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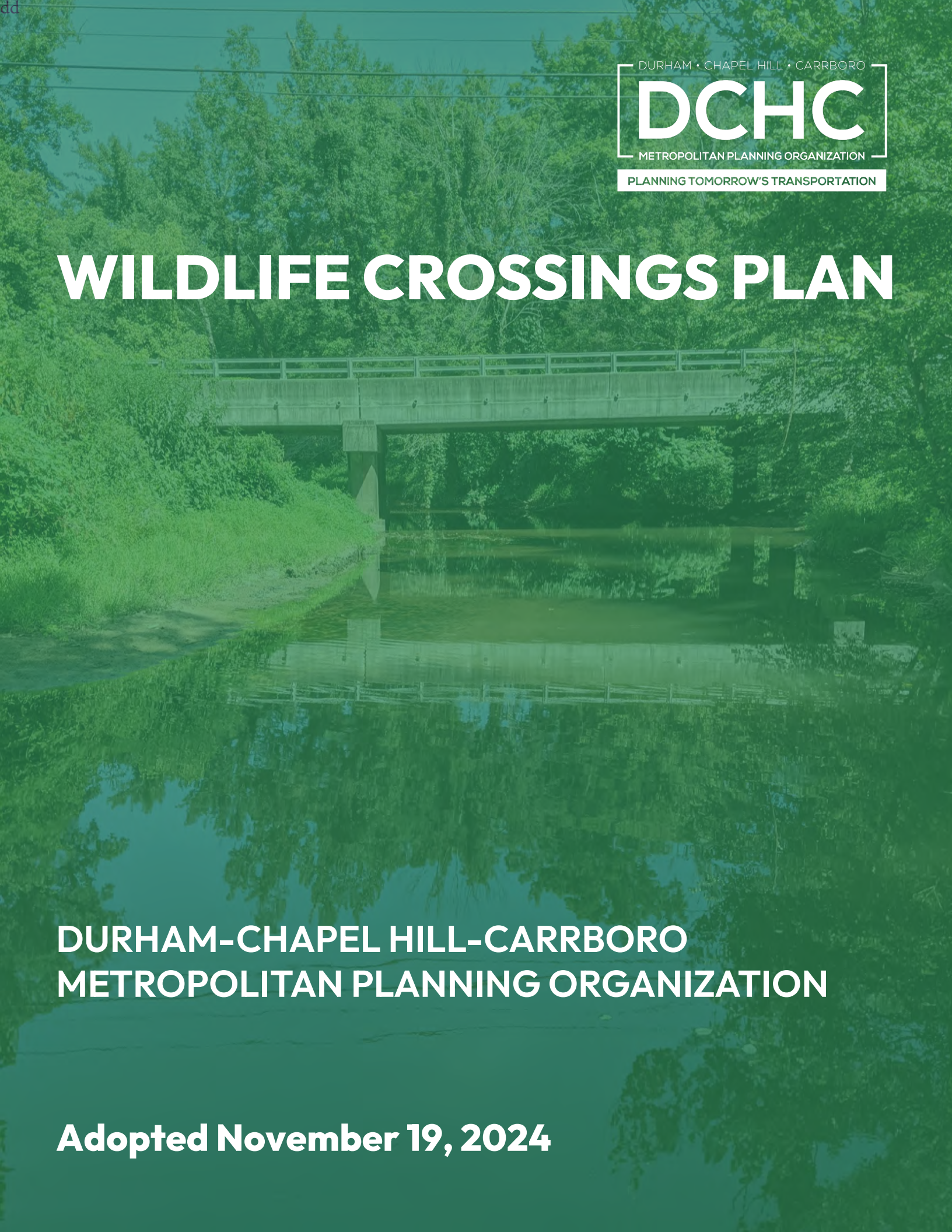

DURHAM • CHAPEL HILL • CARRBORO

DCHC

METROPOLITAN PLANNING ORGANIZATION

PLANNING TOMORROW'S TRANSPORTATION

WILDLIFE CROSSINGS PLAN

DURHAM-CHAPEL HILL-CARRBORO METROPOLITAN PLANNING ORGANIZATION

Adopted November 19, 2024

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Executive Summary

Purpose and Scope
Roads are a serious conflict point between wildlife and vehicles. While roads offer a means for human travel and to move freight, they are often developed through wildlife habitats and corridors, fragmenting ecosystems, creating movable barriers in the form of vehicular traffic – all of which increases the likelihood of a wildlife-vehicle crash (WVC). As humans need a connected transportation network to live, wildlife requires an intact and connected network of habitat and corridors that promote movement to survive and thrive.

As the DCHC MPO's planning area, region, and state continue to grow, planning for wildlife crossings will be essential to reduce the likelihood of WVCs as new developments, roads, and the number of vehicles on the road increase. Wildlife crossing countermeasures are a proven mechanism to help ensure connected travel networks for both humans and wildlife. Planning for and implementing wildlife crossing countermeasures throughout the network of habitats and corridors is an important step to increase the safety of humans and wildlife alike.

Goals and Objectives
The goal of the DCHC MPO Wildlife Crossings Planning study is to eliminate fatalities and serious injuries resulting from WVCs by improving the safety of drivers and wildlife. The following steps were identified and implemented to help meet this goal:

1. Establish a Core Technical Team of key stakeholders to help guide the planning process, provide expertise, and strengthen communication and partnerships for wildlife crossing planning.
2. Identify key wildlife crossing sites in the DCHC MPO planning area.
3. Visit, evaluate, and develop recommendations for key wildlife crossing sites. Recommendations include retrofits at existing bridge and culvert infrastructure, strategies to be considered and incorporated into bridge and culvert replacement projects, and the construction of new infrastructure.
4. Develop an implementation strategy for funding and delivering wildlife crossing projects at key crossing sites and provide a framework for conducting a cost-benefit analysis for each project to help guide decision-making.
5. Establish partnerships with a wide range of stakeholders to coordinate and advance wildlife crossing projects and issues. Partners and stakeholders should include parks & recreation and open space departments, transportation agencies, local land trusts, conservation groups, private entities, and state agencies.
6. Adopt recommendations in local, state, and MPO transportation plans and processes –so that all new road and bridge projects that cross wildlife corridors and core areas are informed by the recommendations from the start. This entails the DCHC MPO Board and NCDOT Board of Transportation adopting relevant projects into the CTP and MTP, and local councils and county board of commissioners adopting relevant changes to local ordinances.

Reported Wildlife-Vehicle Crash Data
North Carolina documents reported WVC statistics, which are made available through the North Carolina Department of Transportation (NCDOT) and published in its Animal Related Crashes, County Rankings and Crash Data report. In 2022, 20,098 WVCs were reported statewide, with an estimated comprehensive crash cost estimate of $486,000,000 (based on NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina).

Executive Summary

The DCHC MPO's counties are among the top 100 counties in North Carolina experiencing the highest number of reported WVCs. Between 2020-2022, Chatham County had 936 reported WVCs (21/100), Orange County had 801 reported WVCs (30/100), and Durham County had 638 reported WVCs (35/100). While these statistics are significant, studies have shown that WVCs are likely underreported and the impact much greater. According to NCDOT's *Wildlife Passage Guidance* document, carcass removal count data from other states shows that crashes are occurring between 5 and 9 times more than what is being reported by state DOTs. While North Carolina does not currently track carcass removals, NCDOT has stated that these findings suggest closer to 100,000 WVCs are occurring annually in the state than what their data shows.

Wildlife Species

The MPO planning area serves as a home and corridor for a variety of wildlife impacted by transportation infrastructure. Common sightings of roadkill along roadways include white-tailed deer (large-sized); turkey vulture and gray fox (medium-sized); and eastern box turtle, eastern gray squirrel, raccoon, and Virginia opossum (small-sized). While numerous species can be found within the MPO's planning area, white-tailed deer are of particular concern in terms of WVCs and the potential for serious injuries and fatalities.

Methodology

The MPO's methodology for its Wildlife Crossings planning process included review of existing literature and plans, data analysis, site identification, and site assessments. Key sources and considerations included coverage of the reported crash and safety data, identified wildlife corridors, transportation structures and locations, land use, and transportation plans. As potential wildlife crossing sites were identified through data analysis, MPO staff and a multidisciplinary team assisting with the project visited each site to conduct a thorough assessment. Countermeasures were developed to help improve wildlife connectivity and reduce WVCs based on each site's assessment.

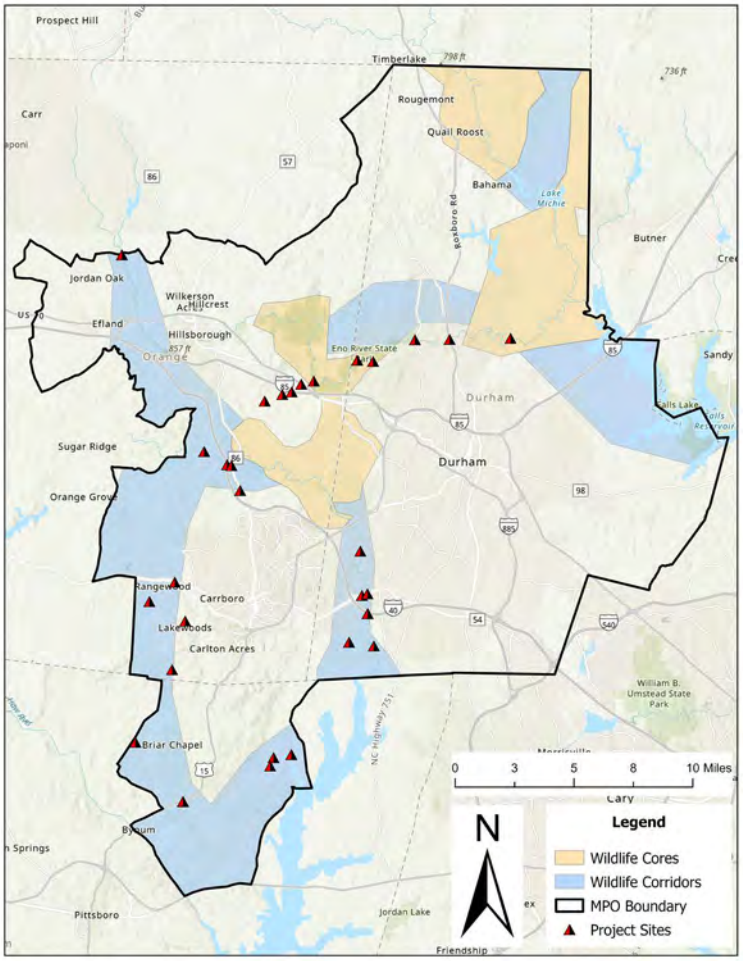
Public Engagement Process

The MPO conducted an extensive public engagement process. Throughout the planning process, updates were presented to the MPO's Technical Committee and Policy Board, as well as to organizations such as the Triangle Connectivity Collaborative and the North Carolina Wildlife Connectivity Coalition. A project webpage was created that included the study's background and purpose, updates, and contact information. A 21-day public engagement period occurred between October 1 - 21, 2024 with eight public engagement events offered throughout the MPO's planning area in virtual, hybrid, and in-person formats, and a survey was conducted to receive public comment. The main themes identified through the 129 survey responses that were received are:

1. Feedback from people's personal experiences shows that building wildlife crossings is important for keeping people and animals safe.
2. Protecting natural areas for wildlife is key in helping animals move around, keeping their habitats safe, and ensuring safe wildlife passage through our transportation network.
3. We need to develop infrastructure that supports wildlife crossings, connects wildlife habitats, and allows people to coexist with wildlife.
4. Based on survey responses, wildlife-vehicle crashes and roadkill impact human physical and mental health, have contributed to financial losses, and have caused animal suffering and death.

Executive Summary

Project Recommendations
The MPO has identified twenty-eight (28) wildlife crossing project recommendations located throughout its planning area as part of this plan. These project recommendations do not represent an exhaustive list of sites within the MPO's planning area that could benefit from wildlife crossing countermeasures to help eliminate fatalities and serious injury crashes related to WVCs and enhance wildlife connectivity. This plan prioritized projects based on its methodology. The GIS analysis included high rates of reported WVCs, wildlife corridor and habitat data, and alignment with NCDOT structures and infrastructure replacement projects. The site assessment process involved an evaluation of each potential site to identify barriers and opportunities for improvement.



Strategies for Funding and Implementation
Several opportunities and methods exist to fund and implement wildlife crossing projects. It is best practice to incorporate wildlife crossing solutions for consideration during the planning phase of transportation projects, such as bridge and culvert replacement projects, as it often will cost less than to retrofit existing structures and sites to address and prioritize safety and promote wildlife movement. Funding for and delivering wildlife crossing projects exists at the federal and state levels, as well as through foundational giving.

Land use is an important consideration in planning for wildlife crossing projects. To reduce the likelihood of ecological dead ends and gaps in an identified wildlife corridor, it is ideal to implement wildlife crossing solutions within and adjacent to natural and managed lands which offer opportunities for wildlife to move and thrive within their natural habitat. Therefore, the acquisition of land to preserve natural areas and implement wildlife crossing solutions is an important step to ensure wildlife connectivity and reduce the likelihood of WVCs.

Wildlife crossing projects can also be realized through partnerships. Agencies such as MPOs, state DOTs, local governments, advisory committees, conservation agencies and organizations, and environmental groups have resources, expertise, and insight that can be leveraged and combined to thoughtfully plan for wildlife crossing projects and achieve shared goals. Partnerships are essential in the planning process.

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Additional Photograph Acknowledgements:
Front cover image: Erwin Road Bridge over New Hope Creek. Ruben Palacio.
Acknowledgements image: Lystra Road culvert over Overcup Creek. DCHC MPO.
Back cover image: I-85 Culvert over Stony Creek. Ruben Palacio.

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and will be updated for the final version of the plan

Section 1

INTRODUCTION, GOALS AND STUDY AREA

1.1 Purpose and Scope

Roads are a serious conflict point between wildlife and vehicles. While roads offer a means for human travel and to move freight, they are often developed through wildlife habitats and corridors, fragmenting ecosystems, creating movable barriers in the form of vehicular traffic – all of which increases the likelihood of a wildlife-vehicle crash (WVC). As humans need a connected transportation network to live, wildlife requires an intact and connected network of habitat and corridors that promote movement to survive and thrive. The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization's (DCHC MPO) Wildlife Crossings Plan aims to eliminate fatalities and serious injury crashes related to WVCs at priority sites throughout its planning area.

