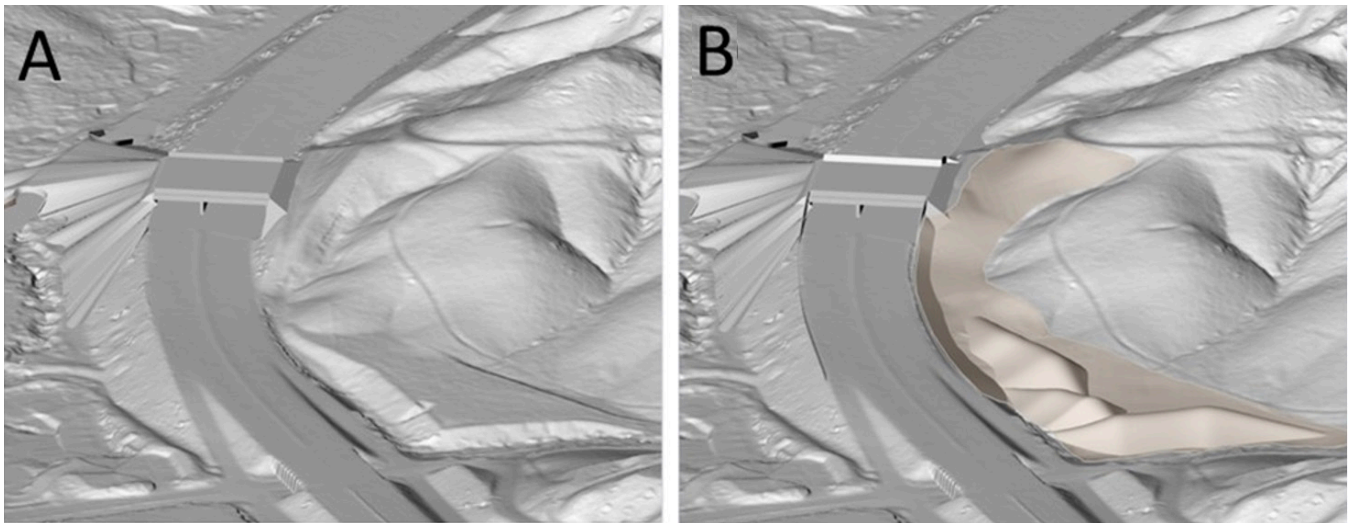

Figure 1. Noise and glare mitigation in the WAOC (north) approach zone. A) Typical approach to crossing structure without noise and light abatement. B) Quiet and dark paths (tan areas) created by excavating and redistributing landscape materials and adding barriers along the highway.

noise-propagation software Traffic Noise Model and the light propagation tool in Blender to test how well different configurations of barriers and berms mitigated traffic noise and light coming from the highway. They found that a single or several large berms using on-site materials, combined with barriers adjacent to the right-of-way, provided the best overall suppression of noise and light for the WAOC. In a similar evaluation of the potential TOC, 15- to 20-foot barriers along the highway reduced noise and glare propagation into the wildlife approach zone.

Moving Forward

Current wildlife crossing design guidance and practice does not include consideration of traffic noise and glare. The researchers' approach of creating dark and quiet paths could be used for planning any wildlife crossing where traffic disturbance might be a concern. It would also be important to field-test the design, both in terms of noise and glare reduction and changes in wildlife use. Finally, new design guidance is needed to improve future wildlife use of engineered-crossing designs.

More Information

This policy brief is drawn from the whitepaper, "Improving Light and Soundscapes for Wildlife Use of Highway Crossing Structures", prepared by the authors listed above from multiple institutions. The whitepaper can be found here: https://www.ucits.org/research-project/2020-03/.

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

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