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THE STRATEGIC INTEGRATION OF WILDLIFE MITIGATION INTO TRANSPORTATION PROCEDURES: FINAL REPORT

June 2022

Nevada Department of Transportation
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16. Abstract

This research resulted in a manual: "The Strategic Integration of Wildlife Mitigation into Transportation Procedures: A Manual for Agencies and Their Partners," a report "The Strategic Integration of Wildlife Mitigation into Transportation Procedures: Practices, Partnerships, and Next Steps," and this final report on practices transportation agencies and their partners can strategically institute to include wildlife concerns in the transportation process. The reports and manual are the results of research that explored approaches to assessing wildlife movement needs that should be accommodated in transportation processes through a two-nation survey of transportation professionals, literature review, case studies of partnerships and other efforts to reduce wildlife-vehicle collisions (WVC) and accommodation of wildlife movement, and the input of dozens of transportation and ecology professionals on the research team and the supporting agency partners in this Pooled Fund Study. The 57 respondents to the on-line survey represented 31 U.S. states, six Canadian provinces, and 27 Metropolitan Planning Organizations (MPOs) in the U.S. The consistent response themes included: 1) The important information sources for integrating wildlife needs were WVC crash data and hotspots analyses of these data; 2) The most important parts of the planning process were collaboration with wildlife agencies and inclusion of wildlife mitigation plans into long range plans; and 3) The top four most common needs were – dedicated funding, legislative support to consider wildlife movement needs, collaboration with wildlife agencies, and instilling environmental stewardship and awareness within agencies. The manual instructs agency professionals and their partners on how the transportation planning process works across U.S. states and some Canadian provinces, and how wildlife concerns, specifically wildlife-vehicle conflicts, can be brought into the steps within the process. The goal of the manual, the earlier report, and this final report is to inspire readers to help institutionalize wildlife concerns into transportation agency mission statements, long range plans, programming of projects, and all the steps to design, construct, and maintain transportation projects. A major step toward this goal is to win the hearts and minds of transportation professionals to think about wildlife in their everyday actions, and how they can help wildlife safely move.

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The Strategic Integration of Wildlife Mitigation into Transportation Procedures: Final Report

to

The Nevada Department of Transportation and
Federal Highway Administration Pooled Fund Study:
The Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity
Transportation Pooled Fund Project TPF 5(358)

Patricia Cramer

June 2022






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Introduction

Figure 1. Mule deer exit a wildlife crossing underpass in Utah that was created in a standalone wildlife mitigation project on US 191. Photo Credit: P. Cramer, Utah DOT, & Division of Wildlife Resources.

Transportation agencies can help reduce the risk of wildlife-vehicle collisions and provide for wildlife connectivity by considering and planning for wildlife throughout transportation procedures from long-term planning to everyday operations. The risk of wildlife-vehicle collisions across the U.S. and Canada threatens the traveling public and all types of wildlife populations. This study looked at lessons learned from U.S. state departments of transportation (DOTs), Canadian ministries of transportation (MoT's), and their partners on how wildlife concerns were incorporated along the transportation process (**Figure 1**). The researchers then created a manual for transportation professionals and their partners to consult for incorporating similar practices. The risk of collisions with wildlife was a major but not the sole factor considered. The term wildlife-vehicle conflict was a guiding principal of the manual. This was defined as the consideration of the impacts of roads and vehicles on all wildlife populations in proximity to roads, and in turn, the impact of wildlife-vehicle collisions on humans traveling on roads. Habitat fragmentation, road avoidance, population isolation, genetic consequences of that isolation, and other factors that affect wildlife populations are also important to consider in transportation processes, as are the risk of collisions with wild animals for motorists.