North Carolina and the DCHC MPO planning area are growing in both their respective transportation networks and population. North Carolina's extensive transportation network includes approximately 13,600 bridges and nearly 81,000 miles of roadway, the latter of which is the second largest state-maintained highway system in the United States.[1] **By early 2030, North Carolina is expected to become the seventh most populous state with a population of 11.7 million people.**[2] The Research Triangle region – which includes the DCHC MPO planning area – is also experiencing continued growth in both population and industry, and has been the tenth fastest growing region in the U.S. since 2020.[3] As the MPO's planning area, region, and state continue to grow, planning for wildlife crossings will be essential to reduce the likelihood of WVCs as new development, roads, and the number of vehicles on the road continues to grow. Wildlife crossing countermeasures are a proven mechanism to help ensure connected and safe travel networks for both humans and wildlife, and planning for and implementing wildlife crossing countermeasures throughout the road network, now, is an important step to take to increase the safety of both humans and wildlife alike.

Figure 1.1.1: White-tailed Deer. Sandhills Sentinel.

The impacts that roads have on wildlife have been studied for many years. The increasing toll of WVCs to both humans and wildlife led to a national study that was reported to the U.S. Congress in 2008. This report, entitled "Wildlife-Vehicle Collision Reduction Study," found that more than 1,000,000 WVCs occur annually, which present a danger to human safety and wildlife survival, cost over $8 billion, and result in approximately tens of thousands of serious injuries and hundreds of fatalities on U.S. roadways.[4] Since this 2008 report, several local, statewide, and nationwide plans have been developed, reports written, and studies conducted that demonstrate the need for wildlife connectivity and provide a framework for how transportation planning can be used to reduce the likelihood of WVCs. The DCHC MPO has reviewed many of these authoritative documents to develop a background of current wildlife crossing research and countermeasures for this wildlife crossing planning effort. The list of reference documents within this plan can serve as a guide for individuals interested in developing a deeper understanding of the many facets of wildlife connectivity.

1.2 Goals and Objectives

The goal of the DCHC MPO Wildlife Crossings Plan is to improve the safety of drivers and wildlife by eliminating fatalities and serious injuries as a result of WVCs in the MPO's planning area. The following steps were established to help meet this goal:

1. **Establish a Core Technical Team of key stakeholders** to help guide the planning process, provide expertise, and to strengthen communication and partnerships for wildlife crossing planning.

2. **Identify key wildlife crossing sites** in the DCHC MPO planning area.

3. **Visit, evaluate, and develop recommendations for key wildlife crossing sites.** Recommendations include retrofits at existing bridge and culvert infrastructure, strategies to be considered and incorporated into bridge and culvert replacement projects, and the construction of new infrastructure.

4. **Develop an implementation strategy** for funding and delivering wildlife crossing projects at key crossing sites and provide a framework for conducting a cost-benefit analysis for each project to help guide decision-making.

5. **Establish partnerships with a wide range of stakeholders to coordinate and advance wildlife crossing projects and issues.** Partners and stakeholders should include parks & recreation and open space departments, transportation agencies, local land trusts, conservation groups, private entities, and state agencies.

6. **Adopt recommendations in local, state, and MPO transportation plans and processes** – including SPOT, STIP, CTP, MTP and local plans – so that all new road and bridge projects that cross wildlife corridors and core areas are informed by the recommendations from the start. This entails the DCHC MPO Board and NCDOT Board of Transportation adopting relevant projects into the CTP and MTP, and local councils and county board of commissioners adopting relevant changes to local ordinances.

1.3 Study Area Description

The DCHC MPO is the regional organization responsible for transportation planning for the western part of the Research Triangle area in North Carolina. The MPO's planning area is defined by the U.S. Census and includes:

- Durham County (entire county)
- A portion of Orange County including the Towns of Chapel Hill, Carrboro, and Hillsborough
- Northeast Chatham County

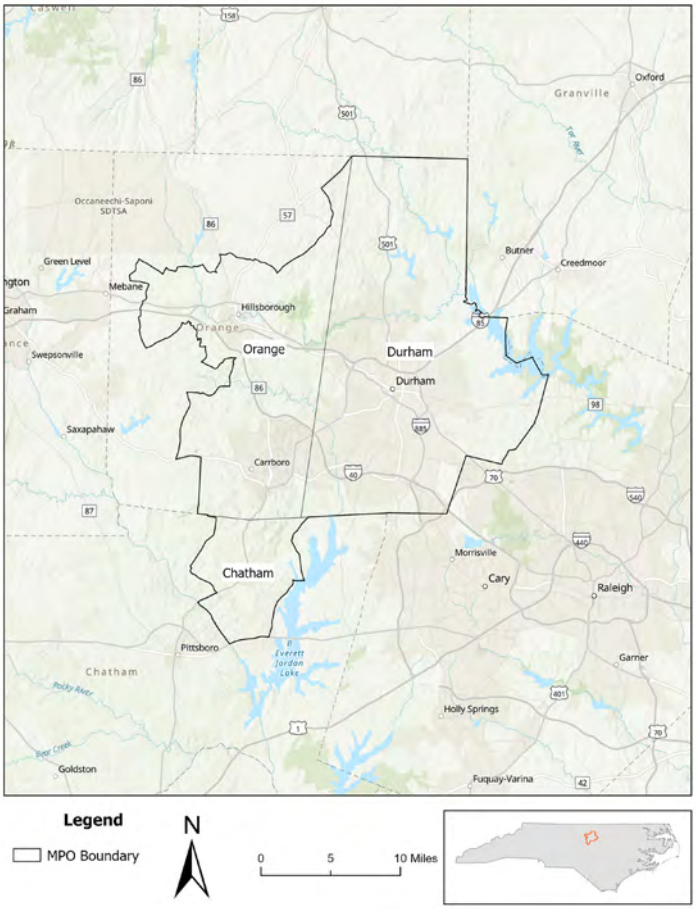

Figure 1.3.1: DCHC MPO Boundary Map.

1.4 Reported Wildlife-Vehicle Crash Data

Wildlife-vehicle crash estimates can come from many sources, including reported WVC data from state DOTs, carcass removal records, and insurance claims. This data can help identify locations of concern that could be improved with wildlife crossing solutions. However, caveats do exist with these datasets, as it is likely they are incomplete and may not show all WVCs for a given area.

Therefore, it must be noted that the absence of animal-vehicle crash reports and data does not indicate the presence of a safe road network for wildlife or drivers.

Reported WVC Data from NCDOT. Reported WVC data for both North Carolina and the DCHC MPO planning area is generated by law enforcement agencies using standard crash report forms. The data from these forms are then shared with NCDOT to develop statewide WVC datasets. In such instances, law enforcement may only be called upon if a vehicle collided with a large animal – such as a white-tailed deer – due to the potential of increased severity of a crash. It is likely that vehicle collisions with small to medium-sized animals – such as turtles, opossum, and snakes – are not included in law enforcement crash reports and thus are not reflected in the actual number of reported WVCs. In addition to documenting what type of injury resulted from the crash in their report, law enforcement generates an on-site estimate of the property damage incurred. This estimate is preliminary and may not coincide with the estimated costs of a WVC as described in NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina. NCDOT's reported WVC data was analyzed as part of the MPO's planning process.

Reported WVCs in North Carolina

NCDOT's reported WVC data is used to develop its Animal Related Crashes: 2020 – 2022 County Rankings and Crash Data report. Table 1.4.1 shows the total number of reported crashes, fatalities, and injury types for North Carolina between 2020 – 2022 from this report. The most recent year from this report, 2022, shows that 20,098 reported wildlife-vehicle crashes occurred statewide.

These reported statewide crashes in 2022 have an estimated comprehensive crash cost estimate of $486,000,000 (based on NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina).[5]

Human injuries are categorized as A, B, or C. As indicated in Table 1.4.1, an A-Injury, referred to as a Suspected Serious Injury, is any non-fatal injury which results in a severe laceration, broken extremities, and/or significant burns. A B-Injury, referred to as a Suspected Minor Injury, is any non-fatal or serious injury that is evident at the scene of the crash that includes abrasions, bruises, or minor lacerations. A C-Injury, referred to as a Possible Injury, is any non-fatal, suspected serious or suspected minor injury that includes momentary loss of consciousness, limping, or complaint of pain.[6]

Table 1.4.1: North Carolina Animal Related Crash Data, 2020-2022.[10]

Total Crashes	Total Fatalities	A Injuries	B Injuries	C Injuries	Total Injuries (A+B+C)
59,644	13	84	785	1,810	2,679

Reported WVCs in Durham, Orange, and Chatham Counties

Referencing the data from the NCDOT Animal Related Crashes: 2020 – 2022 County Rankings and Crash Data report, DCHC MPO's counties of Chatham, Orange and Durham are among the 100 counties in North Carolina that are experiencing the highest number of reported WVCs. Table 1.4.2 shows each county ranking, and the total number of reported crashes, fatalities, injuries and types from its 2020-2022 report. Also included in Table 1.4.2 are the comprehensive crash cost estimates as described in NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina. Elements that go into the comprehensive crash

cost estimate include medical expenses, emergency services, victim work loss, employer costs, traffic delay, property damage, and quality of life. To generate the comprehensive crash cost estimate, the type of injury and number of occurrences, was applied to NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina. Additional information about NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina can be found in Section 2.6: Cost-Benefit Analysis.

Table 1.4.2: Overview of WVC data for Chatham, Orange, and Durham Counties (adapted from NCDOT's North Carolina Animal Related Crashes: 2020-2022 County Rankings and Crash Data[11] and NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina).[12]

County	NCDOT North Carolina Animal Related Crashes: 2020-2022 County Rankings and Crash Data								NCDOT 2023 Standardized Crash Cost Estimates for North Carolina
	County Ranking (Crashes)*	Total Crashes	Total Fatalities	A Injuries	B Injuries	C Injuries	Total Injuries (A+B+C)	Non-injury crashes	Comprehensive Crash Cost Estimates
Chatham	21 / 100	936	0	2	19	10	31	905	$28,456,000
Orange	30 / 100	801	0	2	10	36	48	753	$25,755,000
Durham	35 / 100	638	0	0	10	28	38	600	$20,470,000
TOTAL		**2,375**	**0**	**4**	**39**	**74**	**117**	**2,258**	**$74,681,000**

**Ranking from 1-100; 1 indicating the county with the highest number of animal-vehicle crashes, and 100 indicating the least number of animal-vehicle crashes.*

Carcass Removal Records. Tracking carcass removals along roadways may offer a more complete estimate of the number of WVCs by considering smaller roadkill that may not appear on law enforcement crash reports, though many animals involved in collisions leave crash sites injured, only to perish off the road. While some state DOTs track removal of carcasses along roadways, NCDOT currently does not. Therefore, carcass removal records were unavailable for consideration during the MPO's planning process.

Insurance Claims. Insurance claims pertaining to WVCs can help provide a more complete picture of the number of wildlife involved in vehicle crashes and the costs associated with these claims. The caveats with this data are that WVC claims may not be available for all insurance carriers, and data is often not available at the county and location level. For this planning effort, DCHC MPO was able to obtain the number of WVCs for the state of North Carolina as a whole from one insurance carrier.

Comparison of NCDOT Reported WVCs vs Insurance Claims

While the human and wildlife impact this report details are considerable, it is likely only a fraction of the full impact. A comparison (Table 1.4.3) of the reported WVCs from the NCDOT Traffic Safety Unit's Animal Related Crashes: 2020 – 2022 County Rankings and Crash Data report by year, to a single insurance company's animal collision claims in North Carolina from July 1, 2022 to June 30, 2023[7], shows that **there are at least four times more WVCs and related impacts occurring in North Carolina on an annual basis than what law enforcement records show**.

Table 1.4.3: Comparison of NCDOT Reported Wildlife-Vehicle Crashes and WVC Insurance claims.

	2020 (NCDOT)	2021 (NCDOT)	2022 (NCDOT)	7/22 - 6/23 (Insurance Agency)
Reported WVCs	18,638	20,908	20,098	88,770

Virginia DOT Review of Animal-Vehicle Crash Data

North Carolina and Virginia not only border one another, but they also have high numbers of deer-vehicle collisions (DVCs), and their state DOTs both receive DVC/WVC data from their respective law enforcement agencies through crash reports. In 2017, Virginia DOT published findings from a study examining the quality and cost evaluations of DVC data in Virginia, which indicated an underreporting phenomenon understood to be a nationwide problem. The study found that DVCs represent a considerable safety hazard in Virginia, but the magnitude of this problem exceeds the reported WVC data available. According to Virginia's deer carcass removal records that they track (North Carolina does not currently track carcass removals), **the number of DVCs was up to 8.5 times greater than what was documented in law enforcement reports**.

This underrepresentation of DVCs understates the costs of these types of collisions, and they were estimated to be six times costlier on average than what was indicated in law enforcement agency crash reports.[8] Based on these findings, the potential of the MPO's planning area having 8.5 times more WVCs than what the reported NCDOT data shows is reflected in each project sheet included in this plan.

1.5 Wildlife Species

The DCHC MPO planning area serves as a home and corridor for a variety of wildlife impacted by transportation infrastructure. Common sightings of roadkill along roadways include white-tailed deer (large sized); turkey vulture and gray fox (medium sized); and eastern box turtle, eastern gray squirrel, raccoon, and Virginia opossum (small sized). In terms of navigating roads and crossings, each species has its own challenges based on differences in mobility, speed, defensive tactics, and eating and scavenging habits. Therefore, crossing improvements should consider the variety of wildlife found in the MPO's planning area. While not exhaustive, a list of wildlife (amphibians, birds, mammals, and reptiles) identified in the MPO's planning area that are impacted by crossings can be found in Appendix C.

Figure 1.5.1: White-tailed Deer Fawn. Julie Tuttle.

