

Reducing Wildlife-Vehicle Collisions in Maryland Through Planning, Design, and Technology

PROJECT NARRATIVE

Lead Applicant: Maryland State Highway Administration
Technical Partner: Maryland Department of Natural Resources



Opportunity Number: 693JJ324NF00023
Opportunity Name: FY 2024-2026 Wildlife Crossings Pilot Program

Table of Contents

I. Basic Project Information	1
A. Project Name.....	1
B. Project Goals.....	1
C. Project Objectives	2
D. Project Background and History.....	7
E. Project Location	9
F. Lead Applicant and Other Parties	10
II. Budget Narrative.....	12
III. Project Merit Criteria.....	13
Criterion #1.1: Reduction of Wildlife Vehicle Collisions	13
Criterion #1.2: Improvement of Terrestrial & Aquatic Habitat Connectivity.....	15
Criterion #2.1: Leveraging Federal Investments	17
Criterion #2.2: Economic Development & Visitation Opportunities.....	18
Criterion #2.3: Innovation.....	19
Criterion #2.4: Education & Outreach	19
Criterion #2.5: Monitoring & Research	20
Criterion #2.6: Survival of Species	20
IV. Project Readiness	22
Technical Feasibility	22
Required Approvals	22
Project Schedule.....	23
V. Selection Considerations	24
Safety	24
Climate Change and Sustainability.....	24
Equity	25
Workforce Development, Job Quality, and Wealth Creation	25

I. Basic Project Information

A. Project Name

‘Reducing Wildlife-Vehicle Collisions in Maryland Through Planning, Design, and Technology’

B. Project Goals

This application is for a planning project to be led by the Maryland State Highway Administration (SHA). It has the following core goals:

1. Identify and evaluate SHA road segments with high numbers of Wildlife-Vehicle Collisions (WVCs).
2. Establish design guidance to reduce WVCs and improve habitat connectivity along SHA roads.
3. Sustain statewide efforts in WVC reduction and habitat connectivity through an equitable public engagement strategy tailored to Maryland’s residents.
4. Strengthen statewide environmental and transportation system resilience by building a long-term collaborative partnership between SHA and the Maryland Department of Natural Resources (DNR).

The Project duration is planned for three (3) years. There is no construction proposed in this application. The Maryland Department of Natural Resources (DNR) will be a technical partner. The total funds required for this Project are \$484,280. Of this, \$387,424 (80 percent) are requested from this grant as WCPP funds. The remaining \$96,856 (20 percent) will be provided by the SHA as a non-federal match.

How Will This Grant Help Maryland?

Since the mid-20th century, the rapid construction of roadways has facilitated transportation in Maryland. In conjunction, the state has seen its population triple since the 1950s. Today, there are more than 69,000 lane miles of roads in Maryland, approximately 21.5 percent of which are maintained by the SHA.¹ While development and surface transportation have enabled economic growth, they have been associated with impacts to the state’s natural resources. Additional development and roads have decreased and fragmented habitat, which has led to an increased probability of WVCs. Maryland’s forests and wetlands have shrunk over 13 percent since 1973.² This all leads to an increased risk for the 39 federally listed threatened or endangered wildlife species in Maryland.³

Given Maryland’s high population (6.2 million people) and mix of land cover, human interactions with wildlife are frequent. This grant will help SHA spatially locate roadway segments with high numbers of WVCs (hotspots). Maryland is home to high densities of white-tailed deer (*Odocoileus virginianus*). While these populations are stable, they exist in proximity to human settlements. WVCs with large mammals are accompanied by a high cost and high risk of human injury. Collisions with white-tailed deer are the most recorded WVC in Maryland. A single deer-vehicle

¹MDOT SHA. 2023. Annual Mileage Reports, p.5-6.

²DNR. 2015-2025 State Wildlife Action Plan (SWAP).

³DNR. 2023. List of Rare, Threatened, and Endangered Animals of Maryland.

collision can cost over \$5,600 in vehicular damages.⁴ Evaluating WVC hotspots through this Project will form the basis for future efforts to reduce roadway injuries and fatalities for humans and wildlife.

This Project also seeks to improve habitat connectivity by identifying locations where Maryland's wildlife corridors can be preserved and restored. Increased habitat connectivity can provide more opportunities for safe wildlife passage across state roads. It can also support better climate resilience. With over 3,100 coastal miles, Maryland is highly vulnerable to climate change impacts. Reestablishing contiguous tracts of forests and wetlands improves habitat connectivity while also increasing carbon sequestration capacity.⁷ In addition, preserving wildlife corridors can help species adapt to climate change by allowing them to move in response to ecosystem changes, and by providing cooler microclimates for refuge.

C. Project Objectives

This Project will bring together SHA's long-term goals of roadway safety and environmental stewardship with DNR's leadership in wildlife conservation. It will address the impacts of development and habitat fragmentation to wildlife, as highlighted in the [2015-25 Maryland State Wildlife Action Plan \(SWAP\)](#). It will build on strategies outlined in the [MDOT 2050 Statewide Transportation Plan \(STP\)](#) and the [Strategic Highway Safety Plan \(SHSP\)](#) to minimize environmental impacts and reduce roadway fatalities.

SHA and DNR will establish a core '**Project Team**' to guide the project and ensure coordination amongst SHA and DNR's relevant departments. The Project Team will consist of program leaders and staff from SHA and DNR. There will be representatives from SHA's Office of Environmental Design, Office of Maintenance (SHA-OOM), Asset Management Office (SHA-AMO), Office of Planning and Preliminary Engineering (SHA-OPPE), and Office of Information Technology (SHA-OIT). There will be representatives from DNR's Wildlife & Heritage Service (DNR-WHS), Natural Heritage Program (DNR-NHP), and the Center for Geospatial Products and Services (DNR-CGPS). To deliver on the four core project goals, objectives have been developed with consideration for the distinct strengths of Maryland and the unique challenges faced by its people. They have been grouped into three parts that will overlap and inform each other:

- **Part 1:** Identify WVC Hotspots & Develop a Wildlife Crossing Design Guidance Document
- **Part 2:** Improve WVC Incident Recording Practices
- **Part 3:** Engage Maryland's Residents

Part 1: Identify WVC Hotspots & Develop a Wildlife Crossing Design Guidance Document

Objective 1: Locate WVC Hotspots for Large Mammals

> Task 1a: Process and Map Existing WVC Data

At present, carcass removal data from SHA maintenance shops are the most comprehensive record of WVC incidents on state roads in Maryland. Animal carcasses removed on state roads are digitally documented by maintenance staff on Electronic Team Activity Cards (eTAC).

⁴AAA Insurance. 2023. It's the Peak Time of Year for Deer Collisions: The average insurance damage claim for a deer collision is on the rise. Available at: <https://news.eastcentral.aaa.com/news/releases-20231025>

Records in eTAC start from 2013, but they contain known data gaps. WVC incidents are recorded in eTAC by the route number and mile-point of each carcass. Latitude and longitude are not recorded. Approximately 35 percent of existing eTAC entries do not have a route number and/or mile-point entered correctly, thus making it difficult to spatially locate WVC hotspots.

In this task, SHA will standardize existing carcass removal data from eTAC and process these records for geolocation. To the extent possible, SHA will use this processed eTAC data from each SHA District to map WVC incidents and identify hotspots on state roads. These hotspots will be corroborated against Maryland State Police crash reports and vehicular insurance data. SHA will identify road segments that are at high risk for WVCs with deer and other large mammals.

Deliverables: A map of WVC hotspots across the state, categorized by the rate of WVC incidents per linear mile of a road segment.

Objective 2: Locate WVC Hotspots for Terrestrial and Aquatic RTE Species

> Task 2a: Identify Terrestrial and Aquatic RTE Species Most Threatened by WVCs

Data in eTAC almost exclusively contains reports of deer-vehicle collisions. Incidents with small mammals, birds, reptiles, amphibians, and semi-aquatic species are not part of the statewide WVC record. This makes it difficult to gauge WVC impacts on smaller species, including RTE species.

In this task, the Project Team will identify federally listed RTE species, state listed RTE species, and Species of Greatest Concern (SGCN) that are most threatened by WVCs and habitat fragmentation in Maryland. This will include large mammals, small animals, birds, reptiles, amphibians, and fish. Information on critical habitats will be sourced from four, publicly-available databases maintained by DNR—the Green Infrastructure Assessment (GIA), BioNet, Sensitive Species Project Review Areas (SSPRA), and Targeted Ecological Areas (TEAs).⁵ Based on their collaborative research, the Project Team will spatially demarcate habitats and movement corridors for these critical species and identify SHA roads travelling through them. These road segments will be assumed to be at high-risk for critical species WVCs and will be an opportunity for design guidance to enable wildlife passage.

Deliverables: (i) A list of federal RTE species, state RTE species, and SGCNs in Maryland that are most threatened by road mortality and the habitat loss associated with surface transportation; (ii) A map showing habitats and movement corridors of critical species identified in this task, with SHA roads highlighted.⁶ Access to certain layers of the map may be restricted due to the sensitive nature of RTE species.