The manual was based on the experiences of the research team, the technical advisory panel partner agency personnel wisdom, and the results of a two-nation survey of environmental personnel in U.S. state and Canadian provincial/territorial transportation agencies and U.S. Metropolitan Planning Organizations (MPOs) and Regional Planning Organizations (RPOs). Participants in the survey were asked to respond to questions about the most important inputs to consideration of wildlife in transportation, the toughest challenges, and their ideas on best solutions. Three major themes evolved from the survey results:

1) The important information sources for integrating wildlife needs were wildlife-vehicle crash data and hotspots analyses of these data;

2) The most important parts of the planning process were collaboration with wildlife agencies and inclusion of wildlife mitigation plans into long range plans; and

3) The top four most common needs for improvement were –collaboration with wildlife agencies, dedicated funding, legislative support to consider wildlife movement needs, and instilling environmental stewardship and awareness within agencies.

The authors worked with the agency partners in this Pooled Fund Study, who represented the state DOTs in Alaska, Arizona, California, Iowa, Michigan, Minnesota, Nevada, New Mexico, Oregon, and Washington, the U.S. Federal Highway Administration, along with the Ontario Ministry of Transportation, and Parks Canada. Arc Solutions was a participating partner. The partners helped to identify the fact that the key areas to have wildlife concerns brought into transportation processes were in the early stages of planning. The partners guided the development of the resulting report on best practices and the manual to provide recommendations that worked within the bounds of agency constraints and operating processes.

The authors of the manual concentrated on the survey result themes and presented the transportation process (**Figure 2**) and how agencies and partners could insert wildlife connectivity needs and the reduction of wildlife-vehicle collisions into all aspects of transportation procedures. The manual presented dozens of case studies, websites, and best management practice manuals to serve as examples of how the agencies can work to institutionalize consideration of wildlife across the steps in the transportation process and procedures.

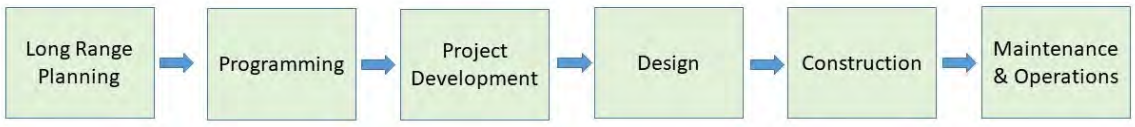

Figure 2. The transportation process from long-range planning to everyday maintenance and operations.

The Challenges

Wildlife presents challenges for transportation agencies because of the risks of collisions with these animals, the conflicts roads, railways, and vehicles pose to animals, the protection status of certain species, and the historic limited funding to address these challenges.

The safety of the motoring public is a concern that is part of transportation agencies' missions, and long range plans. Wildlife-vehicle collisions pose a safety risk in every U.S. state and Canadian province. The reduction of that risk is a safety goal all transportation personnel can get behind and work toward within the mission of an agency (**Figure 3**). The extent of reported crashes with wild and domestic animals was calculated in this study based on data received from every U.S. state DOT. We received five years of total crash and animal and wildlife crash data from all 50 states, along with the coding on the severity of the crashes, and how each state places a monetary value on the cost of those crashes to society.

Figure 3. A mother black bear teaches her cubs to move beneath Highway 93 in a wildlife crossing structure in Kootenay National Park, British Columbia, Canada. Parks Canada works closely with Ministries of Transportation to install wildlife crossing structures throughout much of western Canada. Photo Credit: Parks Canada.

For a national perspective, we used the Federal Highway Administration 2018 crash values from Harmon et al. (2018), which estimate the cost to society when a human life is lost as valued at $11,295,400 , and a property damage only crash as $11,900, with three levels of injury crashes valued between the two. The annual average number of animal crashes and their costs for each state were calculated. Animals included domestic and livestock animals, not just wildlife. There are 13 states that do not indicate in the crash reporting if the animal was wild or domestic. The study used animal for these calculations to represent all states, not just those with a wildlife designation in the crash records. **Figure 4** gives regional representation of these numbers and costs across the U.S. Overall, the reported crashes with animals costs the U.S. public over 10 billion dollars a year.

