Appendix H

Frequently Asked Questions

1. **If Oregon already has a statewide wildlife connectivity initiative (the Oregon Connectivity Assessment and Mapping Project-OCAMP), what was the purpose of this project?**

   While the Oregon Department of Transportation (ODOT) and Oregon Department of Fish and Wildlife (ODFW) are key partners in planning and implementing wildlife crossings, their missions differ. ODOT aims to "provide a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive," while ODFW's mission is to "protect and enhance Oregon's fish and wildlife and their habitats for the use and enjoyment of present and future generations."

   This project developed a decision-support tool that helps ODOT identify locations for wildlife crossings that prioritize transportation safety while supporting deer and elk connectivity, with potential benefits to other species.

   The Oregon Connectivity Assessment and Mapping Project (OCAMP) was essential in setting statewide conservation priorities for wildlife connectivity. Using the best available science and robust statistical modeling, OCAMP identified Priority Wildlife Connectivity Areas (PWCAs) across Oregon. It also pinpointed 156 PWCAs, consisting of over 700 hexagons, where high wildlife connectivity intersects with roads and areas of frequent animal-vehicle collisions, denoted as opportunities for transportation mitigation.

   The challenge for ODOT is determining which of these locations to prioritize in any given year within funding constraints. This project addressed that need by incorporating OCAMP data to help ODOT focus on sites where wildlife crossings could most effectively enhance transportation safety while enhancing connectivity.

2. **Wildlife-vehicle collisions are a problem for many species. Why the emphasis on mule deer and elk in this project?**

   While roads can be a substantial cause of mortality for many species, animal-vehicle collisions that pose a significant safety risk to motorists primarily involve large-bodied wildlife. In Oregon, black bears (*Ursus americanus*), mountain goats (*Oreamnos americanus*), big-horn sheep (*Ovis canadensis*), bison (*Bison bison*), mule deer (*Odocoileus hemionus*), black-tailed deer (*Odocoileus hemionus columbianus*), white-tailed deer (*Odocoileus virginianus*), Rocky Mountain elk

(*Cervus canadensis nelsoni*), Roosevelt elk (*Cervus canadensis roosevelti*), mountain lions (*Puma concolor*), moose (*Alces alces*) and pronghorn (*Antilocapra americana*) are all present in habitats adjacent to roadways. This project focused on deer and elk as large-bodied wildlife surrogates because the vast majority of reported animal-vehicle collisions in Oregon involve deer and elk. While other large-bodied wildlife are occasionally involved in accidents with vehicles on Oregon roads, we chose to focus on locations with the highest frequency of animal-vehicle collisions, which involve deer or elk.

3. **How were the factors for this decision-support tool selected?**

This project began with a thorough review of scientific and gray literature focused on wildlife crossing structures, impacts of land-use, fire, climate change and human activity on ungulate behavior, ungulate movement patterns, and prediction/validation of wildlife corridors. From that literature we synthesized factors likely to influence animal use of habitats adjacent to and potentially bisected by roadways. Following literature synthesis, draft factors were presented to a Technical Advisory Committee (TAC) composed of experts representing state and federal wildlife and transportation agencies as well as non-profit conservation organizations for review and comment. Based on recommendations from the TAC the project team conducted additional literature review and evaluated data sources for factors supported by the TAC for inclusion in the next draft. A second TAC review was conducted following extensive project revision, and comments from individual members were incorporated to the greatest extent possible in the final list of factors.

4. **How were factor weights determined?**

Factor weights were established based on a combination of expert judgement (TAC and project team), literature synthesis, and factors deemed as important drivers in published wildlife movement and animal-vehicle collision modeling studies. Given the project emphasis on safety, factors accounting for either actual (e.g. carcass counts) or predicted (traffic volume, road density, etc.) deer- and elk-vehicle collisions were assigned the highest weights relative to other factors. Factors that influence ungulate presence in habitat adjacent to roads (e.g. winter range) also received higher weights, under the assumption that higher deer and elk densities adjacent to roads increase the likelihood of animal road crossings. Factors for which there is greater uncertainty regarding the directionality of impacts (positive or negative) on wildlife movement (e.g. climate change, fire) were assigned lower weights relative to other factors. Finally, the project used the Analytic Hierarchy Process (AHP) to standardize factor weights and ensure that comparisons of factor importance were made consistently and logically.