> Task 2b: Identify Locations to Improve Aquatic Organism Passage (AOP)

Roads cutting through aquatic and semi-aquatic habitats pose a direct WVC risk to species crossing at road level, such as beavers, turtles, salamanders, frogs, and snakes. Road-stream crossings can also hinder the passage of aquatic species that require stream continuity to maintain their life cycles, such as anadromous fish. There are **827** locations in Maryland where

⁵ See Criterion#1.2 for more information on DNR's databases and how they will be used in this Project.

⁶ Information on habitats and movement patterns of RTE species will be made publicly available based on DNR's discretion and guidance.

fish passage is impeded, as shown in DNR's [Fish Passage Blockage Map](#).⁷ The Project Team will review existing SHA data on road-stream crossings and consult with DNR's Fish Passage Program to verify locations where SHA roads and structures impede AOP. The Project Team will evaluate locations based on the severity of the blockage and the potential impact on aquatic/semi-aquatic species, including RTE species.

Deliverables: A map of locations where SHA roads severely impede the passage of aquatic/semi-aquatic RTE species.

Objective 3: Develop an Interactive Map with WVC Hotspots and Risk Areas

> Task 3a: Combine WVC Hotspots and Risk Areas with Statewide Datasets

SHA will develop an interactive map with multiple layers of spatial data relevant to WVC reduction. At a minimum, the map will include the following layers of information:

- WVC hotspots for deer and other large mammals, from Task 1a.
- SHA roads intersecting with critical species habitats and movement corridors, from Task 2a.
- Road-stream crossings where SHA roads severely impede the passage of aquatic and semi-aquatic RTE species, from Task 3b.
- SHA road centerlines, with route number/name, direction, and mile points.
- Traffic data, including traffic volume, speed limits, and road configurations.
- Land Use/Land Cover data.
- Targeted Ecological Areas, habitat hubs and corridors, conservation areas, and RTE species habitats available through DNR (see Criterion#1.2 for more detail).⁸

The development of this map will enable SHA to study WVC hotspots and risk areas in conjunction with other information, such as traffic volume, number of road lanes, and surrounding land cover. It will serve as a tool for users to evaluate future projects through the lens of with greater consideration for WVC reduction and habitat connectivity.

Deliverables: An interactive map (tentatively titled 'Wildlife-Vehicle Collision Map') of WVC hotspots on SHA roads. SHA and DNR will coordinate to monitor and update this map annually.

Objective 4: Develop a Wildlife Crossings Design Guidance Document

> Task 4a: Research Species-Specific Needs for Wildlife Crossings

Central to this Project is the need to develop suitable design guidance for WVC reduction based on different species' habits and preferences. The Project Team will further classify wildlife species involved in and threatened by WVCs in Maryland—including white-tailed deer, other large mammals, and critical species identified in Task 2a—based on size, mobility patterns, and

⁷ The 827 locations in the Fish Passage Blockage Map includes culverts, dams, and other infrastructure that blocks AOP to varying degrees. SHA will filter this data to obtain locations where state highway infrastructure is specifically blocking AOP.

⁸ Information on habitats and movement patterns of RTE species will be made publicly available based on DNR's discretion and guidance.

environmental preferences. The Team will collate wildlife crossings requirements and research safety innovations to reduce WVCs, suitable for each species-based classification.

Deliverables: A report which: (1) classifies wildlife species involved in and threatened by WVCs based on size and mobility patterns, (2) details wildlife crossings requirements and WVC reduction best practices for each species group.

> **Task 4b: Evaluate Existing Wildlife Crossings in Maryland**

SHA will investigate the efficacy of existing wildlife crossings in Maryland, such as the Intercounty Connector (ICC), an 18-mile segment of MD 200 with several wildlife passage components built into its design. The Project Team will evaluate the opportunities and challenges involved with wildlife crossings along the ICC. This task will also research monitoring tools for wildlife crossings (see [Section D](#) for more information on these projects).

Deliverables: A memo to summarize research on existing wildlife crossings in Maryland.

> **Task 4c: Develop a ‘Wildlife Crossings Guidance Document’ for SHA Infrastructure**

In consultation with DNR, SHA will develop a ‘Wildlife Crossings Design Guidance Document’ to establish wildlife passage design consideration for SHA infrastructure. The Guidance Document will provide species-specific design options for new construction and/or upgrades to existing state roads, bridges, and culverts to enable wildlife passage. It will provide design options for future projects that intersect with the WVC hotspots and high-risk areas identified in Objectives 1 and 2. The Document will be integrated with SHA’s existing design processes.

Deliverables: A ‘Wildlife Crossings Guidance Document’ which will include: (1) design guidance to reduce WVCs with white-tailed deer, other large mammals, and terrestrial and aquatic RTE species, (2) recommended actions for SHA projects in WVC hotspots/high-risk areas, (3) monitoring tools that can be used at different types of wildlife crossings, (4) suggested public outreach strategies for WVC reduction measures in vulnerable communities, as identified subsequently in Task 6a.

Part 2: Improve WVC Incident Recording Practices

Objective 5: Unify, Simplify, and Integrate WVC Data Collection Practices

> **Task 5a: Establish an Improved Structure and Workflow for WVC Data Collection**

SHA will work with maintenance shop engineers to identify gaps in existing WVC data collection practices, specifically during carcass removal. With input from DNR, SHA will determine the type of information and level of detail needed when removing a carcass from state roads. For instance, SHA’s current platform for recording carcass removal data, eTAC, lacks species-specific data. DNR can advise on the correct method and terminology for recording species. The Project Team will create a revised data collection template for use during carcass removal.

The Project Team will develop a collaborative workflow for reporting and collecting carcass removal data. Presently, WVCs involving vulnerable/watchlist species, such as black bears, are managed exclusively by DNR. Biologists at DNR are qualified to correctly identify carcasses, especially for RTE species. By sharing data collection responsibilities, SHA and DNR can unify presently disparate practices and ensure accuracy. In this task, SHA will examine the feasibility of updating their current platform, eTAC, to record high-quality carcass removal data.

The Project Team will also investigate how data from Connected Vehicle (CV) technologies can be incorporated in WVC incident recording practices. Maryland's Connected and Automated Vehicle Program (CAV) is led by the SHA and currently has CV sensors actively deployed at state highways. As the CAV continues its work on transportation safety, the Project Team will coordinate with SHA-OIT and the [‘CAV Working Group’](#) to determine the potential of collecting WVC data through CV technology.

Deliverables: (i) A revised data collection template to be used during carcass removal; (ii) A report on the potential of using CV technology to collect WVC data.

> **Task 5b: User Feedback and Testing**

In this task, the revised data collection structure and workflow will be tested for functionality and institutional compatibility. SHA will conduct focus group sessions and interviews with SHA District maintenance shop staff to solicit feedback on the outputs from Task 5a.

Deliverables: (i) A report documenting user feedback for the revised carcass removal data collection structure and workflow; (ii) Alterations to the revised data collection structure and workflow based on feedback.

> **Task 5c: Train Staff on Revised WVC Data Collection Practices**

The Project Team will implement the revised WVC data collection structure. The Team will coordinate with SHA's twenty-eight maintenance shops and seven engineering districts to conduct in-person training sessions in each district. SHA will also prepare a video recording of the training for maintenance staff for reference. Post training, the Project Team will monitor data collection and follow-up with maintenance shops for questions or revisions.

Deliverables: Seven training sessions with SHA maintenance staff, covering each individual SHA District supported by (1) an in-person presentation; (2) a video to summarize revised recording practices (3) a one-page handout.

Part 3: Engage Maryland's Residents

Objective 6: Develop and Administer an Equitable Public Engagement Approach

> **Task 6a: Identify Vulnerable Communities**

The Project Team will utilize the US Environmental Protection Agency's [EJSCREEN Tool](#), the US Department of Transportation's [ETC Explorer Tool](#), and the [Maryland Department of the Environment's EJ Screening Tool](#) to identify low-income and minority communities in Maryland per Environmental Justice planning requirements.⁹ This will include census tracts with a high burden of climate risk, environmental hazards, and transportation insecurity. The WVC Guidance Document will include information on low-income and disadvantaged communities to inform project design and decision making within the context of equity and inclusion.

⁹ Per Executive Order (E.O.) 12898, 'Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,' issued by President William J. Clinton in 1994. Its purpose is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities.

Deliverables: Information on vulnerable communities, which will be incorporated in the Wildlife Crossings Guidance Document.