There was an annual average of 345,795 crashes with animals reported to the states. This number is far lower than actual crashes, which can 5.6 to nine times greater for medium to large size wildlife species, based on studies of carcasses collected versus reported crashes (Olson 2013, Donaldson and Lafon 2008). These correction factors would put the number of animal-vehicle collisions with medium to larger animals at 1.9 million to 3.1 million annually.

Michigan had the greatest number of reported animal-vehicle crashes, with an average of over 54,000 each year.

There were 201.8 fatal crashes with animals annually across the U.S.

The state with the greatest average fatal crashes with animals each year was Texas, with over 30 fatal animal-vehicle crashes each year. Michigan had the second highest number of average annual fatal crashes with animals, at 18.

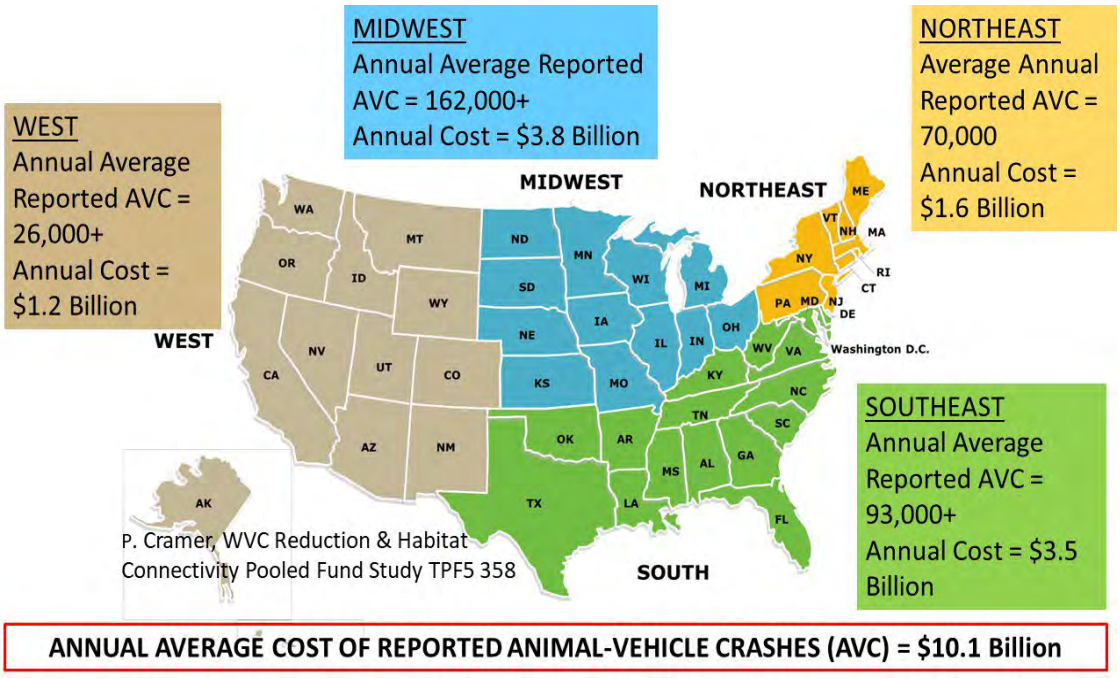

Figure 4. The annual average number of animal-vehicle crashes reported in each U.S. region and their costs based on crash severity and Federal Highway Administration crash costs (Harmon et al. 2018).

Wildlife-vehicle conflict is also a concern for transportation agencies. Wildlife need to move across the landscape and waterways to access food, seasonal ranges, to reproduce, and escape the effects of climate change, such as moving away from fires, floods, and drought stricken areas. Our transportation routes across the country interrupt those movements and thus place populations of animals at risk of dying or greatly decreasing. Huijser et al. (2008) estimated that 21 U.S. federally listed or endangered wildlife species were threatened by vehicle collisions. In 2018, 11 western U.S. states listed their top wildlife migration corridors for mule deer, elk, and pronghorn, in accordance with the Secretary of the Interior Order 3362, which strives to protect wildlife migrations in the west. Every state listed vehicle collisions and roads as major threats to these species. These concerns are also concerns for transportation agencies, who must consider these threats as they move transportation projects through the planning process.

