Abstract

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Wildlife crossing infrastructure is a tool for mitigating the disruption of native wildlife resulting from the extensive U.S. road network, a source of wildlife-vehicle collisions that also threatens motorist safety. This report explores the opportunity to renovate this network from one that is designed to serve the needs of people to one that also proactively accounts for the needs of wildlife, while increasing the safety of both. The many challenges to implementing a systematic approach to wildlife mitigation are explored, including how long-range transportation plans often lack information on wildlife needs, the lack of early coordination of wildlife concerns in transportation plans and projects hinders effective mitigation, agency missions often fail to align, easily implementable opportunities are often missed, and no overarching policy requires inter-agency integration for mitigating wildlife-vehicle collisions and wildlife connectivity. Acknowledging these challenges, this report further highlights opportunities and a wide variety of support for wildlife crossings. In addition, measures are enumerated to further strengthen support for the deployment of wildlife crossing structures, and suggestions for a path forward are mapped out.

Keywords: road ecology, wildlife-vehicle collision, landscape fragmentation, wildlife crossing infrastructure, transportation network.

Executive Summary

Developed collaboratively by a team of engineers, ecologists, biologists, landscape architects, and policy experts, this report summarizes the benefits and challenges to investing effort and funding to support a nationwide commitment to a systematic network of wildlife crossing structures to increase driver and animal safety. Specifically, this report addresses two key issues:

1) Illuminates the safety, ecological, economic, and social benefits of highway crossing structures for wildlife
2) Identifies funding mechanisms, partnerships, and policy implications that hinder or facilitate the standard practice of constructing wildlife crossing structures where they are needed

The High Cost of Wildlife-Vehicle Collisions

The United States has a road network of more than 4,000,000 miles to transport people and goods. While an asset overall, this network presents a safety issue for drivers and is a major source of disruption for native wildlife, as evidenced by an estimated 1 to 2 million collisions that occur each year involving motorists and wildlife in the United States. These collisions result in 26,000 human injuries and 200 human fatalities at an annual cost to Americans of $8 billion (Huijser et al. 2008). In addition to the human toll, millions of animals die each year in collisions with vehicles, and others are prevented from accessing important parts of their habitat, jeopardizing our rich wildlife heritage (sec. 1).

The Myriad Benefits of Wildlife Crossing Structures

Unlike many large-scale problems facing society today, there are proven solutions to reduce wildlife-vehicle collisions and reweave native habitats. Wildlife crossing structures designed or retrofitted to provide safe passage for wildlife above (overpasses) or below (underpasses) a roadway, coupled with fencing, have been shown to reduce wildlife-vehicle collisions by up to 97 percent (Huijser et al. 2009) (sec. 2.1). Indeed, where the total economic cost associated with wildlife-vehicle collisions along a given highway segment exceeds the expense of building a wildlife crossing structure to allow animals to safely cross the road, **it actually costs society less to solve the problem of wildlife-vehicle collisions than it costs to do nothing (sec. 2.2).**

In addition to increased highway safety for people and animals, wildlife crossings provide these benefits:

- Sustained ecosystem integrity due to connected habitats at a local scale
- The opportunity to retain or improve intact ecosystems at a landscape scale when structures are built where they are needed.

- Greater likelihood of viable wildlife populations and adaptability to climate change
- Priceless social values, including stewardship over public resources, education, and citizen engagement (sec. 2.3)

Every highway project is unique when it comes to determining what is necessary to mitigate its effect on wildlife. As a result, standardized designs for wildlife crossings are generally not available. Nonetheless, despite being a relatively new field of applied science, two decades of research reveal some consistent findings:

- Wildlife crossing structure design, size, and placement influence how different species respond to structures
- Some species prefer large, open structures, while others prefer smaller structures with less light
- Wildlife crossing structures designed for multiple species maximize biodiversity conservation
- Because animals often exhibit a learning curve of several years to find and habituate to wildlife crossings, performance evaluations need to be longer term to reliably assess effectiveness
- Land management surrounding wildlife crossings is a key factor in determining their effectiveness; therefore, coordination in the short and long term between transportation and land management agencies is essential
- Fencing keeps animals off the highway and directs them to structures, thus enhancing the effectiveness of wildlife crossing structures; in contrast, fencing alone (without crossing structures) creates a barrier that can keep animals away from crucially important habitat areas (sec. 2.4)

Planning and prioritization are also essential to focus limited resources on locations exhibiting the highest collision risk and conservation priority. By prioritizing conservation improvements as early as possible using data-based planning, state transportation agencies can more effectively address state and regional conservation needs in the short and long term (sec. 2.5).