While numerous species can be found within the MPO's planning area, white-tailed deer are of particular concern in terms of WVCs and the potential for serious injuries and fatalities. According to the white-tailed deer density map developed by the NCWRC, the MPO's counties have among the highest white-tailed deer counts per square mile in North Carolina.[9] Durham County has 41-50 white-tailed deer per square mile, Orange County has more than 50 white-tailed deer per square mile, and Chatham County has 31-40 white-tailed deer per square mile. Due to the high density of white-tailed deer in the MPO's planning area, implementing wildlife crossing solutions at key locations is an essential step to reducing WVCs. Additionally, investigating the structure for evidence of rare, endangered or tracked species should be conducted. The NCWRC is an example of an agency who could be consulted during this process.

Figure 1.5.2: Box Turtle at Smith Level Road. Julie Tuttle.

Section 2

PLANNING PROCESS

2.1 Data Analysis and Site Identification

The MPO's wildlife crossing site identification process included a review of existing plans and literature, and GIS analysis. Key sources included coverage of reported crash and safety data, wildlife corridors, transportation structures and locations, land use, and transportation plans.

2.1.1 Review of Existing Plans and Reports

Numerous wildlife crossing plans and reports from North Carolina, and state and federal departments of transportation in the United States were reviewed to help guide best practices and strategies. Below is a short, sample list of plans and reports that were consulted as part of this process. This plan's Reference list can be reviewed for a full list of sources.

- Wildlife Passage Guidance, 2024 (NCDOT and NCWRC)
- Potential Wildlife Crossings for the French Broad River MPO & Land of Sky RPO Planning Areas, 2022 (French Broad River MPO, Land of Sky RPO)
- Prioritizing Wildlife Road Crossings in North Carolina To Reconnect Wildlife Habitat and Improve Road Safety, 2022 (Wildlands Network)
- A Landscape Analysis for Wildlife Habitat Connectivity in Durham County, North Carolina: Covering Watersheds of the Upper Neuse and New Hope Creek, 2023 (Durham County)
- A Landscape Plan for Wildlife Habitat Connectivity in the Eno River and New Hope Creek Watersheds, 2019
- North Carolina Animal Related Crashes: 2020 – 2022 County Rankings and Crash Data Report, 2023 (NCDOT)
- Wildlife Crossing Structure Handbook, Design and Evaluation in North America, 2011 (FHWA)
- Wildlife-Vehicle Collision Reduction Study: Report to Congress, 2008 (FHWA)
- State Transportation Improvement Program (STIP): 2024-2033 (NCDOT)
- Comprehensive Transportation Plan, 2017 (DCHC MPO)
- 2050 Metropolitan Transportation Plan (DCHC MPO)

2.1.2 GIS Analysis

A variety of GIS datasets were gathered and analyzed to help with the site identification process. DCHC MPO's technical approach included the combination of reactive and proactive datasets. The reactive datasets – which included NCDOT's reported WVC data, and the UNC Highway Safety Research Center's (HSRC) current crash rates in the MPO - demonstrate where WVCs have occurred. The proactive datasets – which included identified wildlife cores and corridors identified by the Wildlands Network, the Triangle Connectivity Collaborative's (TCC) Upper Neuse-New Hope Road crossing points and Habitat Patches, HSRC's projected WVC data in the MPO, and NCDOT's structure locations data – demonstrate locations where risk is high even if no recent WVCs have occurred. This proactive approach is to help prevent WVCs from occurring. The following are the datasets that were analyzed and identified the project sites in this plan:

1. **Wildlife-vehicle collision data (NDCOT)**. NCDOT's reported WVC dataset was analyzed to identify the locations of all reported WVCs from 2018 to 2022 within the MPO's planning area. The dataset represents WVCs reported by law enforcement agencies and does not necessarily reflect the actual number of WVCs that have occurred. A map of the

reported WVCs in the MPO's planning area can be found in Appendix F. Each point on this layer does not indicate a single reported crash and some points represent more than one crash event.

2. **Current and projected wildlife-vehicle crash data (UNC HSRC)**. The UNC Highway Safety Research Center (HSRC) developed maps for the MPO using the geometric interval classification method for alternative comprehension of NCDOT's WVC data with green segments indicating very low crash rates and dark red indicating very high crash rates. For the Current Crash Rate layer, the Roadway Characteristics GIS file from NCDOT was used and the rate of crashes that occurred was calculated on segments based on 100 million vehicle miles traveled. A map of the Current Crash Rate in the MPO's planning area can be found in Appendix G. The Projected AWDT (Average Weekday Traffic) Crash Rate layer includes road segments from DCHC MPO's 2050 AWDT where a crash rate could be calculated from the projected AWDT. A map of the Projected Crash Rate in the MPO's planning area can be found in Appendix H.
3. **Wildlife corridor data (Triangle Connectivity Collaborative, Wildlands Network)**. Wildlife crossings must connect and be part of a larger regional wildlife corridor network that does not lead to ecological dead ends. It is understood that not all crashes are reported, but DCHC MPO relied on available reported WVC data to develop an initial list of crossings to target. The movement paths can help identify crossings that were not necessarily identified through the reported WVC data.
    a. *Wildlife habitat cores and wildlife connectivity corridors (Wildlands Network):* Habitat cores are essential areas within a habitat patch that are crucial for the survival of wildlife. Connectivity corridors are areas of habitat that connect critical core habitats allowing for the movement of wildlife. A map of cores and corridors in the MPO's planning area can be found in Appendix I. Additionally, a map of cores and corridors within the eastern seaboard can be found in Appendix J.
    b. *Upper-Neuse New Hope Road Crossing Points (Triangle Connectivy Collaborative):* This dataset – developed by biogeographer and ecologist Julie Tuttle – represents potential wildlife road crossing points and was derived from the Upper Neuse-New Hope (UNNH) Landscape Habitat Connectivity Network, which was developed as part of the Durham County Landscape Connectivity Analysis (Tuttle & Durham County Open Space Program 2023). The analysis focused on the habitat and movement needs of wildlife species that are sensitive to habitat fragmentation ("priority wildlife") and incorporated data on land cover/land use, floodplains, wetlands, water bodies, roads, buildings, and more. The resulting habitat-corridor network represents a prioritized network of forested habitat and movement corridors for priority wildlife in the Upper Neuse and New Hope watersheds. The UNNH Crossing Points dataset includes points where roads identified as barriers were considered "permeable" to wildlife crossing for the connectivity analysis, typically because of stream crossings. Each potential crossing point was assigned a connectivity priority level based on the priority level for any movement corridors intersecting the point. Where available, attributes for roads, NCDOT structures (bridges, culverts, and pipes), traffic volume, and streams were assigned to each potential crossing point.
4. **NCDOT structures dataset**. A review of the locations of existing bridges, culverts, and pipes in both NCDOT's

jurisdiction and DCHC MPO's planning area was conducted. These structures included both National Bridge Inspection Standards (NBIS) and non-NBIS datasets. Bridges, culverts, and pipes provide an opportunity to enhance wildlife connectivity under and through these structures with relatively minor modifications – or retrofits – at a lower cost and on a shorter time frames than constructing new structures. Structures and their locations were also analyzed to determine if they could be part of a corridor of wildlife movement.

5. **Natural land GIS data**. Wildlife crossing sites should be adjacent to land uses that promote wildlife movement, and to prevent ecological dead ends. Considering protected natural lands in the wildlife crossing planning process is important to help ensure that wildlife will have abundant natural habitat to travel along a corridor – from one crossing to the next. Therefore, protected natural lands were an important consideration in this planning process. The Natural Heritage Natural Areas (NHNA) dataset was used to identify sites of special biodiverse significance for terrestrial and aquatic species. The Managed Areas (MAREA) dataset was used to identify areas where natural resource conservation is one of the management goals. Surface waterways data was used to identify streams, rivers, and creeks, that run adjacent to or within these areas.
6. **DCHC MPO Metropolitan Transportation Plan (MTP)**. The MPO's MTP dataset was used to cross reference potential wildlife crossing sites with transportation projects.
7. **DCHC MPO Comprehensive Transportation Plan (CTP)**. The MPO's CTP dataset was used to cross reference potential wildlife crossing sites with transportation projects.
8. **DCHC MPO 2050 Average Weekday Traffic (AWDT).** This dataset is the projected Average Weekday Traffic for 2050, which is based on the amended MPO's 2050 MTP scenario developed from the Triangle Region Model (TRM) Generation 2 (G2). The MPO's 2050 AWDT dataset was also used to develop the projected WVC rate layer.
9. **Annual Average Daily Traffic (AADT)**. The MPO's AADT dataset was used to develop the current WVC rate layer. AADT data is an important consideration in wildlife crossing planning, as most animals who attempt to cross roads will not succeed unharmed. As roads experience increased traffic, the odds of a WVC also increases. Roads with more than 10,000 vehicles per day are considered total barriers to most wildlife, and roads with intermediate traffic volumes are considered a significant source of mortality.[13]
10. **Population and density datasets (US Census Bureau).** The 2020 Urban Area shapefile from the US Census Bureau was used to examine the current urban area within the DCHC MPO boundary. Although the data shows that more reported WVCs occur in rural areas, WVCs do occur within urban areas.

While a variety of GIS datasets are available to help identify key wildlife crossing sites in the MPO's planning area, some additional datasets that could be helpful are not currently available, and some have not been obtained, that could help with this effort. The following list describes these potential datasets:

1. **Wildlife carcass removal data**. Collecting and analyzing wildlife carcass removal data could allow for a more complete picture of the number and variety of wildlife being killed due to vehicular traffic. While some state departments of transportation track carcass removal instances, NCDOT currently does not. The MPO will continue to inquire about this data's availability to NCDOT for its analysis for future iterations of this plan.
2. **Insurance claim data.** Collecting and analyzing insurance claims from animal-vehicle collisions – especially by county and crash location – can help illuminate a more complete understanding of these crash types, wildlife welfare, and economic impacts. The MPO will continue to inquire about the availability of this data.
3. **Local structures datasets.** A review of the locations of existing bridges, culverts, and pipes within the jurisdictional

limits of the MPO's member agencies should be conducted to develop a more complete picture of potential wildlife crossing corridors. Countermeasures for local structures can extend a wildlife crossing corridor and create a larger network. The DCHC MPO will work with local jurisdictions to obtain this data, develop and coordinate project recommendations for future updates to this plan.

2.2 Site Assessments

As potential wildlife crossing sites were identified through data analysis, Triangle Connectivity Collaborative Transportation Workgroup (TCCTW) members and DCHC MPO staff visited each site to conduct a thorough assessment.

Figure 2.2.1: Photograph of site assessment at US 15-501 bridge over Pokeberry Creek. DCHC MPO.

Figure 2.2.2: Photograph of site assessment at US 15-501 bridge over New Hope Creek. DCHCMPO.

The TCCTW partnered with the NCWRC to develop a site assessment form. The site assessment form was used as a guide (Appendix D), which included elements such as analyzing the existing structure (bridge, culvert, etc.), evaluating the site for roadkill, and identifying obstacles for wildlife connectivity. Based on each site's assessment, countermeasures were developed to help improve wildlife connectivity and reduce WVCs.

2.3 Review of Wildlife Crossing Countermeasures

Wildlife crossing mitigation has two main objectives: 1) to connect habitats and wildlife populations and 2) to improve motorist safety by reducing WVCs.[14] There is no one-size-fits-all solution for each wildlife crossing site. While there are many solutions that have proven to be effective at reducing WVCs, each site's existing infrastructure, topography, surrounding land use, property ownership, speed limit, and traffic volume are considerations that must be analyzed to help identify the recommended wildlife crossing countermeasure. While this planning effort has assessed wildlife crossing sites in the DCHC MPO planning area to make recommendations aimed at eliminating fatalities and serious injury crashes as a result of WVCs, each crossing site must be further evaluated in subsequent phases to generate actual costs.

2.3.1 Infrastructure

Several infrastructure countermeasures have proven to reduce WVCs. Countermeasures discussed in this section include fencing, underpasses and overpasses, bridges, culverts, wildlife tunnels, vegetation management, and signage. While not an exhaustive list of infrastructure countermeasures used through the United States, these solutions reflect recommendations put forth in this plan and solutions implemented in North Carolina.

Fencing

One of the most common wildlife crossing countermeasures is fencing. While both transportation infrastructure – such as underpasses, bridges, and culverts – and

wildlife fencing are not necessarily an effective solution for safe wildlife passage on their own, several studies have found that the combination of transportation infrastructure with wildlife fencing installed at the crossing site reduces WVCs significantly.[15] However, careful planning of the fence's length and placement is needed to help ensure that it does not completely disrupt and impede wildlife movement, genetic and reproductive functions, and other vital ecological processes.[16]

The height and type of fencing depends on the species being planned for. To deter white-tailed deer from jumping over the barrier, and to discourage small wildlife from climbing over, a ten-foot tall fence is an effective solution. However, when planning for smaller species, mesh size might be the primary consideration to prevent wildlife from traveling through the fence. In addition, fencing should be buried deep enough to prevent wildlife from burrowing underneath.[17] While each crossing site is different and has its own strengths and challenges based on differences in topography, vegetation, and land use, at least one mile of fence on both sides of the crossing and road is common. When identifying placement and length of fencing for large wildlife, installing a fence that is three miles along the crossing and roadway has been shown to garner an 80% reduction in DVCs.[18]

Virginia Department of Transportation (VDOT) has reported that it had success with installing eight-foot-high fencing one mile on both sides of crossing sites with an existing culvert and bridge. Their two-year study found that:

"the addition of wildlife fencing to certain existing isolated underpasses can be a highly cost-effective means of increasing driver safety and enhancing habitat connectivity for wildlife."

VDOT reported that the fencing reduced DVCs by 92%, that the culvert saw a 410% increase in deer passage, and the bridge underpass saw a 71% increase in deer passage. In addition to these safety benefits, VDOT reported that "the benefits from crash reduction exceeded the fencing costs in 1.8 years, and fencing resulted in an average savings of more than $2.3 million per site."[19] The average cost incurred by VDOT per site was $265,409, which included site preparation, traffic control, two miles of fencing, and maintenance.

Wildlife fencing is considered an effective countermeasure when used in tandem with existing structures that have functional passage. Fencing may not be suitable or effective in all cases due to surrounding land use and parcel access, and if the structure/site does not yet have a functional passage in place.