5. **Was overlap between factors used in the matrix considered as part of the factor inclusion process?**

   Several factors included in the decision matrix either directly (e.g. DEVCs, PWCAs, MAPs) or indirectly (e.g. AADT, Road Density) incorporate actual or predicted animal-vehicle collisions. This overlap was intentional and desired for several reasons. Wildlife-vehicle collision data often have limitations, including unrecorded incidents (e.g., animals that are struck but exit the roadway), imprecise spatial reporting, and the influence of carcass removal programs. Furthermore, recent research on drivers of wildlife-vehicle collisions indicates that the impacts of traffic and road characteristics, landscape features, and species biology on reported wildlife-vehicle collisions are non-linear.[1] [2] [3] Incorporating multiple, complementary data sources that capture different dimensions of an imperfectly measured underlying (latent) variable can improve the reliability of conclusions drawn from carcass data.

   The three factors that directly incorporate animal-vehicle collision data all do so in a different way. Raw deer- and elk-vehicle data used in this project were derived from ODOT's animal-vehicle collision database for the period 2020-2023 (the most recent data available at the time of the project). While the OCAMP Transportation PWCA hexagons included data from the same source; it employed records collected from 2013-2022.[4]Therefore, incorporating the two factors in the decision matrix allowed the process to account for a longer period of record for DEVCs without duplicating data. Second, DEVC data for this project used raw carcass point data from the ODOT database and associated carcass records with the nearest milepost, while the process to delineate Transportation PWCA hexagons calculated carcass density per mile and classified density as "high", "intermediate", or "low". Finally, this project also included a multi-attribute polygon factor (MAPs) that incorporated results from a deer-vehicle collision hot-spot analysis that employed ODOT animal collision data collected from 2016-2023.

[1] John A. Bissonette & Christine A. Kassar, *Locations of Deer-Vehicle Collisions* (2008).

[2] Richard D. Inman et al., *Estimating Traffic Volume* (2024).

[3] Dror Denneboom et al., *Wildlife Mortality Risk* (2024).

[4] Rachel E. Wheat, Wildlife Connectivity Coordinator at Or. Dep't of Fish & Wildl., Virtual Communication, February 11, 2025.

6. **How were data sources that inform factors selected for this project?**

   The project team obtained data from authoritative sources based on several criteria. First, selected data layers provided spatial coverage for the entire state and/or distribution for a target species. For example, ODFW has Brownian bridge movement models and winter range maps for mule deer but not for Rocky Mountain elk, so the former were included in this decision process. This decision-support tool is designed to incorporate new data layers as they are made available. Second, data selected for inclusion matched the date range adopted for animal vehicle collision data as closely as possible. Third, data layers included were clearly interpretable in terms of the direction of impacts on deer and elk movement and utilization of habitat adjacent to roadways. For example, there are several statewide fire risk models available for the state of Oregon. Fire risk alone is not an unambiguous predictor of impacts to wildlife, as some fires may benefit some species immediately following disturbance or after a period of recovery. The Categorical Wildfire Hazard Potential data layer used in this project predicts areas with a high probability for high-severity fires, which have a higher likelihood of causing vegetation state change and potential invasion by exotic vegetation species (e.g. cheatgrass). Finally, initial data sources were presented to the TAC for review and comment, and any additional data layers recommended by the TAC were considered for incorporation into later phases of matrix development.

7. **Did the project consider impacts from development other than UGBs (e.g. renewable energy infrastructure)?**

   The project team did consider other metrics for impacts of development and human activity levels on animal movement. At the time this project was initiated the team was unaware of any authoritative data sources that covered the entire state of Oregon. Data sources that address different development indicators can easily be added to the decision matrix when they become available in the future.