> **Task 6b: Detail and Implement Public Engagement Activities**

Public outreach will be designed to equitably inform the public about the importance of WVC reduction and motorist safety. The outreach strategy will consider residents and business owners located in high WVC areas and vulnerable communities (as identified in Task 6a), motorists, freight/trucking companies, wildlife advocates, and elected officials, including members of the Maryland legislature, mayors, and county executives. The Project Team will utilize resources from previous SHA and DNR engagement activities. The following tools will be developed and used during the Project:

- A Project Webpage will be the central repository of public-facing information. It will host a Project description, updates, fact sheets, and a link to the Wildlife-Vehicle Collision Map. The website will be regularly maintained so that people can find information easily.
- The ‘Maryland WVC Map’ from Task 3a will be an interactive platform where people can view WVC hotspots and high-risk areas.
- SHA and DNR may present their work on WVC reduction at conferences, potentially including the Maryland Highway Safety Summit, Maryland Land Conservation Conference, American Planning Association Maryland Chapter Conference, and other knowledge sharing events hosted by state agencies and research institutions.
- Flyers/brochures with information on the Project’s purpose and engagement opportunities will highlight the importance of motorist safety, wildlife preservation, and habitat connectivity. These flyers can be placed at libraries, community centers, and at rest stops and welcome centers along SHA roads.
- Social media posts will promote and increase engagement with the Project website, and outreach events.
- The Team will develop up to 6 interpretive signs with information about WVCs, SHA and DNR’s actions to reduce them, and a QR code directing the public to the Project Webpage. These signs will be placed at SHA rest stops, park and rides or other public facilities. The Project Team will provide updates to elected officials, Metropolitan Planning Organizations (MPOs), State Organizations, local and regional research and advocacy groups, and local educational institutions through the Maryland Connectivity Coalition—an existing platform for inter-agency collaboration.

Deliverables: (i) Public engagement tools and activities as described above; (ii) A report summarizing public engagement activities, feedback received, and actions taken to address public concerns.

D. Project Background and History

Several resources from SHA and DNR will be utilized to form the foundation of this project. The MDOT2050 Statewide Transportation Plan (STP) emphasizes the value of natural resources and the importance of inter-agency coordination to conserve them. It commits SHA to both systemic safety and environmental stewardship. The Maryland State Highway Safety Plan (SHSP) incorporated Vision Zero as its underlying philosophy. Both plans highlight the need for data-driven analyses to prioritize transportation investments. MDOT maintains a comprehensive and publicly accessible spatial data portal on the state’s transportation system. Maryland’s Connected

and Automated Vehicle Program (CAV), led by SHA, further enhances innovation in transportation safety through the 2024 CAV Strategic Framework and 2021-2025 CAV Implementation Plan.

In the 2015 State Wildlife Action Plan, DNR established “Transportation and Service Corridors” as the #4 direct threat to Maryland’s wildlife.¹⁰ Amongst DNR’s many conservation resources is the Green Infrastructure Assessment (GIA), which provides an ideal platform to investigate critical wildlife corridors and habitats across the state. Started in the 1990s, GIA is an extensive data analysis project that evaluates and prioritizes forests and wetlands conservation. The Biodiversity Conservation Network (BioNet) further classifies ecologically important lands based on their urgency for conservation.

Wildlife crossings are not a new concept in Maryland. The Intercounty Connector (ICC), an 18-mile corridor between Montgomery and Prince George’s County, was opened to traffic in 2011 with several wildlife passage components built into its design. These include chain link fencing to exclude deer from the highway, wire mesh fencing to prevent smaller animals from crossing, and ‘escape ramps’ to guide deer back into forested areas if they access the ICC. It also includes culverts and bridges that span the area’s streams and 100-year floodplain. Since 2012, the ICC environmental team has documented deer, opossums, raccoons, turtles, foxes, squirrels, horses, and fish using these passages—and have observed a marked reduction in WVCs along the ICC. In 2012, the SHA received an Exemplary Ecosystems Initiative Award from the Federal Highway Administration (FHWA) for this project.¹¹

A 2011 study with the University of Maryland Center for Environmental Science and SHA investigated the use of road drainage structures by wildlife, specifically culverts. The study monitored 265 SHA culverts across Maryland over 2.3 years using infrared motion-detecting cameras. It documented 57 wildlife species, including mammals and birds, using culverts. The most common species observed included raccoons, white-tailed deer, red foxes, and several small mammals. The study recommended improvements to culvert design and placement to enhance their effectiveness as wildlife passages.¹² These recommendations will be incorporated into the Wildlife Crossings Guidance Document developed through this Project.

Previously Incurred Costs

In the first quarter of 2024, SHA worked with an external consultant to review federal funding opportunities for WVC reduction and explore existing WVC data in Maryland. SHA has seven engineering districts and 28 maintenance shops across the state (Figure 1). The consultant interviewed the Resident Maintenance Engineers (RMEs) of all 28 SHA maintenance shops and Assistant District Engineers (ADEs) of all seven districts via telephone calls. SHA maintenance shops are valuable stakeholders to spur statewide WVC reduction in Maryland. In these interviews, RMEs and ADEs provided first-hand accounts of WVC hotspots, data collection practices, WVC

¹⁰ Based on the International Union for Conservation of Nature’s (IUCN) Threat Classification System.

¹¹ FHWA. Maryland: Intercounty Connector Project Wildlife Passage. Available at: https://www.environment.fhwa.dot.gov/Pubs_resources_tools/resources/eei_awards/2012md_1.aspx

¹² Gates, J. E., & Sparks, J. L., Jr. (2011). An investigation into the use of road drainage structures by wildlife in Maryland (Final Report No. MD-11-SP909B4M). University of Maryland Center for Environmental Science, Appalachian Laboratory. Maryland State Highway Administration.

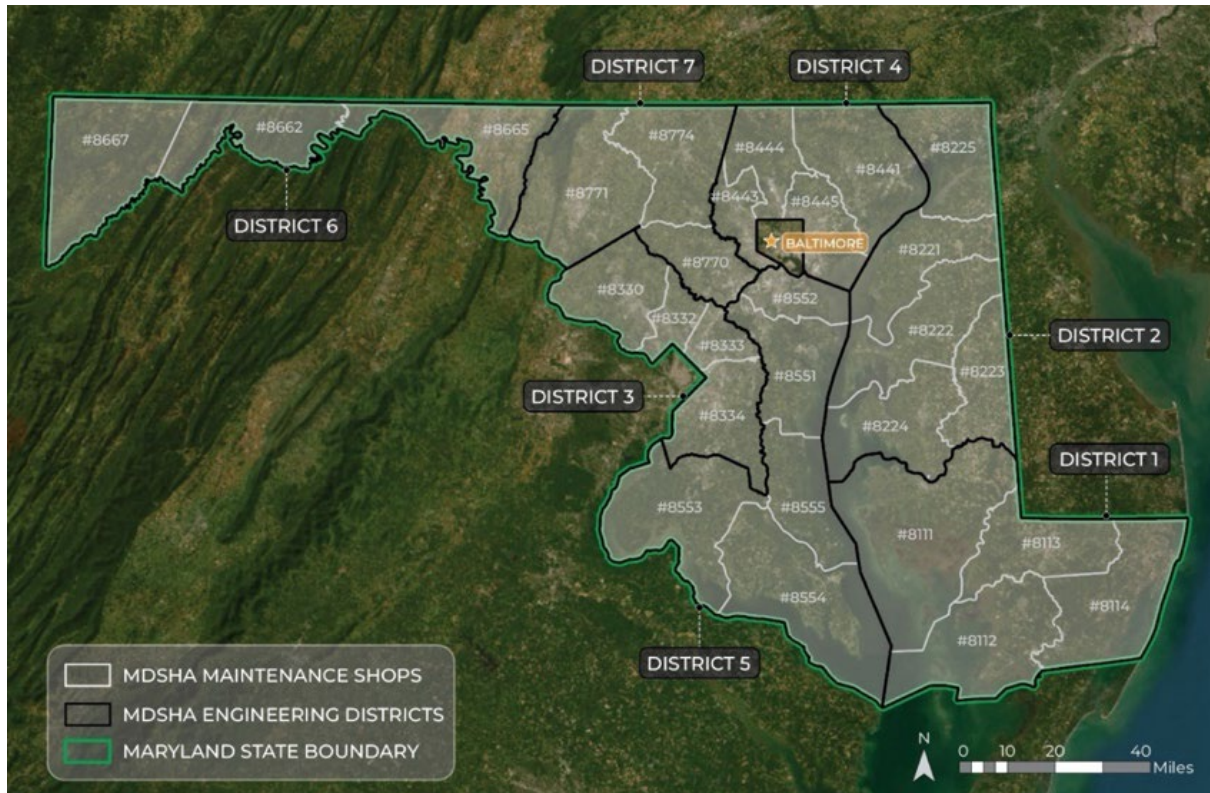
patterns in each region, and inter-district coordination. The interviews have been collated in Appendix C.

E. Project Location

The Project will encompass SHA-maintained roads in the State of Maryland. There are approximately 15,000 SHA-maintained lane miles of roadways in Maryland.¹³ State-maintained roadways carry 70 percent of the state’s traffic.¹⁴ In addition, there are 2,966 bridges and elevated structures.¹⁵ This project will focus on roadways, bridges, and elevated structures that are owned and/or maintained by SHA. SHA’s transportation infrastructure covers twenty-two (22) of the state’s twenty-three (23) counties—Baltimore City is not part of this project since SHA does not have jurisdiction over the city’s roadways. The SHA is open to sharing data from this grant with Baltimore City if it could help reduce WVC in their jurisdiction.

The **Federal Information Processing Standard (FIPS) code** for Maryland is 24. The **geographic coordinates** are 39.0458° N, 76.6413° W.