The cost of annual maintenance should be factored into each site estimate that will add wildlife fencing. Having dedicated personnel maintaining the fencing on a regular basis will ensure that the fence was installed properly and is therefore sturdy and in place; has not moved or been broken apart due to the elements, falling trees or the shifting of earth; has not been breached by human activities such as hunting; has not been destroyed by a vehicle collision; or has collected trash. Fencing that is compromised will be ineffective at keeping wildlife – especially white-tailed deer – off the road.[20]

Underpasses and Overpasses

Underpasses and overpasses can be part of an effective solution for wildlife passage and WVC reduction, but countermeasures should be included in the earliest stages of planning to avoid costly remediations once the infrastructure has been built. The likelihood of these structures reducing WVCs and creating safe crossing opportunities is greatly increased when wildlife fencing is incorporated at the site. Working in tandem, wildlife are guided through an overpass and underpass, and off the roadway.[21] In other words, fences keep wildlife off roads, while underpasses and overpasses allow them to cross safely. An underpass sited over lower speed roads could offer wildlife a natural path to the side of the roadway.

Bridges

Bridges that align with wildlife corridors offer an opportunity for wildlife to move safely by traveling under the bridge and thereby staying off the road and reducing the likelihood of a WVC. However, not all bridges and the land beneath them have been planned, engineered, and developed with safe, inviting, and accessible wildlife passage in mind. Existing bridges and the passage beneath them can

occasionally be retrofitted to promote wildlife travel, which includes the development of passage benches. When a bridge is set to be replaced, adding length to the new bridge can allow for increased opportunity to incorporate dry passage on both sides under the bridge.

Passage Benches

A passage bench is a gravel-surface path built under a bridge that is along a waterway intended to provide wildlife with continued travel and to reduce the likelihood of wildlife traveling across roadways and into vehicular traffic.[22] This countermeasure is often incorporated into bridge riprap. Riprap is a layer of large stone that protects soil from erosion in areas of high or concentrated water flows. It is especially useful for armoring channel and ditch banks, and protecting the integrity of a bridge abutment and prevent scour.[23] However, since riprap can be a challenge for wildlife to pass over, remediation has been done that repositions riprap along embankments and hills to create a wildlife bench - an example of this is the US 15-501 bridge over New Hope Creek in Durham County (Figure 2.3.3.1). The Old Chapel Hill Road bridge over New Hope Creek (Figure 2.3.1.1) is an example of riprap placement that poses such an obstacle. Wildlife that encounters this obstacle may choose to use the roadway to continue travel, putting the safety of themselves and drivers at risk.

Figure 2.3.1.1 Photograph of site assessment at Old Chapel Hill Road bridge over New Hope Creek. DCHC MPO.

The wildlife crossing along US 70 over the Eno River in Orange County (Figure 2.3.1.2) is an example of a transportation project in the MPO's planning area that eliminated this type of obstacle by repositioning riprap to create a wildlife bench. When this type of mitigation measure is implemented in new projects such as a bridge installation or replacement from the start, the cost to position riprap as to not impede wildlife movement is minimal, as is the cost needed for finer material placed over the top of the riprap.

Figure 2.3.1.2: Photograph of US 70 bridge over the Eno River. DCHC MPO.

Bridge Lengthening

The length of a bridge influences the openness and space for wildlife passage underneath. A bridge over water should be long enough to allow for dry passage on either side, with the potential for a wildlife bench to be constructed. Due to the high cost of planning, engineering and constructing a bridge, wildlife connectivity should be included in the early stages of the planning process to determine the appropriate length for the facilitation of wildlife movement, and to reduce the likelihood of a costly remediation project.[24] Alternatively, bridges that are slated to be replaced can be candidates for wildlife crossing recommendations, such as lengthening, if the recommendations are shared with NCDOT at the appropriate stage of the planning process. Therefore, communication with NCDOT Divisions as early as possible is key.

An example of a bridge lengthening transportation improvement project in the MPO's planning area is the US 15-501 bridge over New Hope Creek. This project between NCDOT and NCWRC created a bridge that was 160 feet longer than the original and serves as an important wildlife crossing underpass within a riparian corridor connecting Duke Forest and Jordan Lake Game Land.

Culverts and Pipes

Culverts and pipes are structures used as a drainage management solution, as they guide water and sediment flow through a transportation network with minimal impact. While commonly used for the same purpose, the term used (culvert or pipe) often depends on the size of the structure; culverts are large structures, while pipes are smaller. Figure 2.3.1.3 is an example of a bottomless culvert, while Figure 2.3.1.4 is an example of a pipe.

When culverts are being considered in the planning process, " building bigger culverts is better for the entire water system composed of sediment, wood debris, aquatic organisms, and wildlife."[25] Large culverts with high clearance have been shown to be effective for large mammals, such as white-tailed deer, due to their ability to walk-through unobstructed. Smaller culverts can also be an effective solution in instances where small wildlife – such as raccoons, turtles or opossums – are known to migrate across roads.[26]

Figure 2.3.1.3: Bottomless culvert at US 70 over Stony Creek. DCHC MPO.

Figure 2.3.1.4: Pipe at Cole Mill Road at Eno River. DCHC MPO.

Opportunities exist to enhance existing culverts to encourage and provide passage for wildlife. Due to a culvert's purpose of guiding water through a transportation network, water will be present in the structure's bed at any time. Depending on the water's depth, small wildlife may not be able to traverse through without risk. Large rainfall and locations prone to flooding exacerbates this problem. Two solutions can be considered to accommodate wildlife's preference for flat, textured surfaces.

First, corrugated pipe could be installed along the culvert's floor with enough concrete to prevent inhibiting the hydrologic or geomorphic (sediment-moving) function of the culvert.[27] Second, ledges - or dry shelves - could be considered in some cases as a retrofit on one or both sides of the culvert's interior to allow wildlife to traverse safely, above the water. Figure 2.3.1.5 shows an image of a ledge retrofit for a project administered by the New York Department of Transportation and The Nature Conservancy.[28]

Figure 2.3.1.5: Wildlife shelf is installed in a culvert near Boonville, N.Y. Kurt Gardner/The Nature Conservancy via AP.

Wildlife Tunnels

Many wildlife crossing solutions are aimed at reducing the likelihood of large animals traversing roadways due to the significant damage they can inflict in a WVC. While small animals may not necessarily cause vehicle damage or human injury, they greatly outnumber the large wildlife in the MPO's planning area, and their survival is as equally important as their larger counterparts. A solution to be considered for small wildlife passage – such as for turtles and snakes – is a wildlife tunnel.

Figure 2.3.1.6: Wildlife tunnel in western North Carolina. Kevin Hining/NCDOT.

A wildlife tunnel was installed by NCDOT in Ashe County, North Carolina (Figure 2.3.1.6) to accommodate small wildlife passage. Wildlife tunnels can consist of a trench with concrete on both sides and floor, a metal grate on top to allow lighted passage, and fencing that guides wildlife to the tunnel. This project was made possible through a partnership between NCDOT, NCWRC, and local conservation organizations. Funding for materials was provided by the U.S. Fish and Wildlife Service's Partners for Fish & Wildlife habitat restoration program.[29]

Vegetation Management

Vegetation that is both overgrown and not maintained can create a preventable obstacle for wildlife. Managing vegetation at wildlife crossing sites is necessary to promote wildlife movement under or through structures, which can reduce WVCs and can increase the effectiveness of wildlife crossing retrofits or structures that have been implemented. In addition to consistent maintenance, vegetation should be managed responsibly and should consider potential harm to wildlife and the environment. Vegetation should be managed in accordance with the NCDOT Vegetation Management Manual and standard practices.[30]

Signage

Signage indicating wildlife crossing areas can help reduce driver speed and WVCs when used with other strategies such as fencing.[31] Signage options can be broken down into two categories: passive warning signs and flashing beacons.

Passive warning signs (passive traffic control systems) are the least effective of the two signage categories. For example, speed limits are commonly posted on passive signs, but this has been shown to not be an effective speed reduction strategy as drivers tend to drive the speed at which the road was designed, rather than the speed limit that is posted. Wildlife crossings commonly use passive signs as well, though they are not as effective at reducing vehicle travel speed on their own. However, signs could be installed rather inexpensively at sites that have had wildlife crossing solutions implemented to help raise awareness.[32]

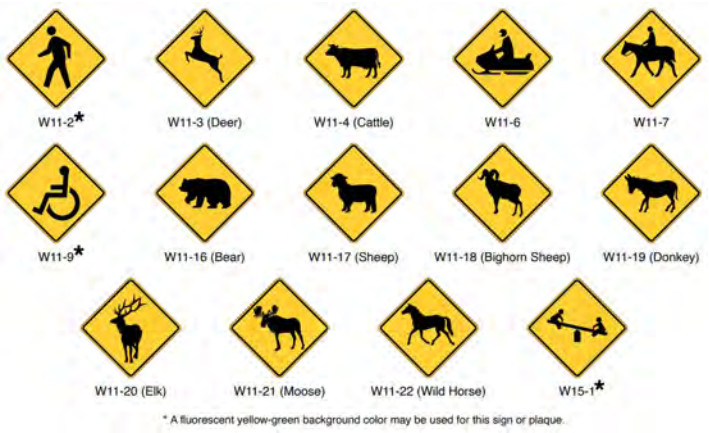

Figure 2.3.1.7: MUTCD Non-Vehicular Warning Signs.

Available wildlife crossing signage is detailed in the Manual on Uniform Traffic Control Devices (MUTCD) (11th edition). The MUTCD does not include a generic "wildlife crossing" sign, but rather ten large wildlife-specific options that are included as part of its non-vehicular warning signs.[33] Sign W11-3 (Deer) is likely the only sign relevant to the DCHC MPO planning area per the NCWRC species list.[34] Figure 2.3.1.7 shows the MUTCD's non-vehicular warning signs.

According to NCDOT's Guidelines for Installing "Deer Crossing" Signs, "this sign can be erected at locations when the investigating traffic engineer determines a site to be a frequent deer crossing and/or an accident location involving deer. Signs normally would not be installed in subdivisions or on unpaved roads due to slow speeds and local traffic. Consideration of the engineering study may include but not limited to: traffic volumes/ approach speeds/ street width/ sight distance/ road geometry, and accident history."[35] The NCDOT Division Traffic Engineer should be contacted when requesting passive warning signage.

Flashing beacons have been proven to be more effective at gaining drivers' attention and reducing vehicular speed. These activated wildlife crossing signs are typically installed during seasonal migration periods and are equipped with flashing lights to attract driver's attention. Activated signs can use infrared technology to detect approaching wildlife, which will trigger the flashing lights,[36] or the lights can be set to remain flashing for a set period of time. A study conducted by the Insurance Institute for Highway Safety found that flashing beacon signs reduced speed by 8 mph, and that DVCs were reduced by 70% during migration.[37] The NCDOT Division Traffic Engineer should be contacted when requesting flashing beacons.

Figure 2.3.1.8: Flashing beacon for wildlife crossings in Utah. Adam Small, KSL NewsRadio.

2.3.2 Policy

Structures are needed to create the foundation for wildlife crossings in the road network, and policies can work in concert with the infrastructure investments to enhance the effectiveness and safety of the crossing. While there might be little to no financial cost, policy change can be difficult to pass and implement. Policies to promote and advance wildlife crossings countermeasures include consideration of wildlife crossings for each transportation project (such as a "Complete Streets" policy for wildlife), vehicle speed reduction and road design, and public education and awareness campaigns.

Wildlife Crossing Considerations, or Complete Streets for Wildlife

Complete Streets are roadways designed for all travelers, allowing for safe and quality access to highways, transit, bicycle, and pedestrian facilities. In other words, Complete Streets can help create equitable access for all travelers, and all modes of transportation. In August of 2019, the NCDOT Board of Transportation passed a Complete Streets Policy and Implementation Guide to enable the inclusion of Complete Street elements such as sidewalks and bicycle facilities in roadway projects, and the department has been directed to consider Complete Streets elements and incorporate several modes of transportation when building new projects or making improvements to existing infrastructure.

One of the benefits of considering and implementing Complete Streets elements from the start is that it can be more costly to

construct these elements as retrofits to already completed projects. This is also the case for wildlife crossing projects. The NCDOT has helped create many effective wildlife crossing projects throughout North Carolina – and within the DCHC MPO planning area – and wildlife crossing considerations should be part of the earliest stages of each transportation planning process to address WVCs proactively at the beginning to avoid costly remediation projects later. Wildlife crossings should be considered during the planning for each transportation project.

Vehicle Speed Reduction and Road Design

Vehicle speed reduction is often cited as a vital step to increased road safety for people, as decreased speeds allow for increased time for drivers to react, and reducing vehicle speed may also decrease the likelihood of WVCs for the same reasons. It is well documented that drivers travel at the speed at which the road was designed rather than the posted speed limit. Many of the roadways that experience high numbers of WVCs have been designed with wide travel lanes, gentle curves, and long sightlines that can create conditions for speeding and distracted driving. In addition, roadways have fragmented habitats for wildlife with various movement abilities and speeds. Therefore, roads designed for lower vehicular speeds and an increased ability to react could help generate fewer WVCs.[38]

Public Education and Awareness Campaigns

Public education and awareness campaigns are a cost-effective way to both inform the public about the potential hazard of WVCs, to promote steps that have been taken to address these hazards, and to share local projects that have incorporated wildlife crossing countermeasures. NCDOT administers a public education and awareness campaign in the Fall to coincide with the documented increase in WVCs resulting from factors like it being darker earlier in the evening and deer mating season. Organizations including the NCWRC, the North Carolina Wildlife Federation, and news agencies, administer awareness campaigns as well. Public education and awareness should continue with increased frequency to help reduce WVCs year-round.