Challenges to Transforming the U.S. Road Network

One of the key challenges to adopting a systematic approach to mitigating wildlife impacts from highways is the fact that no single agency is responsible for ensuring that animals are able to move freely across the landscape. There are also additional challenges to implementation:

- Federal and state transportation and land management agencies have missions, approaches, and priorities that may not overlap
- Long-range transportation plans generally do not include wildlife mitigation or crossing provisions
- Federal and state natural resource agencies are often too resource or time constrained to effectively participate in early coordination with transportation agencies
- Timelines vary greatly among agencies and schedules for planning, and projects and funding are often misaligned, causing mitigation opportunities to be missed
- While federal funds can pay for construction of wildlife crossing structures, states bear the cost burden of maintenance
- Agencies are not required to integrate mitigation to maintain or improve wildlife connectivity, except for certain wildlife or fish species listed under the federal Endangered Species Act or an equivalent state law

In the face of these challenges, the most successful projects have resulted from partnerships among agencies, nongovernmental organizations, and other stakeholders using interdisciplinary principles of engineering, ecology, and design (sec. 3).

New and Existing Support for Wildlife Crossing Structures

The current transportation law provides explicit authority for federal, state, municipal, and tribal managers to reduce the number of motorist collisions with wildlife and to ensure connectivity among habitats disrupted by roads. It also requires state and metropolitan long-range transportation plans to address potential environmental mitigation; and it permits planners to develop programmatic mitigation plans at various scales to encompass multiple resources, such as wildlife habitat or aquatic resources. Although these statutory provisions may be used to support the construction of wildlife crossing structures, they do not require it (sec. 4.1).

In addition to existing support for wildlife crossing structures, a variety of other policy and funding improvements and activities could further enhance motorist safety, reduce wildlife mortality, and conserve habitat connections:

- Develop a standardized methodology for collecting and reporting wildlife-vehicle-collision and carcass data and ensure public access to that data
- Provide technical assistance and peer learning opportunities, including programs to work with and increase capacity for transportation agencies and local governments
- Consider novel mechanisms to fund the costs of constructing wildlife crossing structures

- Include an inflationary adjustment for public lands funding, and enhance the flexibility of federal land management agencies to mitigate wildlife-highway conflicts
- Consider developing a demonstration program to prioritize and fund high-profile wildlife mitigation infrastructure projects nationwide
- Develop guidelines to identify and prioritize wildlife mitigation projects
- Encourage all jurisdictional levels of transportation agencies to manage for wildlife connectivity across highways
- Coordinate a common path forward by encouraging top-ranking officials to aid in aligning the goals and objectives of agencies involved in transportation planning and projects
- Support investment in research and development by assuring an adequate percentage of each highway program is allocated to innovative wildlife mitigation solutions
- Establish a standard performance metric to ensure that investments in wildlife mitigation lead to reductions in wildlife-vehicle collisions and improvements in habitat connectivity
- Work to increase awareness and understanding among key groups in society of the need for a more permeable transportation network
- Educate and cross-train students and professionals by expanding educational opportunities related to road ecology principles and practices for current and future workforces (sec. 4.2)

Benefits of a National Commitment

As scientific evidence of the harmful cumulative effects of habitat fragmentation, introduced invasive and exotic species, climate change, and pollution mounts, the window of opportunity to curtail our road network's detrimental effects on wildlife is closing (Alamgir et al. 2017, Grooten and Almond 2018, Heller and Zavaleta 2009). Fortunately, the foundation for a transportation system capable of coexisting with nature already exists today in the United States; and it may be strengthened even more by considering and applying this report's findings. By building upon successful efforts already underway at the federal, state, local, and tribal levels, we may prevent the fatalities of up to 200 drivers projected to occur this year as a result of wildlife-vehicle collisions, not to mention the tens of thousands of injured motorists, billions of dollars in property damage, and millions of wildlife deaths (Huijser et. al. 2008, 2009). (sec. 5)

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