A large part of the challenge to include wildlife concerns and mitigation in transportation projects is limited funding. However, there is also limited commitment within agencies to address these challenges. If there are not resources, i.e. funding, and institutionalized mandates to mitigate for wildlife movement and reduce wildlife-vehicle collisions, which were both listed by the survey participants as the top impediments to the inclusion of wildlife in planning, the research found there can be limited efforts underway in states to create mitigation for wildlife. However, the researchers in this project found there are several ways to address these concerns, from provisions in national transportation acts that have set aside pots of money for wildlife mitigation, to institutionalizing wildlife considerations in every step of the transportation planning process.

The Solutions

Solution 1 - Get Wildlife Considerations into the Planning Process Early

The most important actions for instilling transportation agency consideration of wildlife connectivity and reduction of wildlife-vehicle collisions is for wildlife to be considered in long-term planning, and the programming process through institutionalized procedures. There are multiple pathways during these processes that can be taken to create wildlife crossing structures and other wildlife mitigation projects, as standalone approaches, or as part of upcoming transportation projects (**Figure 5**).

A key to including wildlife concerns in a transportation agency's processes is for the reduction of wildlife-vehicle collisions and consideration of wildlife connectivity to be part of the goals and objectives of the agency's long-range plan. Transportation agencies' mission statements typically include a safety aspect. The reduction of wildlife-vehicle collisions can be part of this safety goal. If there is an environmental aspect, such as a "do no harm" statement or protecting the environment, then wildlife connectivity and wildlife crossings structures can be part of those goals. With these common goals, concerns for wildlife can be better incorporated into every potential project. This includes progressing through the U.S. National Environmental Policy Act (NEPA) definition of

Figure 5. Constructing large structures such as this wildlife overpass entail inclusion of these structures in early planning, such as in the long-range plans of agencies. Photo Credit: T. Brennan.

mitigation, taken from the "Do No Harm" conservation hierarchy: first avoid, then if the project cannot be avoided, minimize, and finally compensate. With input from partner agencies, there may be avoidance of projects that would seriously impact wildlife populations. With enough data and planning, standalone wildlife mitigation projects can be included in long range plans to rectify situations where motorists and wildlife are at risk of collisions or wildlife need assistance in connectivity across transportation corridors. Finally, all potential projects in the long-range plan that occur in areas with wildlife should consider and mitigate for wildlife impacts.

Programming is the next step in the transportation process where wildlife concerns are best identified and incorporated, which in U.S. states, result in the State Transportation Improvement Program, or STIP, typically a five-year planning document. These are when potential projects in the long-range plans are further detailed, prioritized, and funding is identified. Each transportation agency has its programming process for prioritizing what projects are moved to the STIP. The information sources that are used in programming include planning studies, MPOs' and RPOs' transportation plan priorities, collaborating partners' priorities, and those of the transportation agency's heaquarters' divisions and districts. These sources offer a rich variety of ways various agencies and professionals can be working to include wildlife concerns into the upcoming STIP projects, and to create standalone wildlife transportation projects.

The approaches to these actions include collecting data on wildlife-vehicle collisions, wildlife habitats and needs to move, analyzing and mapping those data, finding where the resulting maps and priorities are integrated in the transportation planning and project development process, and identifying the specific role various personnel within the agencies have to put forward projects that help reduce those collisions and/or provide connectivity for wildlife populations.