8. **What are authoritative data sources?**

   Although there is a healthy discussion about what constitutes an “authoritative data source” in the academic literature the term generally applies to a single, trusted source of data that can be consulted to verify specific information related to a specific subject of interest.

9. **Was land ownership considered in the factor selection process?**

   Yes. The TAC discussed land ownership as a potential factor for the decision matrix. The project team ultimately decided not to include land ownership as a factor because it is difficult to generalize clear benefits or disadvantages of ownership categories (e.g. private or public) at a statewide scale. In some cases, public land ownership may be a benefit for crossing structure construction, but the same could be true for private lands in other locations. Given the lack of clear and consistent directional impact associated with landownership we recommended that this element be considered during the site evaluation phase.

10. **Why did climate change and landscape resilience factors receive low weights in the decision matrix?**

    Although both climate change and landscape resilience are important factors for future animal movement and habitat utilization, there are several challenges to using available data layers as strong predictors for wildlife crossing locations. First, changes in macroclimate (e.g. regional precipitation and temperature regimes) are often mediated or moderated by site-specific (microclimate) conditions, including topography, existing vegetation, geologic features and soils. Most of the available data layers for future climate conditions and resilience are not sophisticated enough to account for site-specific responses to changes in macroclimate conditions. Additionally, changes in climate or landscape resilience may be either exacerbated, mitigated or moderated by land use, including changes in forest management, commercial and residential development, recreation, energy production, patterns of homelessness, or restoration, making it difficult to predict a linear wildlife response to climate change. Second, there is not a sufficient and unambiguous literature basis for predicting how wildlife populations will respond to climate changes of various degrees of severity with a high degree of confidence, and individual populations are likely to respond differently to different degrees of change. Finally, given this project's emphasis on risks to motorists, other factors incorporated in the matrix (e.g., carcass data), flawed as they may be, are better measures of actual (versus predicted) animal behavior.

11. The Multi-Attribute Polygon (MAP) factor description notes that it incorporates mule deer movement data for central and eastern Oregon herds. Does this dataset include the ODFW mule deer movement data published in Coe et al. 2015, which contains Utilization Distributions for central Oregon herds collected from 2005–2012?

The MAP factor does not include the mule deer movement data published in Coe et al. (2015) for several reasons. First, we filtered available data sources with a strong preference for the most up to date information possible, as that information was most likely to capture current animal movement and habitat use patterns on the landscape. Coe et al. (2015) analyzed data from 2005-2012, ending at a time when The Dalles-California Highway had a single dedicated wildlife crossing structure and lower traffic volumes compared to current traffic patterns. Landscape and human community conditions (e.g., additional crossing structures, increasing population, wildland fires, forest management, recreation use, colonization by wolves, a growing houseless population, etc.) have changed substantially along the Dalles-California Highway since 2012, and there is evidence to suggest that migratory mule deer herd movement has shifted to the south from Lava Butte (Coe et al. 2015). Second, we evaluated the degree of overlap or differentiation between the herd movement data from Coe et al. (2015) and the mule deer herd and movement data we incorporated into our decision system. Overall, there was a high degree of convergence between those datasets, and particularly for areas prioritized by the MAP evaluation process (Figure A.H.1). It does not appear that use of the Coe et al. (2015) dataset would substantially alter the outcomes of our MAP analysis.