Figure 1: Project Location



¹³ Maryland Department of Transportation State Highway Administration (MDOT SHA). *2023 Annual Highway Mileage Report*. Available online: https://roads.maryland.gov/OPPEN/2023_Mileage_Reports.pdf

¹⁴ Maryland DOT. *2050 Maryland Transportation Plan*. Available at: https://www.mdot.maryland.gov/OPCP/MTP_Playbook_web.pdf

¹⁵ Maryland DOT. *2050 Maryland Transportation Plan*.

Urban and Rural Land

Maryland contains both urban and rural areas. As of the 2020 Decennial Census, there are 33 urban areas in Maryland that collectively cover 1,828 square miles. Eighty-five percent of the state's total population lives in urban areas, which account for 19 percent of the state's total land area.

Congressional Districts

The project will cover all eight (8) Congressional Districts in Maryland.

Other Important Planning Areas

- There are **no federally recognized Tribal lands in Maryland**.¹⁶ The Maryland Commission on Indian Affairs serves Native American communities, including the Accohannock Indian Tribe, Assateague Peoples Tribe, Nause-Waiwash Band of Indians, Piscataway Conoy Tribe, Piscataway Indian Nation, Pocomoke Indian Nation, and Youghiogheny River Band of Shawnee Indians.
- **There are 149 Opportunity Zones** in Maryland, with at least one in each county.
- There are no Empowerment Zones in the Project area.
- There are Choice Neighborhoods in Hagerstown.

F. Lead Applicant and Other Parties

The SHA will be the Lead Applicant for this project. SHA is one of six modal administrations at the Maryland Department of Transportation (MDOT). The SHA maintains Maryland's highways to provide a safe, well-maintained, reliable highway system that enables mobility choices for all customers and supports Maryland's communities, economy, and environment. SHA is responsible for numerous transportation projects each year. In FY 2024, the MDOT Consolidated Transportation Program allocated over \$1.6 billion to SHA for its Major Construction Program, and \$360 million for operating expenditures. In FY 2023, MDOT received \$812 million in highway formula funding. Most federal funding received by SHA is for capital projects, especially funds received through the Infrastructure Investment and Jobs Act (IIJA). The SHA is presently responsible for managing and administering over ten federal aid highway funds in Maryland.

Project Partners

This Project will be led and managed by the Maryland State Highway Administration (SHA). If awarded WCPP funding, SHA will be the primary point of contact with FHWA throughout the course of the project. The Maryland Department of Natural Resources (DNR) will be the technical expert for wildlife conservation and habitat preservation. SHA and DNR staff will coordinate as the 'Project Team' to complete project objectives and ensure inter-agency coordination through regular meetings.

Stakeholder Consultation

The Project Team will provide periodic updates to elected officials, state organization representatives, subject matter experts, regional research and advocacy groups, and federal

¹⁶ Verified against the Bureau of Indian Affairs, 'Indian Lands of Federally Recognized Tribes of the US' Map.

institutions. These stakeholders—many of whom are already involved with the Maryland Connectivity Coalition—could be from the organizations listed below:

- Metropolitan Planning Organizations
 - National Capital Region Transportation Planning Board
 - Baltimore Regional Transportation Board
 - Cumberland Area Metropolitan Planning Organization
 - Wilmington Area Planning Council
 - Salisbury/Wicomico Metropolitan Planning Organization
 - Calvert-St. Mary's Metropolitan Planning Organization
- Regional Advocacy/Research Groups and Educational Institutions
 - [Wildlands Network](#)
 - [Chesapeake Bay Foundation](#)
 - [Chesapeake Executive Council](#)
 - [North Atlantic Aquatic Connectivity Collaborative](#)
 - [Wild Earth Allies](#)
 - [Wildlife Habitat Council](#)
 - [Climate Change Working Group of Frederick County](#)
 - Johns Hopkins University
 - University of Maryland
- Federal Institutions
 - Federal Highway Administration
 - [Maryland Fish & Wildlife Conservation Office, US Fish & Wildlife Services](#)
 - National Oceanic & Atmospheric Administration
 - [Maryland Natural Resources Conservation Service, US Department of Agriculture](#)

II. Budget Narrative

The total funds required for this Project are \$484,280. Of this, \$387,420 (80 percent) are requested from this grant as WCPP funds. The remaining \$96,856 (20 percent) will be provided by the SHA as a non-federal match. Funds provided by SHA will be sourced from the State Transportation Trust Fund (TTF). The TTF is a non-lapsing special fund that consists of tax and fee revenues, operating revenues, bond proceeds, and fund transfers. It is a dedicated state fund for transportation that is expected to provide reliable support towards the completion of this Project.

Table 1: WCPP Application Project Funding by Component

PROJECT PHASE	TOTAL FUNDS	WCPP FUNDS REQUESTED (80 percent)	STATE MATCH ALLOTTED (20 percent)
PART 1 Identify WVC Hotspots & Develop a Wildlife Crossings Design Guidance Document	\$186,375.00	\$149,100.00	\$37,275.00
PART 2 Improve WVC Incident Recording Practices	\$102,375.00	\$81,900.00	\$20,475.00
PART 3 Engage Maryland’s Residents	\$102,375.00	\$81,900.00	\$20,475.00
Project Management	\$15,155.00	\$12,124.00	\$3,031.00
Biweekly Project Team Meetings	\$78,000.00	\$62,400.00	\$15,600.00
TOTAL	\$484,280.00	\$387,424.00	\$96,856.00

III. Project Merit Criteria

Criterion #1.1: Reduction of Wildlife Vehicle Collisions

Over 33,000 animals die each year in Maryland due to WVCs. From 2019-2023, 6 people were killed and over 1,020 were seriously injured in wildlife-vehicle collisions.¹⁷ WVC reduction on SHA roads must be achieved through detailed, reliable data. Preliminary research carried out for this Project in early 2024 found three main sources of WVC incident data in Maryland – carcass removal statistics from the SHA Maintenance Shops, MD State Police crash reports, and vehicular insurance claims.

- SHA has seven engineering districts and 28 maintenance shops across the state. SHA maintenance shops track daily labor hours and equipment usage using Electronic Team Activity Cards (eTAC) – including carcass removal from state roads. While eTAC offers a record from 2013 to the present, data gaps have been identified.
 - Carcass removal data is not georeferenced by latitude/longitude, making it labor intensive to spatially map WVC hotspots in Geographic Information Systems (GIS) programs.
 - Records in eTAC are primarily of large mammals such as deer. Small mammals, reptiles, amphibians, and semi-aquatic species are excluded from SHA’s WVC record.
 - There are no overarching regulations to monitor the quality of data. On average, 35 percent of existing eTAC entries do not have a route number and/or mile-point entered correctly. These datasets require extensive ‘cleaning’ before they can be processed and mapped to identify WVC trends.¹⁸
- The Maryland Department of State Police (MDSP) collects [vehicular crash data](#). MDSP data identifies ‘animal’ as a ‘crash circumstance’ and is georeferenced by latitude/longitude.

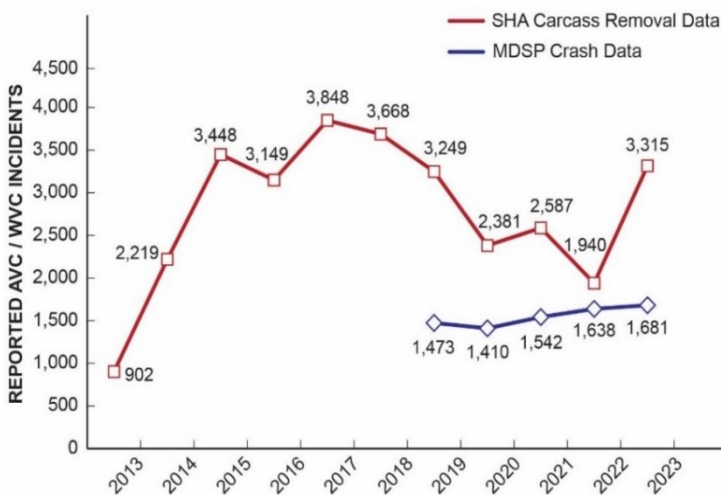


Figure 2: Gaps in WVC Data from Two Sources

However, it does not distinguish between different species, thus grouping domestic pets and livestock with wildlife. Further, not all WVCs are reported to MDSP, so this database underrepresents the state’s WVC incidents. Figure 2 illustrates the discrepancy between SHA carcass removal data and MDSP reports.