Nevada DOT identified areas of wildlife-vehicle conflict across the state with a study to identify both the animal crash hotspots and the wildlife habitats that are bisected by roads (Cramer and McGinty 2018). The results have been used to prioritize the upcoming wildlife mitigation projects. The animal-vehicle collision hotspot map was created based on crashes/mile/year. Additional transportation factors were added to create a transportation-safety map of top hotspot road segments. An ecological map was created with GIS information on wildlife corridors, wildlife GPS locational data, and areas where horses and cows were involved in collisions. This map gave priority to areas with the highest scores based on various wildlife species' presence and habitat. These two maps were brought together to score Nevada roads for all these factors for potential animal-vehicle conflict, not just reported crashes. This

resulted in the Nevada Cumulative Safety and Ecological Priority Road Segments for Wildlife Vehicle Conflict (**Figure 6**).

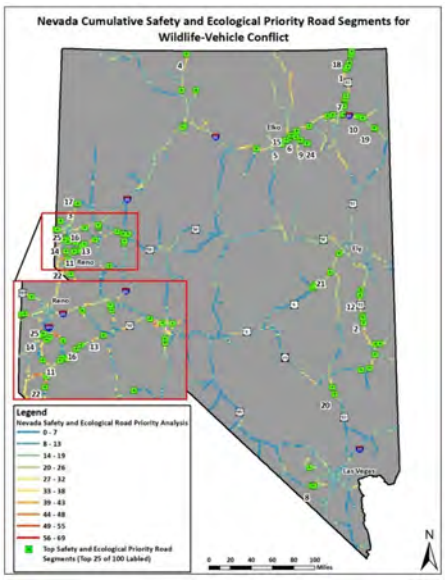

Figure 6. Nevada's priority road segments map of wildlife-vehicle conflict based on ecological and safety maps combined. Top 25 Listed, Top 100 road segments presented as green box icons. Modeled on data from 2007-2016. Taken from Cramer and McGinty 2018.

New Jersey's Division of Fish and Wildlife maintains an interactive website that helps identify key areas where actions are needed for wildlife connectivity. It is the Connectivity Habitat Across New Jersey, or CHANJ program (**Figure 7**). The interactive map helps to guide mitigation of road barriers to wildlife movement and can be used in early long-range planning. See: https://www.state.nj.us/dep/fgw/ensp/chanj.htm

Figure 7. New Jersey's Connectivity Habitat Across New Jersey program emblem.

Solution 2 – Partnerships

Partners help keep wildlife concerns included in all stages of transportation planning. They can help to institutionalize wildlife concerns throughout the transportation process.

The most successful efforts to include wildlife crossing structures in transportation projects and overall in a transportation agency's planning come from partnerships with other agencies, non-profits, Tribes, and the public. These include working with

MPOs and RPOs in the development of their transportation plans which are included in the STIP; working with federal agencies and Tribes to identify the most important areas to mitigate for wildlife and to secure federal funding; and most importantly, working with the state or provincial wildlife agency to identify key areas for wild animal movement and to help secure funding and public support for wildlife mitigation projects.

MPOs and RPOs can be important partners in providing wildlife connectivity mitigation. These agencies are in communities with 50,000 or more residents, and they develop transportation plans for the future that are by law, incorporated into a state's STIP. State transportation agencies administer roughly only 25 percent of the roads in a state. The remaining roads are under these MPOs and RPOs, federal agencies, counties, and other jurisdictions. Thus it is important these organizations identify wildlife connectivity and wildlife-vehicle conflict problem areas as important in their transportation plans, and also help to find funding sources to support wildlife mitigation actions, creating win-win solutions.

In Tucson Arizona, the Pima County residents voted to tax themselves for wildlife connectivity, which raised $45 million for wildlife crossings and land protection. Pima County authorizes the Regional Transportation Authority to build several wildlife crossings with Arizona DOT and has several more planned in southern Arizona (**Figure 8**).

Figure 8. Mule deer used the SR 77 overpass placed in conjunction with the Regional Transportation Authority and Arizona Department of Transportation. Photo Credit: Arizona Game and Fish Department.