2.3.3 Examples of Wildlife Crossing Projects in the DCHC MPO Planning Area

US 15-501 Bridge over New Hope Creek in Durham County

The bridge on US 15-501 over New Hope Creek in Durham County (Figure 2.3.3.1) is a transportation project in partnership between NCDOT, NCWRC, and others that incorporated wildlife crossing countermeasures. The location of this site was identified as an important wildlife passage – particularly for white-tailed deer – because the natural and riparian areas associated with New Hope Creek create a wildlife corridor between Duke Forest to the north and B. Everett Jordan Lake to the south.[39] Completed in 2007, the bridge span was lengthened by approximately 160 feet. The lengthening created space on both sides of New Hope Creek to develop wildlife benches, which has improved wildlife connectivity and promotes movement underneath the bridge and along this corridor. While fencing is often incorporated as part of wildlife crossing bridge projects, the site's surrounding urban land use prevented fencing from being a viable option due to its relatively short range.[40] Since completion, evidence from camera trap data has shown that the new bridge has increased passage under US 15-501 for a variety of wildlife species.[41] To help ensure this site continues to promote wildlife connectivity under the bridge, land conservation efforts should be explored that include the acquisition of remaining natural lands adjacent to the site.

Figure 2.3.3.1: US 15-501 bridge over New Hope Creek in Durham County, NC. DCHC MPO.

US 70 Bridge over the Eno River in Orange County

The bridge on US 70 over the Eno River, east of Hillsborough in Orange County (Figure 2.3.3.2) is a transportation project in partnership between NCDOT, NCWRC, and others that incorporated wildlife crossing countermeasures. This project was completed in 2022, which lengthened the span to 265 feet (27 feet longer than the original), installed guardrails, and was designed to accommodate the potential for a greenway to be developed underneath. To enhance wildlife connectivity underneath the bridge, a riprap remediation was completed in 2023 that constructed a wildlife passage benches on both sides of the Eno River.

Figure 2.3.3.2: US 70 bridge over Eno River in Orange County, NC. Southeast side. DCHC MPO.

Figure 2.3.3.3: US 70 bridge over Eno River in Orange County, NC. Northwest side. DCHC MPO.

2.4 Core Technical Team

A Core Technical Team (CTT) was formed to help guide the development of DCHC MPO's Wildlife Crossing Plan. The seventeen member CTT was comprised of stakeholders from DCHC MPO's member governments, its NCDOT highway divisions, and environmental and conservation agencies and institutions. The CTT met four times throughout the planning process; April, June, August, and October 2024.

The following stakeholder agencies participated on the CTT:

- Chatham County
- Durham County
- Orange County
- Town of Carrboro
- Town of Chapel Hill
- Town of Hillsborough
- City of Durham
- Durham City-County Planning
- NCDOT Division 5
- NCDOT Division 7
- NCDOT Division 8
- Wildlands Network
- North Carolina Wildlife Resources Commission
- Duke University
- Southern Environmental Law Center
- Triangle Land Conservancy
- DCHC MPO

2.5 Public Engagement Process

The MPO's wildlife crossings planning study included an extensive public engagement process. Throughout the planning process, updates were presented to the MPO's Technical Committee and Policy Board, as well as to organizations such as the Triangle Connectivity Collaborative and the North Carolina Wildlife Connectivity Coalition. A project webpage was created that included the study's background and purpose, updates, and contact information.

Figure 2.5.1 Public engagement event at Chapel Hill Farmers Market in Chapel Hill, NC. DCHC MPO.

The 21-day public engagment period occured between October 1 - 21, 2024. The public engagement activities included:

- Eight public engagement events offered throughout the MPO's planning area in virtual, hybrid, and in-person formats.
- An online survey using ArcGIS Survey123 in both English and Spanish languages. For in-person events, MPO staff utilized iPads to capture survey responses, and paper version of the survey (Appendix M). A total of 129 surveys were received, and the full results can be found in Appendix N.
- A project webpage updated that included all details of the public engagement events, the draft plan for review, the online survey, and a webmap of the project recomendations.
- An awareness campaign that included targeted social media advertisements, and project information distribution by the MPO's partners.

Figure 2.5.2 Public engagement event at Carrboro Farmers Market in Carrboro, NC. DCHC MPO.

The main themes public input indicated are:

- Feedback from people's personal experiences shows that building wildlife crossings is important for keeping both people and animals safe.
- Protecting natural areas for wildlife is a key step in helping animals move around, keeping their habitats safe, and ensuring safe wildlife passage through our transportation network.
- We need to develop infrastructure that supports wildlife crossings, connects wildlife habitats, and allows people to coexist with wildlife.
- Based on survey responses, wildlife-vehicle crashes and roadkill impact human physical and mental health, have contributed to financial losses, and have caused animal suffering and death.

Figure 2.5.3 Public engagement event at Move-a-Bull City event in Durham, NC. DCHC MPO.

2.6 Cost-Benefit Analysis

Conducting a cost-benefit analysis can help inform decision making by comparing the estimated cost of a project with the anticipated benefits. In terms of wildlife crossing projects, a cost-benefit analysis can compare the cost of a countermeasure (i.e. wildlife fencing, passage benches, riprap remediation, wildlife tunnels, etc.) with the variety of costs saved from reducing WVCs (i.e. personal injury, loss of life, medical expenses, vehicle repair, property damage, carcass removal, etc.), including the value to the public of having the animal as part of the ecosystem. The total calculated cost of reducing a WVC – or break-even threshold – can be used to compare the total cost of the project, to understand the length of time it will take to reach the cost benefit.[42]

Estimating Costs

Cost estimation is associated with the construction and maintenance of the proposed infrastructure countermeasure. The estimated monetary benefit is derived from the reduction in the number of WVCs over the infrastructure's lifetime. Table 2.6.1 lists generalized wildlife mitigation cost estimates that were developed by New Mexico DOT and Colorado DOT as part of the New Mexico Wildlife Corridors Action Plan (2022), correspondence with U.S. Fish & Wildlife Service, and correspondence with NCDOT. The cost estimates are meant to compare project costs without requiring further site-specific analysis, which should occur once actual project-specific planning begins.

Estimating Benefits

Benefits of proposed countermeasures can be estimated based on the cost per WVC incident, and how much these costs are expected to be reduced over the life of the countermeasure. While WVC data reported by NCDOT may not identify all WVC crashes that have occurred in an area or site since it is based on law enforcement agency reports alone (as described in Section 1.4) – and a comparison of this data to WVC insurance claims has identified that WVCs are occurring more frequently than what is being reported – it can be used as a starting point. As part of the site identification process for this plan, the MPO used a one-mile buffer around potential crossing sites to identify all WVCs in the area - the total number of WVCs cited for each site could be used to estimate the potential number of WVC reductions.

The NCDOT Transportation Mobility and Safety Division periodically updates costs associated with traffic crashes for cost analyses. Table 2.6.2 displays the monetary values associated with AVCs as published by NCDOT in its 2023 Standardized Crash Cost Estimates for North Carolina[43] report. Elements that go into NCDOT's comprehensive crash cost estimate include medical expenses, emergency services, victim work loss, employer costs, traffic

Table 2.6.1: Wildlife mitigation cost estimates based on NMDOT Wildlife Corridors Action Plan (2022), U.S. Fish & Wildlife Service, and NCDOT.

Structure and Mitigation Type	Cost Estimate	Structure and Mitigation Type	Cost Estimate
14-foot x 14-foot concrete box culvert (CBC) (2-lane) *	$1,430,000	14-foot x 14-foot concrete box culvert (CBC) (4-lane) *	$2,280,000
2-lane pipe arch underpass *	$1,840,000	4-lane pipe arch underpass *	$3,230,000
2-lane underpass bridge *	$1,070,000	4-lane underpass bridge *	$2,520,000
2-lane overpass *	$4,460,000	4-lane overpass with median *	$7,280,000
4-lane overpass without median *	$7,430,000	Wildlife tunnel **	$100,000
Fence per mile *	$100,000	Wildlife Bench Installation and Riprap Placement Retrofit***	$335,000

* NMDOT Wildlife Corridors Action Plan
** U.S. Fish & Wildlife Service
*** NCDOT Cost from Bridge over Eno River on US 70 Bypass project

delay, property damage, and quality of life. Information about crash types can be found in NCDOT's DMV-349 Instructional Manual.[44]

The DCHC MPO developed cost benefits for each project recommendation, which can be found in each project sheet. Each cost benefit was developed by identifying the injury type and number of WVCs within a one-mile buffer of the recommended wildlife crossing site (A Injury, B Injury, Non-Injury Crash, etc.), and then multiplying the number of crash type to its associated cost estimate described in NCDOT's 2023 Standardized Crash Cost Estimates for North Carolina report.

Table 2.6.2: Cost per Crash – Animal Crashes (2023 Standardized Crash Cost Estimates for North Carolina, NCDOT).

Crash Type	Cost Per Crash – 2023 Dollars
Fatal Crash	$11,498,000
A Injury Crash	$604,000
B Injury Crash	$187,000
C Injury Crash	$107,000
Property Damage Only Crash	$15,000
Average Crash	$25,000
Injury Crash (F+A+B+C)	$282,000
Non-Fatal Injury Crash (A+B+C)	$154,000
Severe Injury Crash (F+A)	$2,884,000
Moderate Injury Crash (B+C)	$133,000

As part of each project recommendation sheet found in Section 3, both the reported WVCs and associated crash cost estimates, and the likely WVCs and associated crash cost estimates (based on the Virginia DOT Review of Animal-Vehicle Crash Data found in Section 1.4: Reported Wildlife-Vehicle Crash Data of this plan), are included. Table 2.6.3 summarizes the reported and likely WVCs and assocated crash cost estimates for these projects by county. The number of WVCs and crash cost estimates in Table 2.6.3 pertain to only the project sites identified in this plan; they do not pertain to every reported WVC and related crash cost estimate in the MPO's planning area.

Additional costs associated with WVCs that can be factored in to estimate the benefit of a countermeasure – while more difficult to quantify – include animal carcass removal, increases to vehicle insurance, emotional stress on both humans and wildlife, the benefit of wildlife to humans and what loss of wildlife means (ecosystem services), and the hunting value lost of an animal per collision.

Virginia DOT Case Study

To address wildlife-vehicle collisions and the costly toll they inflict, the Virginia DOT identified two sites along Interstate 64 to implement countermeasures. Fencing was installed at a bridge over a creek, and a culvert, which helped guide deer, black bears, foxes, and other wildlife through the crossing instead of on the road. The Virginia DOT reported a 90% decline in roadkill and determined that the fences had paid for themselves within two years.[45]

Table 2.6.3: Reported and Likely Wildlife-Vehicle Crashes and Cost Estimates for Wildlife Crossings Plan Project Recommendations (Animal-Vehicle Crash Data (2018-2022), NCDOT; 2023 Standardized Crash Cost Estimates for North Carolina, NCDOT).

DCHC MPO County	Reported		Likely	
	WVCs	Cost Per Crash – 2023 Dollars	WVCs	Cost Per Crash – 2023 Dollars
Chatham	56	$1,482,000	467.5	$12,624,000
Durham	141	$4,259,000	1,198.5	$36,200,500
Orange	183	$5,229,000	1,555.5	$44,446,500
Total	**380**	**$10,970,000**	**3,221.5**	**$93,271,000**

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Section 3

PROJECT RECOMMENDATIONS

The DCHC MPO is recommending twenty-eight (28) wildlife crossing projects located throughout its planning area as part of this plan. Five (5) projects are recommended for Chatham County, ten (10) are in Durham County (two (2) reside in the City of Durham), and thirteen (13) are in Orange County. Table 3.1 outlines the full list of recommended projects across all jurisdictions. Project recommendations assigned two project IDs signify two separate structures at the site. Rather than listing projects in priority order, each project sheet on the subsequent pages describes the site's significance, which can be referred to as structure replacements or retrofits are considered.

Project recommendations in Section 3 are organized by County, corridors, and additional sites for future consideration. Appendix H: Project Sheet Descriptions may be referred to as a guide.

Project ID	Project Name	Jurisdiction
ChathamCo1 / ChathamCo2	US 15-501 over Pokeberry Creek	Chatham County
ChathamCo3	Big Woods Road over Bush Creek	Chatham County
ChathamCo4	Manns Chapel Road over Wilkinson Creek	Chatham County
ChathamCo5	Lystra Road over Overcup Creek / Jordan Lake	Chatham County
ChathamCo6	Jack Bennett Road over Herndon Creek	Chatham County
DurhamCo1	Cole Mill Road over Eno River	Durham County
DurhamCo2	Rivermont Road over Nancy Rhodes Creek	Durham County
DurhamCo3	US 501 (Roxboro Road) over Eno River	Durham County
DurhamCo4	Guess Road over Eno River	Durham County
DurhamCo5	Old Oxford Road over Eno River	Durham County
DurhamCo6 / DurhamCo7	NC 54 over New Hope Creek	City of Durham
DurhamCo8 / DurhamCo9	I-40 Bridge over New Hope Creek	City of Durham
DurhamCo10	Stagecoach Road over New Hope Creek	Durham County
DurhamCo11	Old Chapel Hill Road over New Hope Creek	Durham County
DurhamCo12	Farrington Road over Little Creek	Durham County
OrangeCo1	Pleasant Green Road over Eno River	Orange County
OrangeCo2	US 70 over Stony Creek	Orange County
OrangeCo3	I-85 over Stony Creek	Orange County
OrangeCo4	University Station Road over Stony Creek	Orange County
OrangeCo5	Old NC Highway 10 over Stony Creek	Orange County
OrangeCo6	Halls Mill Road over Eno River	Orange County
OrangeCo7	Jones Ferry Road over Neville Creek	Orange County
OrangeCo8	Neville Road over Phil's Creek	Orange County
OrangeCo9	NC 54 over Morgan Creek	Orange County
OrangeCo10	Damascus Church Road over Pritchard Mill Creek	Orange County
OrangeCo11	New Hope Church Road over New Hope Creek	Orange County
OrangeCo12	NC 86 over New Hope Creek	Orange County
OrangeCo13	I-40 Culvert over New Hope Creek	Orange County

Table 3: Complete list of wildlife crossing project recommendations in the DCHC MPO planning area.

Section 3.1

CHATHAM COUNTY RECOMMENDATIONS

The DCHC MPO is recommending five (5) wildlife crossing projects that reside within Chatham County as part of this plan. The list of projects can be found below, and a map showing these sites are found in Figure 3.1: Map of complete list of wildlife crossing project recommendations in Chatham County. This map also distinguishes between the MPO's planning area boundary and the boundary for Chatham County. Project recommendations assigned two project IDs signify two separate structures at the site.