- Vehicular insurance claims are an unreliable source of WVC data. Claims are typically filed for major damage, which usually occurs with large mammal crashes. Not all

¹⁷ MD State Police Crash Data, 2019-2023. Available at: <https://mdsp.maryland.gov/Pages/Dashboards/CrashDataDownload.aspx>

¹⁸ ‘Data cleaning’ is the process of fixing or removing incorrect, incorrectly formatted, duplicate, or incomplete data within a dataset. A ‘clean’ dataset is necessary for accurate spatial and statistical analysis.

vehicles are insured against WVCs, and insurance claims do not necessarily include the detail of information needed to identify WVC hotspots and species.¹⁹

The interviews conducted in early 2024 with SHA maintenance shop engineers (see [Section D](#)) revealed white-tailed deer to be the primary species recorded during carcass removal. The concern of deer-vehicle collisions is especially severe during the ‘rut’ (deer mating season), where populations spike and deer families move more than usual. According to DNR’s White-Tailed Deer Management Plan, State Farm Insurance estimated nearly 33,000 deer-vehicle collisions in Maryland in 2017, the annual cost of which exceeded \$100 million.²⁰ Through Task 1a, this Project will map WVC hotspots involving deer. These hotspots can be used in conjunction with DNR’s knowledge of deer population and habitats to guide deer population management as a potential WVC mitigation strategy. Deer population management has been proven to reduce WVCs. For instance, a deer population reduction program in Minnesota that lowered winter deer densities by 46 percent was accompanied by a 30 percent reduction in deer-vehicle collisions.²¹

Another point noted during interviews with SHA maintenance engineers was that several wildlife species are involved in WVCs but not always reported in eTAC. These include black bears, bobcats, coyotes, foxes, beavers, turtles, raccoons, opossums, skunks, squirrels, owls, hawks, and other large birds. WVCs with black bears are reported largely in Districts 4, 5, 6, and 7. Though far fewer than deer, carcasses of American Black Bears (*Ursus americanus*) killed by WVCs are not removed by SHA staff because they are classified as ‘vulnerable/watchlist.’ Bear carcasses are handled exclusively by DNR. Bobcat (*Lynx rufus*) collisions are rare, but important to record since they are state listed as ‘vulnerable and in need of conservation.’

Maryland’s 2005 SWAP identifies 610 Species of Greatest Conservation Concern (SGCN). Several SGCNs are also on the state RTE list, with the Bog Turtle (*Glyptemys muhlenbergii*, federally listed as threatened) noted by FHWA to be directly at-risk from road mortality.²¹ In addition, the Short-eared Owl and Barn Owl, both state RTE species, are highly vulnerable to WVCs because they fly low while hunting, typically at the same height as vehicles.²² In the winter, Pine Siskins often cluster in the middle of roadways to feed on sand, salt, and de-icing agents. Maryland is also part of the Atlantic Flyway, one of four migratory routes that birds follow from nesting to wintering areas. The Piping Plover (federally listed as threatened), Red Knot (federally listed as threatened), King Rail, and Least Tern can all be found in Maryland during their migration routines.

There is presently a lack of consistent, reliable, and coordinated WVC data in Maryland. Records are not adequately georeferenced, do not differentiate between species, and only consider large mammal collisions, specifically with white-tailed deer. The lack of species-specific WVC data makes it difficult to pinpoint where vehicles pose a critical threat to RTE species. Barriers to accurate data collection that emerged during interviews with maintenance engineers will be addressed through continued engagement, staff training, and a partnership between SHA and DNR.

¹⁹ State Farm Insurance places the likelihood of an animal-involved claim in Maryland as 1 in 116.

²⁰ DNR. Maryland White-Tailed Deer Management Plan 2020-2034.

²¹ FHWA. 2008. Wildlife-Vehicle Collision Reduction Study: Report to Congress.

²² USFWS. Threats to Birds: Collisions-Road Vehicles. <https://www.fws.gov/story/threats-birds-collisions-road-vehicles#:~:text=Road%2Dkill%20scavengers%20at%20risk,that%20feed%20on%20animal%20carcasses.>

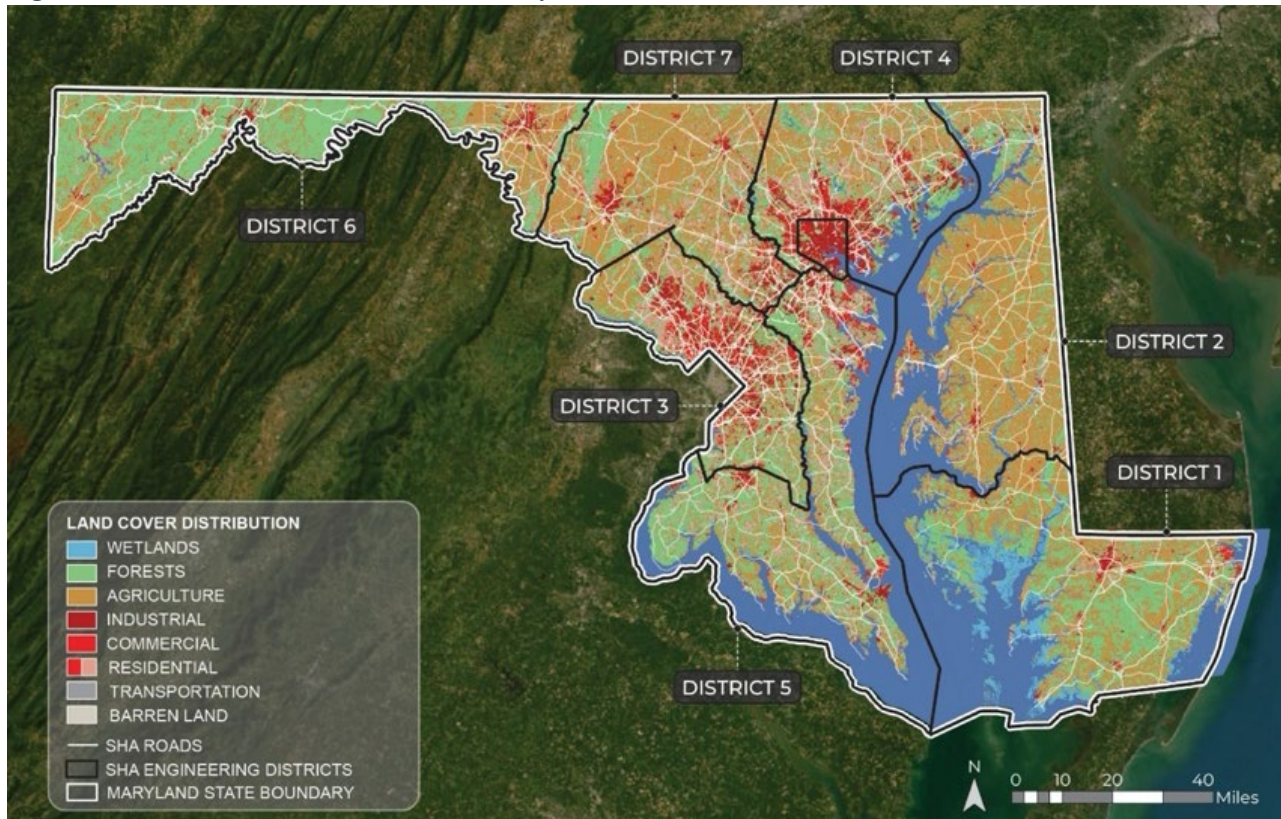
This Project will lay a foundation for WVC reduction and habitat connectivity across Maryland's state highways, bridges, and culverts through the following actions:

- Locate WVC hotspots for deer/large mammals and high-risk areas for RTE species and evaluate wildlife movement corridors with WVC collision data (Tasks 1a, 2a, 2b).
- Develop design guidelines to reduce WVCs with white-tailed deer and terrestrial/aquatic RTE species on SHA roads (Tasks 4a, 4b, 4c).
- Recommend actions for SHA projects in WVC hotspots/risk areas, including new construction and upgrades to state highways, bridges, and culverts (Tasks 4a, 4b, 4c).
- Establish uniform standards for WVC data collection (Tasks 5a, 5b, 5c).

Criterion #1.2: Improvement of Terrestrial & Aquatic Habitat Connectivity

With rapid urbanization and roadway expansion, Maryland's forests and wetlands have shrunk more than 13 percent since 1973.²³ Six of the state's 23 counties—Prince George's, Montgomery, Anne Arundel, Charles, Calvert and Baltimore—accounted for almost 70 percent of all tree canopy and forest losses.²⁴

Figure 3: Land Cover Distribution Across Maryland



²³ DNR. 2015-2025 State Wildlife Action Plan (SWAP).

²⁴ Minnemeyer, S., et al. (2022). *Technical study on changes in forest cover and tree canopy in Maryland*. Harry R. Hughes Center for Agro-Ecology, University of Maryland College of Agriculture and Natural Resources. <https://agnr.umd.edu/sites/agnr.umd.edu/files/files/documents/Hughes%20Center/Maryland%20Forest%20Technical%20Study%20Use%20Final%20Web.pdf>

Based on the International Union for Conservation of Nature (IUCN) classification system, DNR established ‘Transportation and Service Corridors’ as the #4 direct threat to Maryland’s wildlife. The #1 IUCN Threat is ‘Residential and Commercial Development,’ which is directly linked with transportation systems. In Figure 3, Maryland’s Land Use/Land Cover (LULC) dataset shows that concentrated regions of urbanized land (industrial, commercial, and residential) overlap with dense road networks. Over 69,000 roadway lane miles in Maryland fragment habitat, degrade interior forests, disrupt wildlife corridors, and kill species across almost all taxa through vehicular collisions. Twenty-two percent of these roads are maintained by SHA. State-maintained lane miles of roadway carry 70 percent of the state’s traffic. There is a critical need for transportation and conservation planning to work in tandem. The Project will address this requirement by guiding the integration of wildlife passage and thereby, habitat connectivity, with SHA’s surface transportation infrastructure.