Wildlife agencies are important partners for transportation agencies, from the long term planning to the everyday operations and maintenance. Wildlife professionals identify locations of wildlife species protected at the federal and state level and those important to the state, which in turn helps transportation agencies first avoid, then minimize, and finally compensate transportation projects with wildlife crossings structures and other types of mitigation to reduce crashes with wildlife and provide safe connectivity for them. These wildlife biologists can also suggest the best types of wildlife crossing structures for target species.

Wildlife agency and non-profit partners can also provide funding for projects. The most robust programs in states with dozens to hundreds of wildlife crossing

structures have Memoranda of Understanding between the two agencies, regular meetings, some regulatory power for the state or federal agency to approve transportation projects, and active research programs.

Figure 9. Colorado's Wildlife and Transportation Alliance emblem.

In 2017 Colorado's DOT and Parks and Wildlife, in coordination with the U.S. Federal Highway Administration (FHWA) sponsored a two-day Wildlife and Transportation summit, which led to the Wildlife and Transportation Alliance (**Figure 9**). The working relations among these agencies and many other partners under the Alliance have resulted in prioritization of top wildlife connectivity areas across the state, some of those locations becoming wildlife mitigation projects or additions to upcoming projects to help wildlife move beneath the road, and the 2019 Governor Polis' Executive Order on Big Game Winter Range and Migration Corridors and Wildlife Crossings, which reinforced the Alliance's ongoing work. See: https://www.coloradowta.com/home/.

Legislative actions and funding opportunities can be developed through partnerships with non-profit organizations interested in promoting wildlife connectivity. Legislation promoted by non-profit conservation organizations at the state and national level have resulted in both providing additional funds for wildlife mitigation, and in persuading transportation agencies to identify and prioritize areas of wildlife connectivity or corridors across transportation where wildlife need to be accommodated. The U.S. federal 2021 Transportation Act, known both as the Bipartisan Infrastructure Law (BIL) and the Infrastructure Investment and Jobs Act (https://www.congress.gov/bill/117th-congress/house-bill/3684/text) has 10 funding sources that can be used to create wildlife crossing structures, including $350 million for use specifically for wildlife crossing structure and mitigation. States will be able to compete for the annual $60 million or more each year in this pilot program.

States are also passing legislation to incentivize transportation agencies to identify places wildlife need to move across roads, and to institutionalize efforts to keep the state transportation and wildlife agencies working together on behalf of wildlife. See the New Mexico case study below and the Colorado example above.

In 2019 the New Mexico legislature created the New Mexico Wildlife Corridors Act. New Mexico DOT then supported a study of where wildlife need to move across the state and areas of wildlife-vehicle collision hotspots, to be combined together with

other planning to create the New Mexico Wildlife Corridors Action Plan (**Figure 10**, Cramer et al. 2022b). The plan provides a list of top 11 priority locations for wildlife mitigation and recommends what structures should be placed where to provide connectivity for wildlife.

Figure 10. New Mexico's Wildlife Corridors Action Plan.

Solution 3 – Agency Culture Change

Transportation agencies can also make changes from within to help create a culture of awareness of wildlife concerns and institutionalize actions to assure wildlife will be included in planning and other parts of the transportation process. Examples of how this has been done are given below.

1) The consideration of wildlife written into professional manuals within the DOT is an approach to institutionalize wildlife concerns. Texas DOT (TxDOT) commissioned a study (Loftus-Otway et al. 2019) to assess how recommendations to consider wildlife can be written into TxDOT professional manuals. This resulted in specific instructions for 18 professional manuals, from the planners to the traffic safety engineers, to the maintenance professionals. See this TxDOT-made movie on the project, https://www.youtube.com/watch?v=YuCR-zGSbcA.

2) There can be a formal education program within an agency for all professions to better understand the need for wildlife connectivity, and prevention of all types of wildlife-vehicle crashes. Vermont Transportation Agency (VTrans) offers the Vermont Highways and Habitat Program. Agency participants go into the field to see how wildlife move near roads, to track and photograph wildlife, to handle snakes and other reptiles and amphibians, and to work with wildlife professionals to better understand how the transportation agency's actions affect wildlife of all kinds. See the website of the company, "Keeping Track" on how they offer these courses to various northeast agencies: https://keepingtrack.org/habitats-highways.