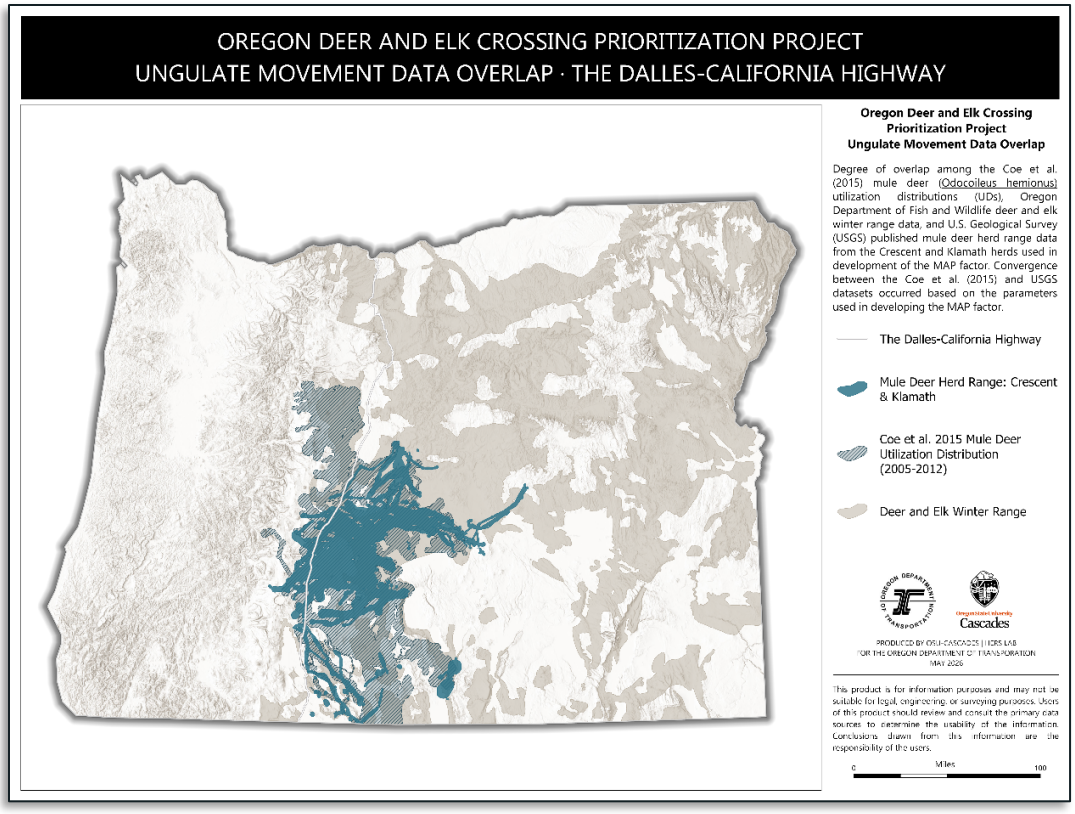

Figure A.H.1. Spatial overlap between Multi-Attribute Polygon (MAP), Mule Deer Winter Range factors, and mule deer utilization distributions (UDs) for south-central Oregon herds (2005–2012), as published by the Oregon Department of Fish and Wildlife (*see*, Coe et al. 2015).

12. The methods section notes that Priority Highway Segments (PHSs) were developed to rank distinct highway segments on the ODOT Highways of Analysis Interest (OHAI). Are these PHS values intended to be comparable across the entire analyzed highway network, or only within the highway on which they were established or within defined geographic region groups?

PHS designations are a product of analysis for each individual highway, as the landscape and traffic use context of highways across the state differ from one location to another. Traffic patterns, adjacent habitat conditions, species present, and highway-adjacent land-use vary from one highway to the next. The decision-system utilized here provides an indication of the two highways in the state with the highest concentration of High Priority Segments (The Pacific Highway and The Dalles-California Highway), as well as the locations along those highways with the highest aggregate scores from the decision matrix.

13. Does the recently released Missouri Department of Transportation (MoDOT) *Wildlife-Vehicle Collision Study and Prioritization Project* impact the findings of the Oregon Deer and Elk Crossing Prioritization Project (ODECPP)?

While our manuscript was in final preparation for publication, the Missouri Department of Transportation (MoDOT) independently published a related prioritization approach (Wildlife-Vehicle Collision Study and Prioritization Project, 2026) consistent with the methodology selection, findings, and recommendations presented within this Oregon Deer and Elk Crossing Prioritization Project (ODECPP). Similarities in methodology or outcomes between these two efforts reflect broader, encouraging trends in state-led wildlife-vehicle collision research, as well as growing investment in data-driven mitigation and prioritization to address this challenge for the benefit of both the public and wildlife. As the Oregon and Missouri efforts arose independently and were conducted separately, methodological similarity highlights the positive convergence of best practice and strongly supports the adoption of these developed tools for respective state DOTs.