Maryland sits at a unique ecological position in the mid-Atlantic. With the Chesapeake Bay to the east and Appalachian Mountains in the west, there are over 15,000 animal and plant species that live in the state’s five geographical divisions. 1,200 of these species are rare, uncommon, or declining.²⁵ The 2015-2025 State Wildlife Action Plan lists 41 mammals, 143 birds, 26 reptiles, 19 amphibians, 31 fish, 272 insects, and 78 other invertebrates as Species of Greatest Conservation Concern (SGCN). Thirty-nine (39) wildlife species in Maryland are federally listed as threatened or endangered. The Project will address WVC reduction and habitat connectivity for deer, large mammals, and numerous RTE species.

Six turtle species in Maryland are federally listed as threatened or endangered—the Bog Turtle is specifically vulnerable to road mortality. Seven salamanders and toads are state listed as endangered, including the Eastern Tiger Salamander (*Ambystoma tigrinum*). Task 2a will identify RTE species and SGCNs in Maryland that are most threatened by road mortality and the habitat loss associated with surface transportation. Task 1a will map WVC hotspots involving deer and other large mammals, which pose a risk to both humans and wildlife. The Project will thus classify WVC hotspots and high-risk areas on state highways. The following publicly available spatial datasets will support this task:

- **The Green Infrastructure Assessment (GIA)** maps a network of forests, wetlands, and other natural lands in the state. GIA classifies upland and aquatic resource areas as "hubs" and "corridors." **Hubs** are typically large contiguous areas, separated by major roads and/or human land uses. **Corridors** are linear features connecting hubs together to help animals and plant propagules move between hubs. According to GIA, 590 wildlife corridors are intersected by highways in Maryland. Analyzing locations of hubs and corridors in relation to WVC hotspots will help the Project Team evaluate actions for wildlife passage.
- **Targeted Ecological Areas (TEAs)** are lands and watersheds identified as conservation priorities by DNR. They represent the most ecologically valuable areas in the State, i.e. they are the "best of the best." TEAs combine several ecological databases, including GIA, rare species and wildlife habitat, aquatic life hotspots, and coastal ecosystems.

²⁵ Maryland Department of Natural Resources (DNR). 2015-2025. State Wildlife Action Plan.

- **Sensitive Species Project Review Areas (SSPRA)** represent the general locations of documented rare, threatened and endangered species. While SSPRA does not strictly delineate habitats of RTE species, it provides a basis for RTE habitat analysis.
- **BioNet: Biodiversity Conservation Network** is a tool for DNR’s Natural Heritage Program (NHP) and its partners to prioritize conservation efforts. Areas are classified into a five-tiered system based on conservation urgency. In addition to focusing on vanishing species and habitats, and high-quality common habitats, the criteria were designed to incorporate landscapes required for migratory animals, population dispersal, and habitat shifts resulting from climate change.
- **The Fish Passage Blockage Map** maintained by DNR shows **827** locations in Maryland where fish passage is impeded by various types of infrastructure.²⁶ Task 2b will identify locations where SHA roads impede Aquatic Organism Passage (AOP). Aquatic barriers along free-flowing waterways can block migratory routes and habitat access for numerous aquatic/semi-aquatic organisms. In contrast, well-designed culverts can help fish species access spawning areas, coldwater habitats, and forage. The Atlantic Sturgeon (*Acipenser oxyrinchus*) and Shortnose Sturgeon (*Acipenser brevirostrum*) are both federally listed as endangered. These fish species spend their lives in the Chesapeake Bay and migrate upstream to spawn. The Brook Trout (*Salvelinus fontinalis*) is an SGCN species native to Maryland that relies on coldwater habitats during the summer.
- **Land Use/Land Cover (LULC) data** will allow SHA and DNR to analyze land cover around WVC hotspots involving deer. White-tailed deer collisions typically occur in areas where forested and agricultural land mix and food sources are abundant. These mixed land cover conditions are profuse in Maryland (Figure 3). WVC hotspots involving deer will be layered with LULC data in Task 3a. The correlations that emerge through this analysis will be incorporated into the ‘Wildlife Crossings Guidance Document’ in Task 4b and can inform future deer population studies.

In Task 4a, the Project Team will research best practices on wildlife passage and create design guidance specifically for Maryland’s wildlife that is involved in, or threatened by, WVCs. For instance, low-mobility species like the Bog Turtle typically need cover, as provided by a culvert, when moving through an open area. Providing grates on the culvert to allow natural light can help turtles feel more comfortable using the culvert as a road crossing. In Tasks 5a, 5b, and 5c, SHA will strengthen WVC data collection practices so that species-specific information can be recorded. In addition to deer, this measure will help identify terrestrial and aquatic RTE species killed by vehicular collisions.

Criterion #2.1: Leveraging Federal Investments

SHA has programmed funds to meet the 20 percent state match required for this Project. The state match will be provided from the State Transportation Trust Fund (TTF). The TTF is a non-lapsing special fund that consists of tax and fee revenues, operating revenues, bond proceeds, and fund transfers. It is a dedicated state fund for transportation that is expected to provide reliable support towards the completion of this Project.

²⁶ AOP blockage types in this dataset include gauging weirs, dams, culverts, concrete channels, gabion baskets, pipelines, sewer lines, sheet pile weirs, and tide gates. SHA will focus on blockages associated with state highways.

The Project Team will further leverage federal investments by working to institutionalize practices for WVC reduction. WCPP funding will enable SHA to form a long-term partnership with DNR. The ‘Wildlife Crossings Guidance Document’ developed in this project will embed WVC reduction and habitat connectivity in SHA’s planning, design, and construction processes. Further, in addition to providing a 20 percent state match, SHA will dedicate personnel and resources to guide this Project.

Criterion #2.2: Economic Development & Visitation Opportunities

Economic Development and Ecosystem Services

Maryland maintains 46 state parks, 18 federal parks, and several local parks and open spaces. Activities such as hiking, camping, fishing, water sports, trail sports, boating and wildlife viewing generate significant regional economic activity. Per the Maryland Outdoor Recreation Economic Commission’s (MORE) 2019 Report, outdoor recreation is an ‘economic engine’ in Maryland. It generates \$14 billion annually in consumer spending, 109,000 direct jobs, \$4.4 billion in wages and salaries, and \$951 million in state and local tax revenue.

Additionally, the ecosystems of Maryland provide \$11.4 billion in benefits to its people every year. This includes provisioning, regulating, cultural, and supporting services from the state’s forests, wetlands, clean air, and clean water. About \$2 billion a year comes from recreation and wildlife protection benefits.²⁷ The Project will help improve habitat connectivity and conserve RTE species, thus sustaining Maryland’s natural environment for visitation and ecosystem benefits.

Visitation Opportunities

The US Bureau of Economic Analysis associated over \$8 billion of economic activity with outdoor recreation in Maryland as of 2022.²⁸ In 2018, DNR conducted a statewide survey for their [Land Preservation and Recreation Plan \(LPRP\)](#). The survey found that almost 40 percent of Marylanders

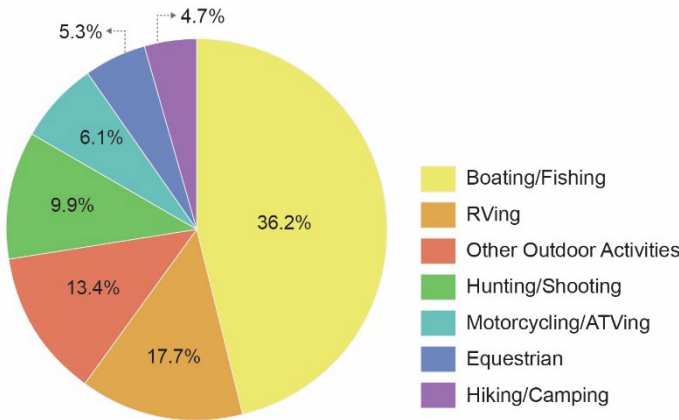


Figure 4: Value-Added Outdoor Recreation in Maryland, 2022²⁵

visit a state park, forest, or wildlife management area at least once a month. The Project will increase vehicular safety through the identification of WVC hotspots. This will help reduce WVCs in the state, especially around outdoor recreation areas where wildlife may use roads more frequently. For instance, Yosemite National Park uses cautionary road signs and information panels to alert and educate visitors about bears on the Park’s vehicular roads. The LPRP also found that the public highly rated conservation

²⁷ DNR, Chesapeake and Coastal Service. 2017. Maryland’s Return on Environment.

²⁸ US BEA. 2022. State Outdoor Recreation Satellite Account (ORSA) Statistics. The graph in Figure 5 has been extrapolated from the [Maryland Outdoor Recreation Economic Impact Report](#) prepared by Eastern Shore Regional GIS Cooperative with the use of 2022 ORSA Statistics.

benefits. To enhance the relationship Marylanders have with their natural environment, this Project will increase environmental stewardship through sustained public engagement. By using tools such as the Project Webpage and Maryland WVC Map, the Project will provide an opportunity for Maryland's 'outdoors'—forests, rivers, mountains, and wildlife—to become a more prominent part of people's lives.