Project ID	Project Name	Jurisdiction
ChathamCo1 ChathamCo2	US 15-501 over Pokeberry Creek	Chatham County
ChathamCo3	Big Woods Road over Bush Creek	Chatham County
ChathamCo4	Manns Chapel Road over Wilkinson Creek	Chatham County
ChathamCo5	Lystra Road over Overcup Creek / Jordan Lake	Chatham County
ChathamCo6	Jack Bennett Road over Herndon Creek	Chatham County

Table 3.1: Complete list of wildlife crossing project recommendations in Chatham County.

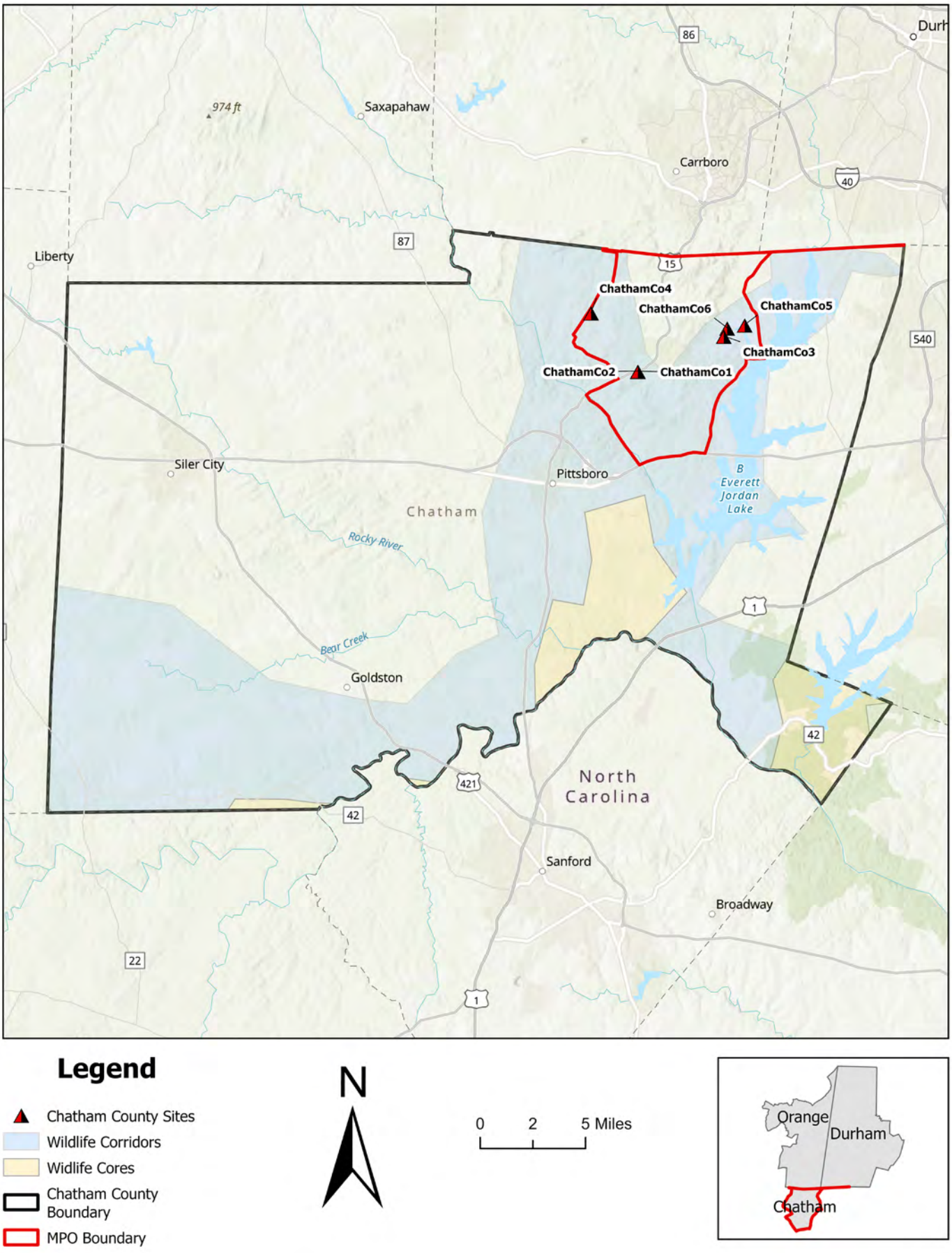


Figure 3.1: Map of complete list of wildlife crossing project recommendations in Chatham County.

Chatham County

US 15-501 over Pokeberry Creek

Summary and Problem Statement

The two bridges on US 15-501 S and N (Chapel Hill Road) over Pokeberry Creek have been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by Wildlands Network, and 20 WVCs have been reported within a one-mile buffer of this site. This roadway has two lanes running both north- and southbound divided by a 20-foot grass median; the divide continues through the bridge structure. The gap between the bridges provides good daylight and visibility to the creek banks below. This site has no bicycle and pedestrian facilities, has a posted speed limit of 55 mph, and garners 16,500 vehicles per day (2021 AADT).

This site has an existing good, dry bench on both sides of the stream when not flooded. The width of the spans and the cross section of the ground surface under the spans already provide adequate space and geometry for wildlife passage on dry banks on both sides of the creek. However, barriers to wildlife travel exist along this corridor and under the bridges, which encourages wildlife travel on the roadway and results in conflicts with motorists. There are areas of exposed riprap with shallow to no sediment/ soil (i.e., large voids) that are creating an uneven surface that likely makes it difficult for some wildlife species to traverse. The exposed riprap areas along the streambanks (and possibly in the adjacent toe ditches running parallel to the road) should be filled with material such as fines, soil, screenings, or aggregate to make the surface more even and traversable for wildlife.

Vegetation under the bridge does not appear to be an obstacle, but vegetation downstream along the streambanks is dense, brushy, and thorny. There are also abundant invasive woody species present which should be removed, as they significantly degrade the habitat value of the corridor through the ROW. Vegetation management in at least the downstream riparian area should be explored to determine if it would help guide or attract wildlife to the riparian corridor and the crossing under the bridge. If these aspects are addressed, this crossing site may be a good candidate for fencing, depending on parcel ownership, fencing design factors, etc.

Facing east, under US 15-501 bridge at Pokeberry Creek. DCHC MPO.

Facing west, under US 15-501 bridge at Pokeberry Creek. DCHC MPO.

Aerial photograph of US 15-501 over Pokeberry Creek. Nearmap.

Site Facts

Location ID	ChathamCo1 (southbound) ChathamCo2 (northbound)
Date of Site Visit	May 24, 2024
Jurisdiction	Chatham County
Coordinates	35°47'23.7"N, 79°06'31.3"W
NCDOT Crossing/Structure Code	Southbound bridge: 180037 Northbound bridge: 180489
Existing Structure Type	Bridge (two separate structures)
Property Owner Type	Public, private
Existing Plan Alignment	2024-2033 STIP (TIP #: U-6192)
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	16,500
Projected Average Weekday Traffic (AWDT)	25,694
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 19 ($475,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 20 ($582,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 161.5 ($4,037,500) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 170 ($4,947,000)**

20
Reported WVCs within 1-mile buffer (2018-2022)

$582,000
Reported WVCs cost estimate

16,500
Annual average daily traffic (2021)

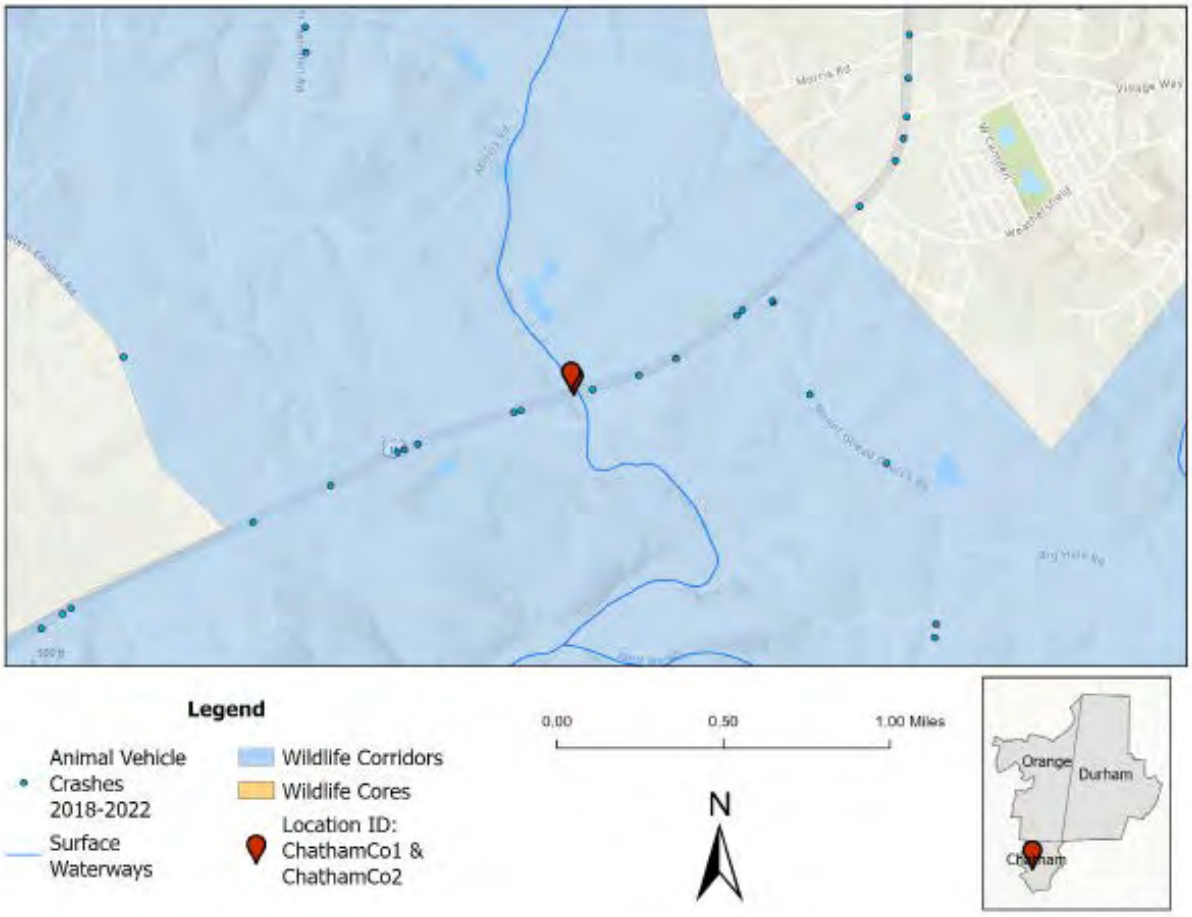
55
mph speed limit

Preferred Scenario

Fill voids in the exposed riprap under and adjacent to the spans on both sides of the creek with fine aggregate to provide a smooth natural surface for wildlife passage on the existing benches. Thin vegetation and remove invasives within the ROW immediately downstream of the bridge to increase permeability into the adjacent undisturbed habitat to allow wildlife passage. Install fencing to guide wildlife under the bridge.

Alternate Scenario

Until the riprap surface can be filled/improved, perform the selective vegetation clearing described above at a minimum.



Chatham County

Big Woods Road over Bush Creek

Summary and Problem Statement

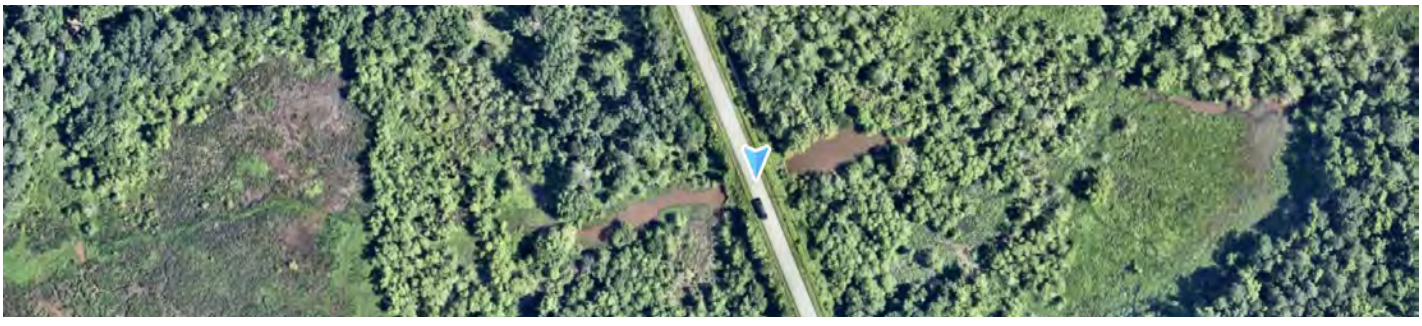
The culvert at Big Woods Road over Bush Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by Wildlands Network, and 8 WVCs have been reported within a one-mile buffer of this site. The bridge is a two-lane undivided roadway with no bicycle and pedestrian facilities, and has a posted speed limit of 55 mph. This site is adjacent to several managed and natural lands, which include the US Army Corps of Engineers land that includes the Bush Creek marshes area which connects nearby to Jordan Lake, and the NC Department of Natural and Cultural Resources Natural Heritage Program.

Barriers to wildlife travel exist along this corridor and through the culvert, which encourages wildlife travel on the roadway and results in conflicts with motorists. Barriers include standing water through the double box / two-bay culvert, and the placement of riprap. There are areas of suitable dry habitat approaching the underpass area on both sides of the road, even though there are also flooded wetland areas. However, there is no dry passage because both cells of the culvert are flooded to their full width, and because the riprap slope protection on the roadway embankment (causeway) extends into the standing water both up and downstream of the culvert.

Several elements of the roadway embankment (causeway) and stream culvert construction present challenges for the potential of dry passage through the culvert except potentially in times of extremely low water levels when no standing water is present. First, the culverts are not wide enough to accommodate dry wildlife passage and hydrology. Further, the placement of embankment riprap slope protection to the toe of the embankment at the adjacent floodplain elevation, cuts off dry passage from the floodplain when it is flooded. In addition, the uniform steep slope of the riprap on the embankments and the concrete wingwalls does not include a level bench that could be tied into the culvert if dry passage through them were provided.