3) A transportation agency can have an official wildlife program where a point person and team are the go-to professionals to help with all things wildlife. In British Columbia's Ministry of Transportation and Infrastructure, the wildlife program leader welcomes all new hires individually to brief them on wildlife

concerns in the face of transportation and to give them "swag" with wildlife images. This individual also creates a robust social media presence for employees and the public about wildlife and roads compensation projects (**Figure 11**). Children in communities where wildlife and roads are a big part of life also participate in wildlife awareness programs. See: https://www.tranbc.ca/tag/bc-wildlife/ for more information and inspiration.

Figure 11. The MoT staff in conjunction with the Ministry focus groups have developed messaging concepts to communicate "watch for wildlife" graphics for placement on t-shirts and online campaigns. Photo Credit: L. Sielecki, British Columbia Ministry of Transportation

Summary and Recommendations

This study found that transportation agencies can make great gains in the installation of wildlife crossing structures in some of the larger transportation projects, only to often lose those gains because the actions to create wildlife mitigation were not institutionalized. Some of the true successes for transportation agencies to include wildlife considerations in everyday actions are based on incremental changes that do not necessarily garner headlines and attract social media stories. There is a need have wildlife considered in standardized procedures, to inspire transportation professionals to consider wildlife in their everyday actions, and to partner with outside agencies and others to plan, fund, and construct wildlife crossing structures. Three major policies that can help institutionalize wildlife considerations include:

1) Include reduction of wildlife-vehicle collisions and consideration of wildlife into the goals of the long-range plan. This can be done by linking the reduction of wildlife-vehicle collisions with safety goals, and wildlife connectivity as part of environmental concerns. These may already be included in some long-range transportation plans. These stated goals help wildlife considerations to become part of the planning process from the beginning.

2) Include the transportation agency environmental staff, wildlife agency biologists, and maintenance personnel in the long-range planning process.

3) Create check points in the programming process to consider wildlife from the standpoint of what wildlife need to move and survive in standalone projects and within other proposed projects in the long range-plan and STIP.

These multiple efforts then create a culture of care for wildlife, that then results in actions to mitigate roads for wildlife movement, regardless of the size of the animals and their threat to the motoring public.

The key to sustain successful wildlife crossing mitigation in agencies and across jurisdictions is working partnerships. Four key recommendations on partnerships include:

1) The state or provincial/territorial wildlife agency is the most important partner for bringing information to transportation and in helping to make decisions all along the transportation process. Partnerships with the transportation agency can become institutionalized with Memoranda of Understanding and Agreement.

2) Work with MPOs and RPOs to show them how they can consider wildlife and include wildlife mitigation in their long-range transportation plans.

3) Form an alliance between the transportation agency and its partners. The roles of the alliance would be to identify key areas for wildlife mitigation along roads, educate the agency personnel, public and legislators, and pursue funding for wildlife mitigation.

4) Work with private landowners, agency landowners, and Tribal landowners to ensure protection of lands at and near future and existing wildlife crossing structures.

Readers are encouraged to review the Strategic Integration of Wildlife Mitigation into Transportation Procedures: A Manual for Agencies and Partners (Cramer et al. 2022c) for how agencies and partners can standardize wildlife considerations in transportation procedures, from planning and projects to everyday maintenance and operations. See the FHWA Pooled Fund Website for the manual and report on how agencies work to include wildlife in their processes. Scroll to the Documents pull down menu, and look for publications with Cramer as the author. https://pooledfund.org/Details/Study/610.

The reports, manual, and slide shows are also available on the Wildlife Connectivity Institute website: https://www.wildlifeconnectivity.org/national-study-to-integrate-wildlife-into-transportation.

References and Resources

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