Criterion #2.3: Innovation

The Project will foster innovation by experimenting with new data collection and management techniques, and by promoting strategic alignments amongst state agencies in Maryland. In Part 2, 'Improve WVC Recording Practices,' SHA will assess methods to incorporate Connected Vehicle (CV) technology to capture a wider range of WVC data. CV technology can be integrated into vehicles and state infrastructure to establish vehicle-to-everything (V2X), vehicle-to-infrastructure (V2I), or vehicle-to-vehicle (V2V) communications. These channels can collect and transmit roadway data in real-time to sense hazards. According to the US DOT, CV technology is operational in regions and states throughout the country.²⁹ It can be a powerful innovation to collect WVC risk data and reduce collisions.

Task 5a will investigate the extent to which eTAC, the existing data platform used by maintenance shops during carcass removal, can be modified to record high-quality data. SHA will work with its maintenance shops, Asset Management Office, and Office of Information Technology to integrate georeferenced carcass removal data with MDOT's GIS Open Data Portal. The Portal includes spatial roadway data for the entire state, ranging from a roadway sign inventory to traffic counts. By ensuring that WVC data becomes a part of MDOT's Open Data Portal, this Project will create a foundation for spatially analyzing WVC incidents with statewide traffic, transportation, and environmental data

In Objective 4, 'Develop a Wildlife Crossings Design Guidance Document,' SHA will place innovation and creativity at the fore while researching wildlife crossings guidelines. Innovation in wildlife crossings can be part of design, materials, construction processes, monitoring methods, or funding mechanisms. The 'Wildlife Crossings Design Guidance Document' produced in Task 4c will emphasize innovative practices and work to include them as long-term components of SHA's project planning and delivery processes.

Criterion #2.4: Education & Outreach

The Project Team will design equitable public outreach activities to educate and inform the people of Maryland about the impacts of WVCs on motorist safety and habitat connectivity. A Project Webpage will be the central repository of information. In addition to Project updates and digital public engagement activities, the webpage will provide links to articles, papers, and books that explore best practices to incorporate safety and habitat connectivity into transportation design. Care will be taken to provide some examples that can inspire young children.³⁰ An electronic

²⁹ US DOT. 2020. How Connected Vehicles Work. Available at: <https://www.transportation.gov/research-and-technology/how-connected-vehicles-work>

³⁰ For instance, 'Crossings: Extraordinary Structures for Extraordinary Animals,' by Katy S. Duffield and Mike Orodan is an illustrated picture-book that explores the impact of habitat fragmentation on wildlife species, and the benefits of wildlife crossings for habitat connectivity. The Project webpage can list the book as a resource for children and provide [a YouTube link to a read-aloud of the book](#).

survey will be designed for the public to provide comments on their experiences with WVCs. The ‘Maryland WVC Map’ from Task 3a will be an interactive platform where people can view WVC hotspots and high-risk areas. It will be designed for the public to learn more about Maryland’s wildlife, the areas they inhabit, and the benefits of conserving the state’s natural ecosystems.

The Project Team will design outreach strategies for vulnerable communities based on equity screening conducted in Task 6a. Flyers, brochures, and social media posts will be used to disseminate engagement activities and Project information. The Team will place flyers at libraries and recreation centers in communities, and at rest stops and welcome centers along SHA roads—especially in areas where communities have limited internet access. The Team will build on engagement resources from previous outreach conducted by SHA and DNR, such as the 2050 Statewide Transportation Plan and the 2020-2034 White-Tailed Deer Management Plan.

The Project Team will also provide updates to and solicit feedback from elected officials, Metropolitan Planning Organizations (MPOs), State Organizations, local and regional research and advocacy groups, and local educational institutions through the Maryland Connectivity Coalition—an existing platform for inter-agency collaboration. The Project will include communications with elected officials, such as members of the Maryland legislature, city/township mayors, and county executives. Elected officials will be requested to share project activities occurring in their districts with their constituents.

Criterion #2.5: Monitoring & Research

Monitoring in this Project will focus on collecting detailed and accurate data on WVC incidents. As a non-construction project, research and observations will be collated to inform practices for WVC data collection and inter-agency collaboration. In Part 1, the Project Team will develop mapping tools to visualize WVC data with a statewide database of traffic, transportation infrastructure, and natural resources. Tasks 2a and 2b will establish the first statewide baseline of WVC risks for terrestrial and aquatic rare, threatened, and endangered (RTE) species. Task 3a will ensure these observations are recorded and maintained in the ‘Maryland WVC Map.’ In Part 2 of the Project, the Team will monitor their progress and barriers towards setting up a collaborative workflow for data collection. This will guide a long-term partnership between the two organizations.

Task 4b will research monitoring techniques at wildlife crossings, which will inform the ‘Wildlife Crossings Design Guidance Document’ developed in Task 4c. Further, the Team will maintain a thorough record of focus group sessions with maintenance staff (from Tasks 5b and 5c) and public engagement activities (from Task 6b). The Project webpage will host information related to the Project, including fact sheets, links to engagement opportunities, and a link to the Wildlife-Vehicle Collision Map. All status updates and technical reports prepared as part of this Project will be made available to FHWA and the public through the Project webpage.

Criterion #2.6: Survival of Species

This Project will build on DNR’s work in wildlife conservation to incorporate habitat connectivity and wildlife preservation in transportation planning. Through mapping tools and design guidance, the Project is expected to directly and indirectly benefit **five** federally threatened or endangered species in Maryland. These include the Bog Turtle (*Glyptemys muhlenbergii*), Atlantic Sturgeon (*Acipenser oxyrinchus*), Shortnose Sturgeon (*Acipenser brevirostrum*), Piping Plover (*Charadrius*

melodus), and Red Knot (*Calidris canafus rufa*). It will indirectly benefit numerous other species on the state RTE and/or SGCN list. The Project will factor differences in how these distinct species cluster and move. Task 1a will focus on deer, bears, and other large mammals, as they pose a threat to the lives of both humans and wildlife. Task 2a and 2b will respond to habitat connectivity issues for terrestrial and aquatic RTE species. Task 4a will classify the different wildlife species involved in and threatened by WVCs in Maryland, based on size and mobility patterns.

Large and Small Mammals

During SHA maintenance staff interviews, RMEs recalled American black bears (*Ursus americanus*), and bobcats (*Lynx rufus*) as occasionally involved in WVCs. Black bears are state classified as ‘vulnerable/watchlist.’ Bobcats are state classified as ‘vulnerable and in need of conservation.’ Several small animals, such as the Delmarva Fox Squirrel (*Scirus niger cinereus*) or the Least Weasel (*Mustela nivalis*), both listed by the state as ‘threatened,’ may also be involved in WVCs without a written record.

Aquatic and Semi-Aquatic Species

The increased focus on Aquatic Organism Passage (AOP) through this Project will benefit fish, amphibians, and reptiles. Critically, the Bog Turtle (*Glyptemys muhlenbergii*) is federally listed as ‘threatened’ and is directly at-risk from road mortality.³¹ Conversations with DNR through the development of this application also highlighted WVC risks to Wood Turtles (*Glyptemys insculpta*), that are state listed as ‘rare/vulnerable.’ The Atlantic Sturgeon (*Acipenser oxyrinchus*) and Shortnose Sturgeon (*Acipenser brevirostrum*), federally listed as “endangered,” both spend their lives in the Chesapeake Bay and migrate upstream to spawn. The Brook Trout (*Salvelinus fontinalis*) is an SGCN species native to Maryland that relies on coldwater habitats during the summer.

Birds

Four migratory birds that use the Atlantic Flyway through Maryland are RTE. The Piping Plover (*Charadrius melodus*) and Red Knot (*Calidris canafus rufa*) are both federally listed as ‘threatened.’ The Plover nests on Assateague Island along Maryland’s coast. Its habitat is threatened by human activity, such as the overuse of beaches, and natural environmental changes. Red Knots migrate through Maryland and Delaware on their way north each spring. The King Rail (*Rallus elegans*) and Least Tern (*Sternula antillarum*) are state listed as ‘rare’ and ‘threatened’ respectively. The two birds can be found breeding in Maryland during migration. In addition, the Short-eared Owl (*Asio flammeus*) and Barn Owl (*Tyto alba*) are highly vulnerable to WVCs because they fly low while hunting, typically at the same height as vehicles.³² The Short-eared Owl is state listed as ‘endangered,’ and the Barn Owl is state listed as ‘threatened.’ Pine Siskins (*Pinus spinus*), state listed as ‘rare,’ often cluster on roads in the winter to feed on sand, salt, and de-icing agents.

³¹ FHWA. 2008. Wildlife-Vehicle Collision Reduction Study: Report to Congress.

³² USFWS. Threats to Birds: Collisions-Road Vehicles. <https://www.fws.gov/story/threats-birds-collisions-road-vehicles#:~:text=Road%2Dkill%20scavengers%20at%20risk,that%20feed%20on%20animal%20carcasses.>

IV. Project Readiness

Technical Feasibility

SHA has a consistent and reliable record managing federal highway funds. From FY 2024 to FY 2029, over \$5.7 billion in federal funding has been planned for capital expenditures at SHA.³³ SHA administers federal funding for all Maryland projects eligible for the Transportation Alternatives Set-Aside Program (TAP) on behalf of FHWA. SHA is also responsible for numerous other federal aid programs, such as the Carbon Reduction Program, Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program, and the National Electric Vehicle Infrastructure (NEVI) Program.