Facing East from west side of Big Woods Road culvert. Pete Schubert.

Facing west from above Big Woods Road culvert. Pete Schubert.



Aerial photograph of Big Woods Road over Bush Creek. Nearmap.

Site Facts

Location ID	ChathamCo3
Date of Site Visit	June 13, 2024
Jurisdiction	Chatham County
Coordinates	35°48'41.8"N 79°02'36.2"W
NCDOT Crossing/Structure Code	180440
Existing Structure Type	Culvert
Property Owner Type	Public
Existing Plan Alignment	CTP Highway: Big Woods Rd CTP Pedestrian: Big Woods Rd
Managed and Natural Lands	U.S. Army Corps of Engineers, NC DNCR Natural Heritage Program
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	2,392
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 8 ($200,000) **Total crashes and cost estimate: 8 ($200,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 68 ($1,700,000) **Total crashes and cost estimate: 68 ($1,700,000)**

8
Reported WVCs within 1-mile buffer (2018-2022)

$200,000
Reported WVCs cost estimate

2,392
Projected annual daily traffic

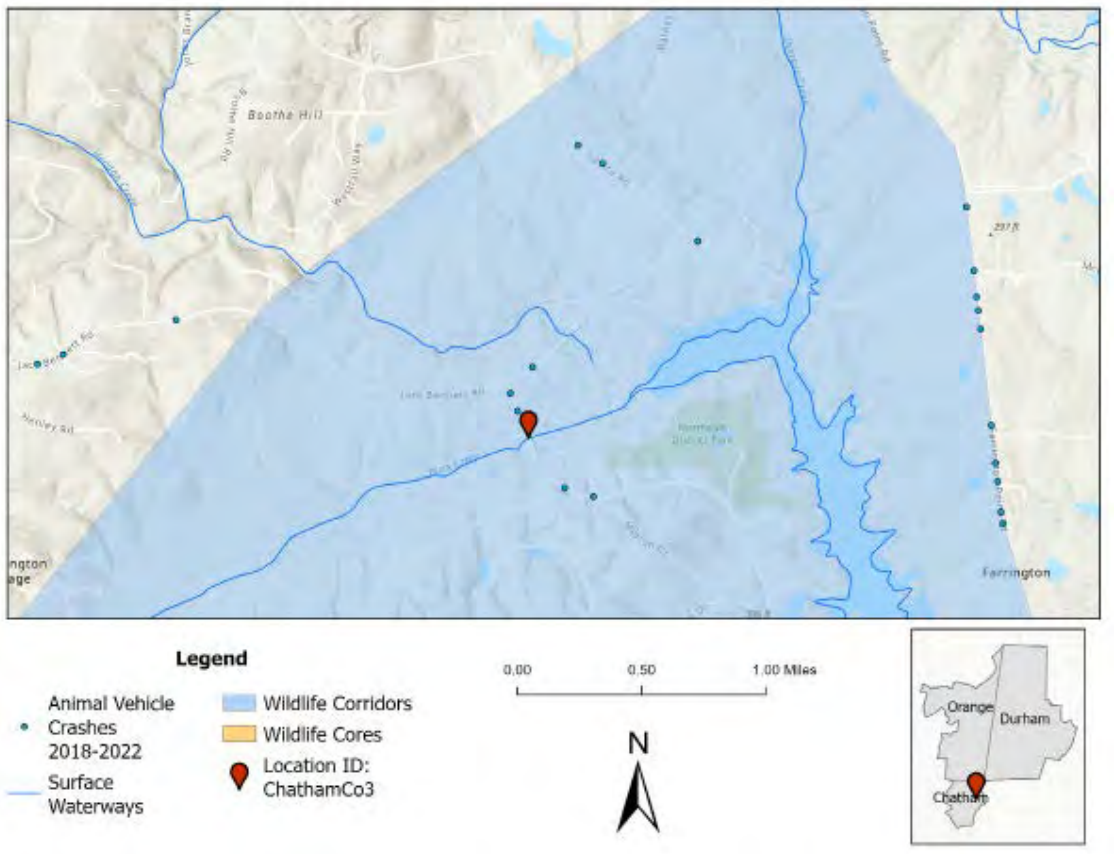
Adjacent managed natural land

Preferred Scenario

Replace the existing culverts and adjacent earthen embankments with a single span bridge of sufficient roadway length to provide both hydrologic function plus a minimum width of 8 feet at and above floodplain elevation on both sides of the creek for dry wildlife passage. Extend these dry passages on both side of the bridge up and downstream into adjacent dry habitat areas. All dry passages must be natural surface, free of open riprap.

Alternate Scenario

Construct new dry culverts through the causeway as wildlife underpasses on both sides of the existing culvert, placed so that wildlife can move from dry habitat areas on either side of the road, through these new dry culverts, to dry habitat areas on the other side of the road. These two new culverts should be at least 8 feet high and 12 feet wide, with a natural surface floor that is not normally flooded and should be straight with no offset or skew. If sufficient causeway height is not present to achieve the required height of the new dry culverts, the profile of the roadway may need to be raised in the section between the new culverts.



Chatham County

Manns Chapel Road over Wilkinson Creek

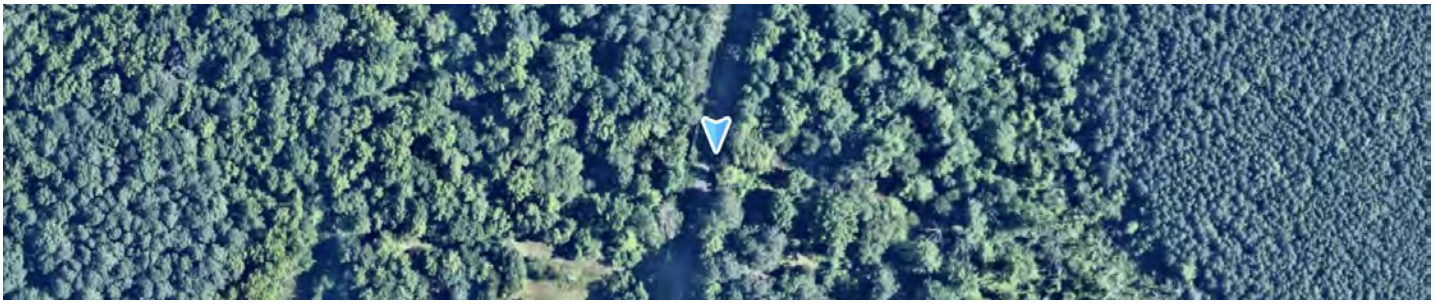
Summary and Problem Statement

The triple pipe culvert at Manns Chapel Road (SR 1532) over Wilkinson Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by Wildlands Network, and there have been four reported wildlife-vehicle crashes within a one-mile buffer of this site. This crossing is positioned along a two-lane road that has no bicycle and pedestrian facilities, and has a posted speed limit of 45 mph.

Barriers to wildlife travel exist along this corridor and through the culvert, which encourages wildlife travel on the roadway and results in conflicts with motorists. This site offers no dry passage for wildlife through the existing triple pipe culvert. During the relatively low water conditions on the date of site assessment, all pipe culverts were flooded with water, and debris was blocking the central culvert pipe. The three identical pipe culverts are round corrugated galvanized steel (pipe appears to be bituminous-coated on bottom) and are aging. Given the less than 6 feet of elevation difference between the road profile and the adjacent floodplain, there is no opportunity for any modification to the pipe culverts or installation of dry passage culverts adjacent to the existing culverts away from the stream channel.

East side of Manns Chapel Road culvert over Wilkinson Creek. DCHC MPO.

West side of Manns Chapel Road culvert over Wilkinson Creek. DCHC MPO.



Aerial photograph of Manns Chapel Road culvert over Wilkinson Creek. Nearmap.

Site Facts

Location ID	ChathamCo4
Date of Site Visit	May 24, 2024
Jurisdiction	Chatham County
Coordinates	35°49'33.7"N 79°08'39.6"W
NCDOT Crossing/Structure Code	180444
Existing Structure Type	Triple pipe culvert
Property Owner Type	Private
Existing Plan Alignment	CTP Highway: Highway: Manns Chapel Rd. CTP Bicycle & Pedestrian: Manns Chapel Rd.
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	3,862
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 4 ($100,000) **Total crashes and cost estimate: 4 ($100,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 34 ($850,000) **Total crashes and cost estimate: 34 ($850,000)**

4
Reported WVCs within 1-mile buffer (2018-2022)

$100,000
Reported WVCs cost estimate

3,862
Projected annual daily traffic

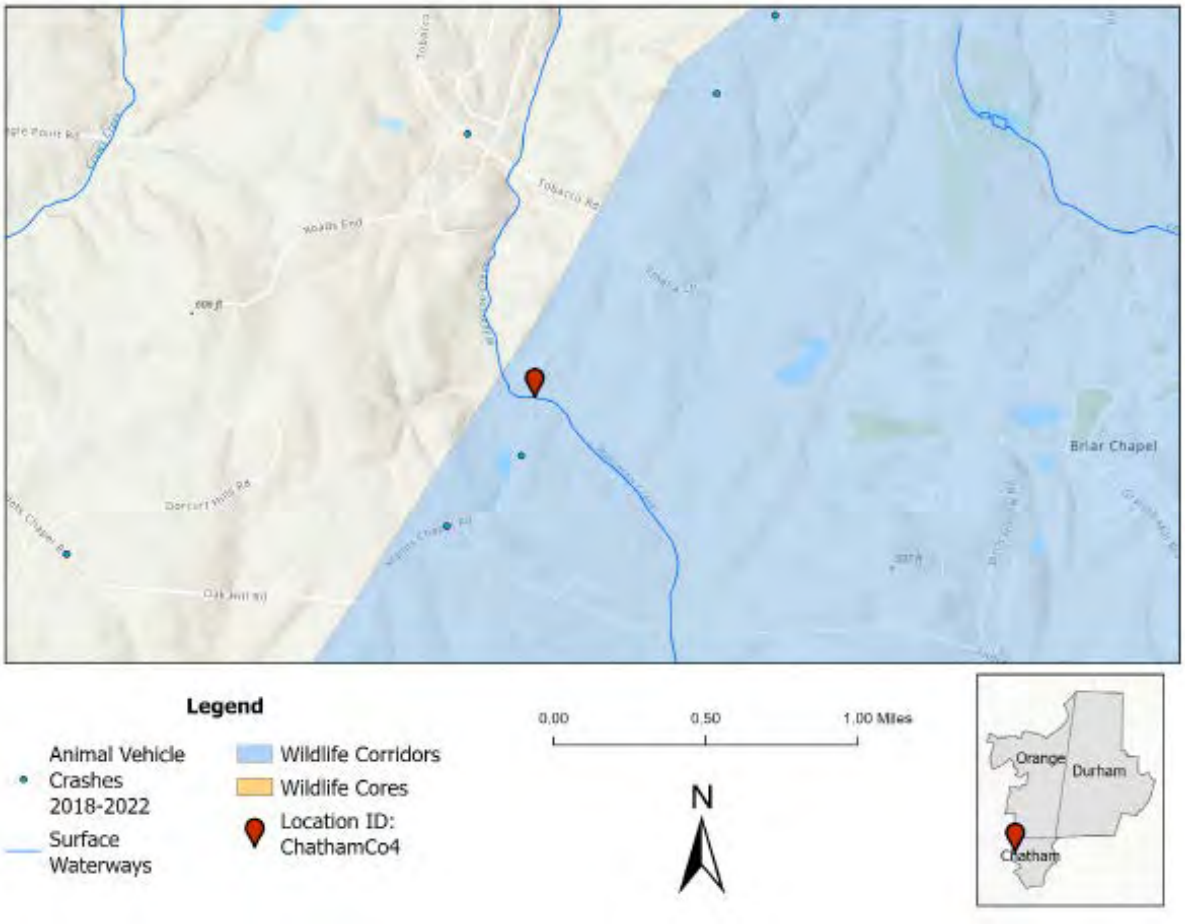
45
mph speed limit

Preferred Scenario

The triple pipe culverts should be replaced with a single bridge of sufficient span to provide dry passage for wildlife on both sides of the stream at or above floodplain elevation. The road causeway profile should be raised to provide at least 8 feet of vertical clearance between dry passages and the bottom of the bridge structure.

Alternate Scenario

The existing triple pipe culvert could be replaced with a 5-bay box culvert that provides outer cells with higher, dry passage for wildlife on both sides of the stream, with these dry passages connected to habitat up and down stream; or, a relatively short, full open-span bridge wide enough and high enough for dry passage on both sides of stream. The road causeway profile should be raised sufficiently to provide at least 8 feet of vertical clearance between the natural surface bottoms and the box culvert ceilings within dry passage bays.



Chatham County

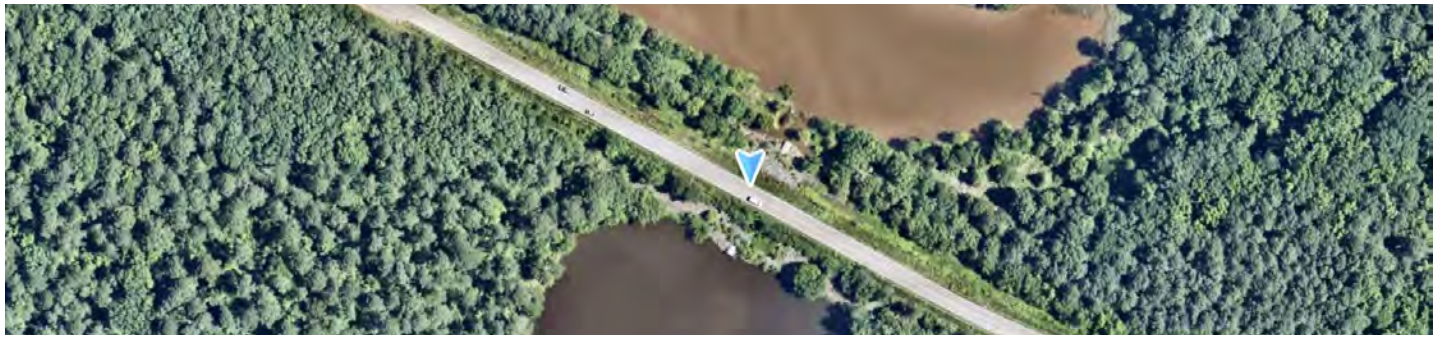
Lystra Road over Overcup Creek / Jordan Lake

Summary and Problem Statement

Lystra Road over Overcup Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by Wildlands Network, and there have been sixteen reported wildlife-vehicle crashes within a one-mile buffer of this site. This crossing is positioned along a two-lane road that has no bicycle and pedestrian facilities, and has a posted speed limit of 45 mph. The US Army Corps of Engineers maintains the natural managed land of Jordan Lake adjacent to this site.