The 2022-2025 Maryland Statewide Transportation Improvement Program (STIP) lists eight federal-aid highway funding sources, including the Appalachian Development Highway System (ADHS), Congestion Mitigation and Air Quality (CMAQ), Surface Transportation Program (STP), National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), Transportation Alternatives Program (TAP), Special Federal Appropriations (SFA). The Office of Finance is responsible for SHA's budget and expenditure reports, programming certification, and collection of federal funds. Specifically, the Capital Program Division manages state matching in accordance with FHWA policies and submits bills to FHWA for federally funded projects.

Required Approvals

Environmental Permits and Reviews

There will be no environmental permits or reviews required, including the National Environmental Policy Act (NEPA), since there is no construction proposed in this Project. There will also be no Right-of-Way Acquisition required.

State Approvals and Federal Transportation Requirements

The Project is aligned with SHA and DNR's long-term goals of roadway safety and environmental stewardship. Its goals of WVC reduction and environmental impact mitigation are consistent with the [MDOT 2050 Statewide Transportation Plan \(STP\)](#) and the [Strategic Highway Safety Plan \(SHSP\)](#). The Project will be programmed in the Maryland Statewide Transportation Improvement Program (STIP) if WCPP grant funding is awarded. Further, the reintroduction and potential adoption of SB902 will formalize a partnership between SHA and DNR towards WVC reduction. SB902 also included the provision of a special, non-lapsing Wildlife Highway Crossings Fund, which would be a valuable source of future funding to sustain this Project.

The numerous projects SHA is responsible for implementing are completed in compliance with federal requirements including Title VI, as well as contract and procurement requirements such as Buy America, the Americans with Disabilities Act, the Uniform Relocation Assistance and Real Property Acquisition Policies Act, and the Davis-Bacon Act. All public engagement efforts for the

³³ MDOT. Maryland Consolidated Transportation Program (CTP), FY2024-FY2029.

proposed project will adhere to Title VI requirements regarding equal treatment, access, and rights, such as the provision of translation services at public meetings and for written publicity materials.

Project Schedule

	YEAR 1				YEAR 2				YEAR 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PART 1												
Objective 1												
Objective 2												
Objective 3												
Objective 4												
PART 2												
Objective 5												
PART 3												
Objective 6												

Assessment of Project Risks and Mitigation Strategies

> **Risk 1: Effective deployment of improved WVC data collection practices**

Carcass removal is one of many maintenance tasks performed by SHA’s maintenance shop staff. The improvements proposed to WVC incident recording practices may be challenging to integrate with maintenance shop staff’s existing responsibilities and skill sets.

Proposed Mitigation

The focus group sessions proposed in Task 5b will ensure that changes to carcass removal data collection can be smoothly integrated with the existing responsibilities of maintenance shops. In Task 5c, the Project Team will facilitate training sessions with maintenance shop staff to implement the revised WVC data collection structure. Training will be supported by an explanatory video, handout, and follow-up phone calls. Further, SHA will consult with DNR to establish accurate methods for carcass identification.

> **Risk 2: Maintaining the project schedule and budget**

Multi-agency collaboration is a cornerstone of this project. Consensus-building comes with an inherent risk of falling behind the assigned schedule and budget.

Proposed Mitigation

Building a long-term partnership between SHA and DNR will require consistent communication and leadership. Both organizations have a record of successful project management that will ensure the Project remains on schedule and within budget. Further, biweekly Project Team meetings between SHA and DNR have been programmed into the proposed budget. These meetings will provide a regular communication platform for the Project Team to track the progress of each task, and to adjust strategies where necessary.

V. Selection Considerations

Maryland is both rural and urban, home to mountains, streams, forests, rivers, and marshes. Policies and planning in Maryland must constantly provide for a diversity of conditions and interests. The objectives presented in this Project seek to reduce WVCs, address wildlife conservation in transportation planning, build systemic resilience to climate change, and improve opportunities for workforce development. This project advances several of the goals and objectives outlined in USDOT's Strategic Plan.

Safety

This Project focuses on reducing human injuries and fatalities caused by WVCs. From 2019-2023, 6 Marylanders were killed and over 1,020 injured in wildlife-vehicle collisions. MDOT's Strategic Highway Safety Plan (SHSP) commits the state to FHWA's Safe Systems approach. This Project will further the goals of Maryland's SHSP by evaluating road segments with a high risk of wildlife-vehicle collisions. The 'Wildlife Crossings Guidance Document' will recommend actions for SHA projects in WVC hotspots/high-risk areas. The Project aligns with DOT's safety objectives by emphasizing data-driven collision reduction. This will be achieved by strengthening existing WVC data collection and tapping into new innovations, such as Connected Vehicle technology. The actions taken by this Project will embed a systematic and proactive approach to WVC safety.

Climate Change and Sustainability

There are over 3,100 miles of coastline in Maryland, which makes it one of the most vulnerable regions in the United States as sea levels rise. Without intervention, storm surges can ruin salt marshes and beaches along the Eastern Shore. Shifting rainfall patterns can destroy homes and state infrastructure. If temperatures and sea levels continue to rise at their current rate, some species will be forced to migrate while others may not survive.³⁴ Habitat connectivity is critical for species to migrate with climate change. In addition to providing continuous tracts for movement, corridors, buffers, and connectivity zones can protect sensitive areas from climate events, offer a range of microclimate refugia, and reduce greenhouse gases.³⁵ By identifying RTE species at high risk and charting locations where natural land can be reconnected across state roads, this Project will enable habitat connectivity.

The WCPP grant provides Maryland with an opportunity to reconcile its transportation system and natural environment. Climate considerations are embedded in SHA and DNR's goals.³⁶ Through their collaboration on this Project, the two agencies can lay a foundation for a long-term, interdisciplinary approach to climate adaptation. Results from the Project will inform SHA's long-term planning and construction practices to reduce the impact of transportation corridors on wildlife and natural habitats.

³⁴ International Fund for Animal Welfare (IFAW). 2022. The Impact of Climate Change on Our Planet's Animals. Available at: <https://www.ifaw.org/journal/impact-climate-change-animals#:~:text=Habitat%20loss%3A%20Rising%20temperatures%20affect,other%20animals%20to%20die%20off>

³⁵ USDA. Conservation Buffers. Available at: https://www.fs.usda.gov/nac/buffers/guidelines/2_biodiversity/6.html

³⁶ In addition to funding programs for GHG reduction, the 2022 STIP highlights resilience building through wetland restoration and stormwater management. Additionally, SHA's [Climate Change Vulnerability Viewer \(CCVV\)](#) illustrates the potential impacts of climate change to Maryland's transportation infrastructure.

Equity

There is a documented correlation between traffic fatalities and socioeconomic indicators such as race, sex, income, and transportation access. Across the United States, 40 percent of counties with the highest poverty rates in 2019 experienced 35 percent higher rates of traffic fatality than the national average.³⁷ People who identify as Black, American Indian or Alaskan Native, and Native Hawaiian or Pacific Islander experienced, on average, almost double the fatality rate of the total population.³⁸ In Task 6a, the Project Team will use EJSCREEN and ETC Explorer to identify underserved communities with a disproportionate burden of social, economic, and environmental vulnerabilities. This will include minority and low-income communities, and census tracts with a high burden of climate risk, environmental hazards, and transportation insecurity. The Project's public outreach strategies will be tailored to maximize involvement from these communities. Engagement activities will involve residents and business owners located in high WVC areas and vulnerable communities. The Project will also ensure equitable representation from traffic safety and conservation advocates.

Workforce Development, Job Quality, and Wealth Creation

In one year, Maryland's outdoor recreation economy generates \$14 billion in consumer spending, 109,000 direct jobs, \$4.4 billion in wages and salaries, and \$951 million in state and local tax revenue.³⁹ The actions taken in this Project to conserve RTE species and preserve habitats, especially in the face of climate change, will sustain Maryland's natural ecosystems and the numerous benefits they provide. The Project also seeks to positively impact SHA's own staff by establishing simple, standardized WVC data collection practices – which will be integrated through stakeholder engagement and training sessions. The Project Team will involve subject matter experts from local research, advocacy, and education institutions to represent a broader range of issues.

The WCPP grant will enable SHA and DNR to evaluate WVC hotspots, incorporate wildlife passage in the design of state highways, improve data collection practices, educate the public about WVCs and habitat connectivity, and establish channels of institutional cooperation. Reducing wildlife-vehicle collisions and reconnecting fragmented habitats will help Maryland--and by extension the United States--achieve safety, sustainability, equity, and workforce goals.

³⁷ Calculated on a per population basis. From the National Highway Traffic Safety Administration (NHTS) Fatality Analysis Reporting System (FARS). 2019 data publication: 1st release.

³⁸ FARS. 2018. Final File: Population.

³⁹ DNR and MD Department of Commerce. 2019. Maryland Outdoor Recreation Economic Commission Final Report. Available at: https://dnr.maryland.gov/Documents/more/MORE_FinalReport.pdf