Barriers to wildlife travel exist along this corridor and through the pipe, which encourages wildlife travel on the roadway and results in conflicts with motorists. The road at this site crosses the lake on a raised causeway with steep riprap slopes from the road down to the floodplain and lake. The land around this crossing has existing trails currently used by the public that are conducive to wildlife travel. However, due to the pipe's location in the middle of Overcup Creek, and the wide body of water surrounding it, the structure is not conducive for wildlife passage through a retrofit.

View of pipe from north side of Lystra Road over Overcup Creek / Jordan Lake. DCHC MPO.



Aerial photograph of Lystra Road pipe over Overcup Creek / Jordan Lake. Nearmap.

Site Facts

Location ID	ChathamCo5
Date of Site Visit	June 13, 2024
Jurisdiction	Chatham County
Coordinates	35°49'07.1"N 79°01'39.1"W
NCDOT Crossing/Structure Code	16333
Existing Structure Type	Pipe
Property Owner Type	Public
Existing Plan Alignment	2050 MTP Highway: Jack Bennet Rd/Lystra Rd CTP Highway: Jack Bennet Rd CTP Pedestrian: Jack Bennet Rd
Managed and Natural Lands	US Army Corps of Engineers
Average Annual Daily Traffic (AADT) (2019)	8,700
Average Annual Daily Traffic (AADT) (2021)	6,700
Projected Average Weekday Traffic (AWDT)	9,143
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 16 ($400,000) **Total crashes and cost estimate: 16 ($400,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 136 ($3,400,000) **Total crashes and cost estimate: 136 ($3,400,000)**

16
Reported WVCs within 1-mile buffer (2018-2022)

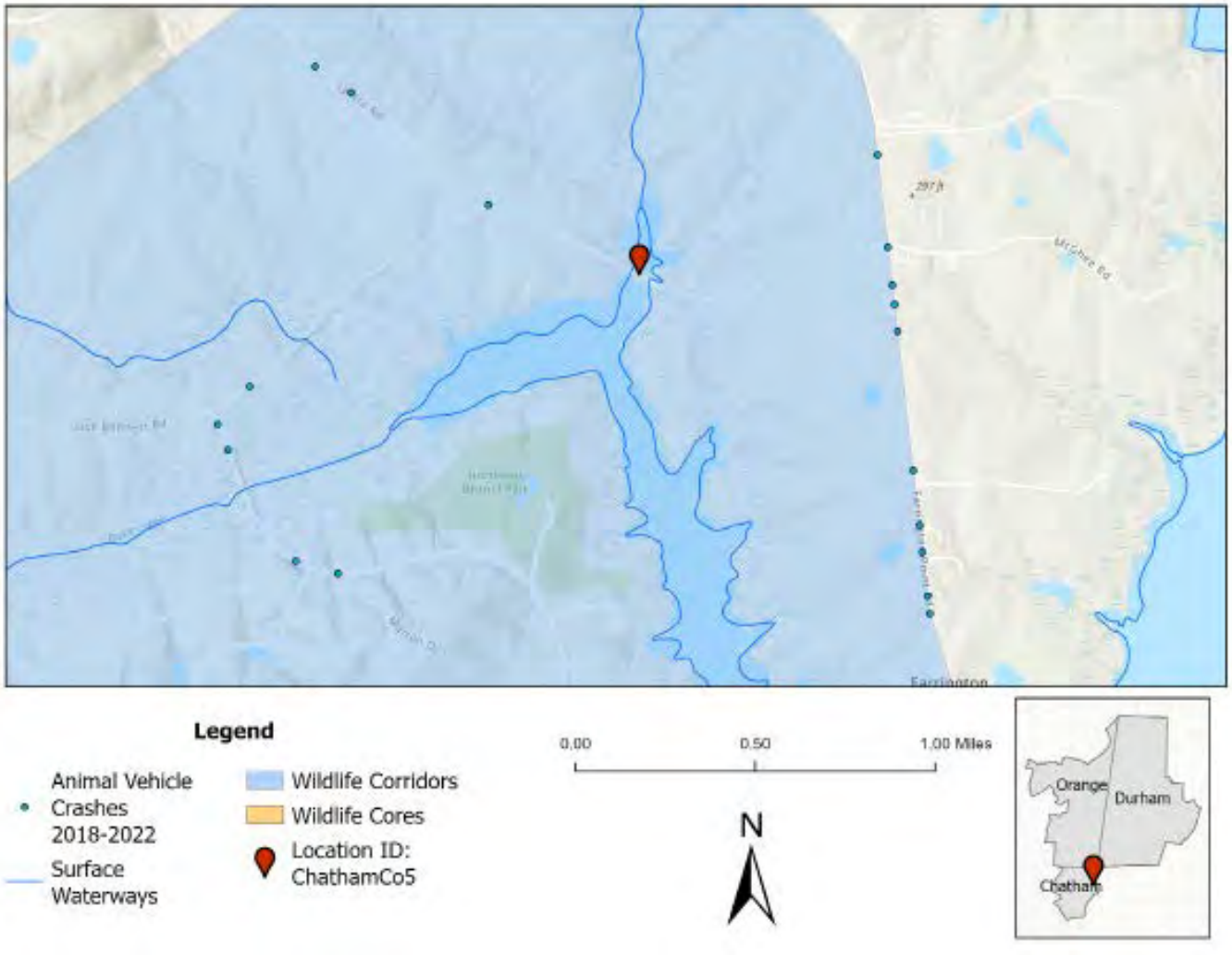
$400,000
Reported WVCs cost estimate

6,700
Annual average daily traffic (2021)

Adjacent managed natural land

Preferred Scenario

Construct dry culverts through the causeway on both sides of the lake to connect the high-quality lakeside habitat on both sides of the road. Dry culverts should be at least 12 feet wide and 8 feet high. The existing approach for wildlife to a potential underpass in these areas (visibility, slopes, etc.) is already good. This solution would also require fencing to guide wildlife to the dry culverts.



Chatham County

Jack Bennett Road over Herndon Creek

Summary and Problem Statement

Jack Bennett Road over Herndon Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and there have been eight reported wildlife-vehicle crashes within a one-mile buffer of this site. This crossing is positioned along a two-lane road that has no bicycle and pedestrian facilities, and has a posted speed limit of 55 mph. The US Army Corps of Engineers has adjacent natural and managed land within the Jordan Reservoir impoundment area, managed by the NC Wildlife Resources Commission as a gameland.

Barriers to wildlife travel exist along this corridor and under the bridge, which encourages wildlife travel on the roadway and results in conflicts with motorists. The continuous riprap slope protection along the causeway/roadway embankments and under the bridge is a major barrier to wildlife passage through the underpass and connection to habitat areas up and downstream. This riprap extends from about 10 feet below shoulder grade down to the toe of the slopes at the floodplain without a bench that could function as dry passage above the floodplain elevation. Though low water dry passage exists on the east side, none exists on the west side, and neither functions at high creek levels. A 30 feet wide partially dry natural surface floodplain exists on the north bank under the bridge, beyond the toe of the riprap slope protection that has good connectivity to adjacent up and downstream habitat, but only at low water levels. No dry passage is present on the south bank as the riprap slope protection extends to the top of the creek bank.

Under bridge at Jack Bennett Road over Herndon Creek, facing northwest. Pete Schubert.

Under bridge at Jack Bennett Road over Herndon Creek, facing southwest. Pete Schubert.

Aerial photograph of Jack Bennett Road bridge over Herndon Creek. Nearmap.

Site Facts

Location ID	ChathamCo6
Date of Site Visit	June 13, 2024
Jurisdiction	Chatham County
Coordinates	35°49'00.2"N 79°02'27.0"W
NCDOT Crossing/Structure Code	180060
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	2050 MTP Highway: Jack Bennet Rd/Lystra Rd CTP Highway: Jack Bennet Rd CTP Pedestrian: Jack Bennet Rd
Managed and Natural Lands	US Army Corps of Engineers
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	6,651
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 8 ($200,000) **Total crashes and cost estimate: 8 ($200,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 68 ($1,700,000) **Total crashes and cost estimate: 68 ($1,700,000)**

8
Reported WVCs within 1-mile buffer (2018-2022)

$200,000
Reported WVCs cost estimate

6,651
Projected annual daily traffic

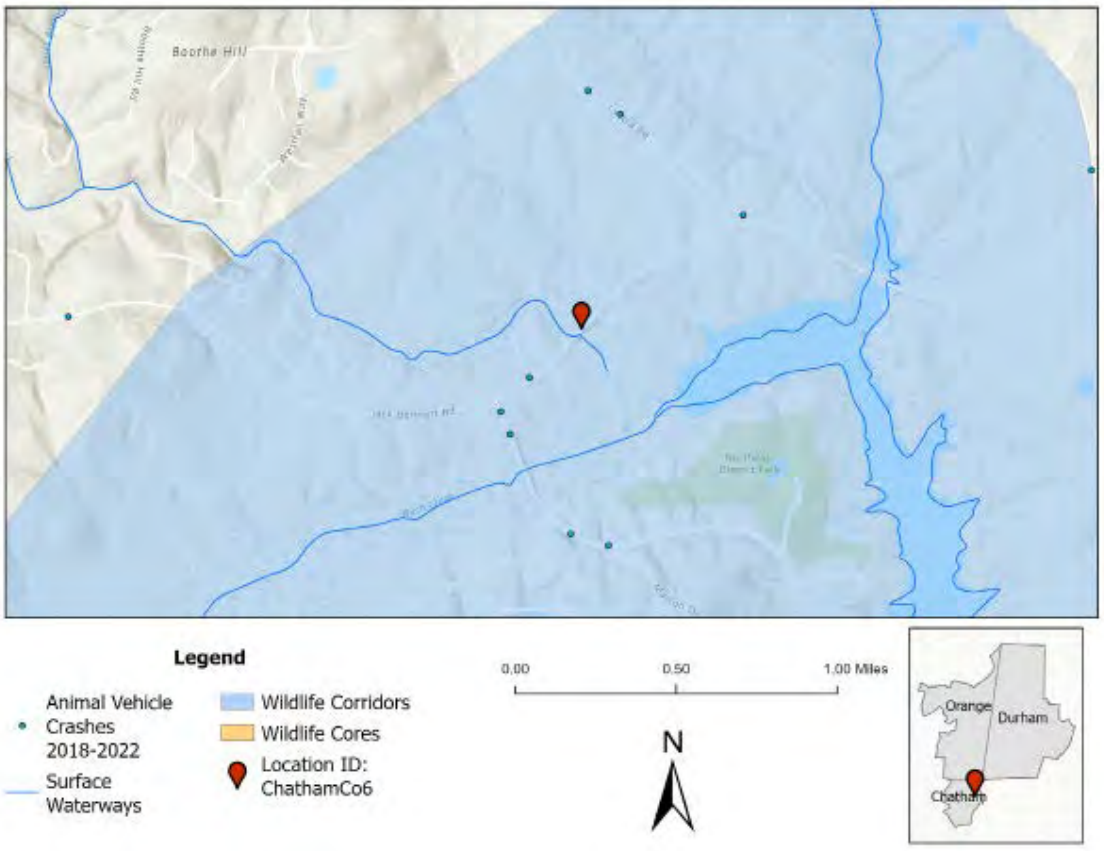
Adjacent managed natural land

Preferred Scenario

If the length of the bridge span between abutments is sufficient, grade 8 feet wide benches into the embankment/causeway slopes across the entire width of the creek floodplain on both sides of the road to create dry passages for wildlife at high water. Connect the benches under the bridge on each end, and tie them into dry habitat up and downstream. Benches should be natural surface or, if riprap is used, it must have all voids filled to provide a smooth surface.

Alternate Scenario

Construct new dry culverts through the causeway to serve as wildlife underpasses on both sides of the existing bridge span, placed so that wildlife can move from dry habitat areas on either side of the road, through these new dry culverts, to dry habitat areas on the other side of the road. These two new culverts should be at least 8 feet high and 12 feet wide, with a natural surface floor that is not normally flooded, and be straight with no offset or skew. If sufficient causeway height is not present to achieve the required height of the new dry culverts, the profile of the roadway may need to be raised in the section between the new culverts.



Section 3.2

DURHAM COUNTY RECOMMENDATIONS

The DCHC MPO is recommending ten (10) projects for Durham County (two (2) reside in the City of Durham) as part of this plan. The list of projects can be found below in Table 3.2, and a map showing these sites are found in Figure 3.2: Map of complete list of wildlife crossing project recommendations in Durham County. Project recommendations assigned two project IDs signify two separate structures at the site.

Project ID	Project Name	Jurisdiction
DurhamCo1	Cole Mill Road over Eno River	Durham County
DurhamCo2	Rivermont Road over Nancy Rhodes Creek	Durham County
DurhamCo3	US 501 (Roxboro Road) over Eno River	Durham County
DurhamCo4	Guess Road over Eno River	Durham County
DurhamCo5	Old Oxford Road over Eno River	Durham County
DurhamCo6 DurhamCo7	NC 54 over New Hope Creek	City of Durham
DurhamCo8 DurhamCo9	I-40 Bridge over New Hope Creek	City of Durham
DurhamCo10	Stagecoach Road over New Hope Creek	Durham County
DurhamCo11	Old Chapel Hill Road over New Hope Creek	Durham County
DurhamCo12	Farrington Road over Little Creek	Durham County

Table 3.2: Complete list of wildlife crossing project recommendations in Durham County.

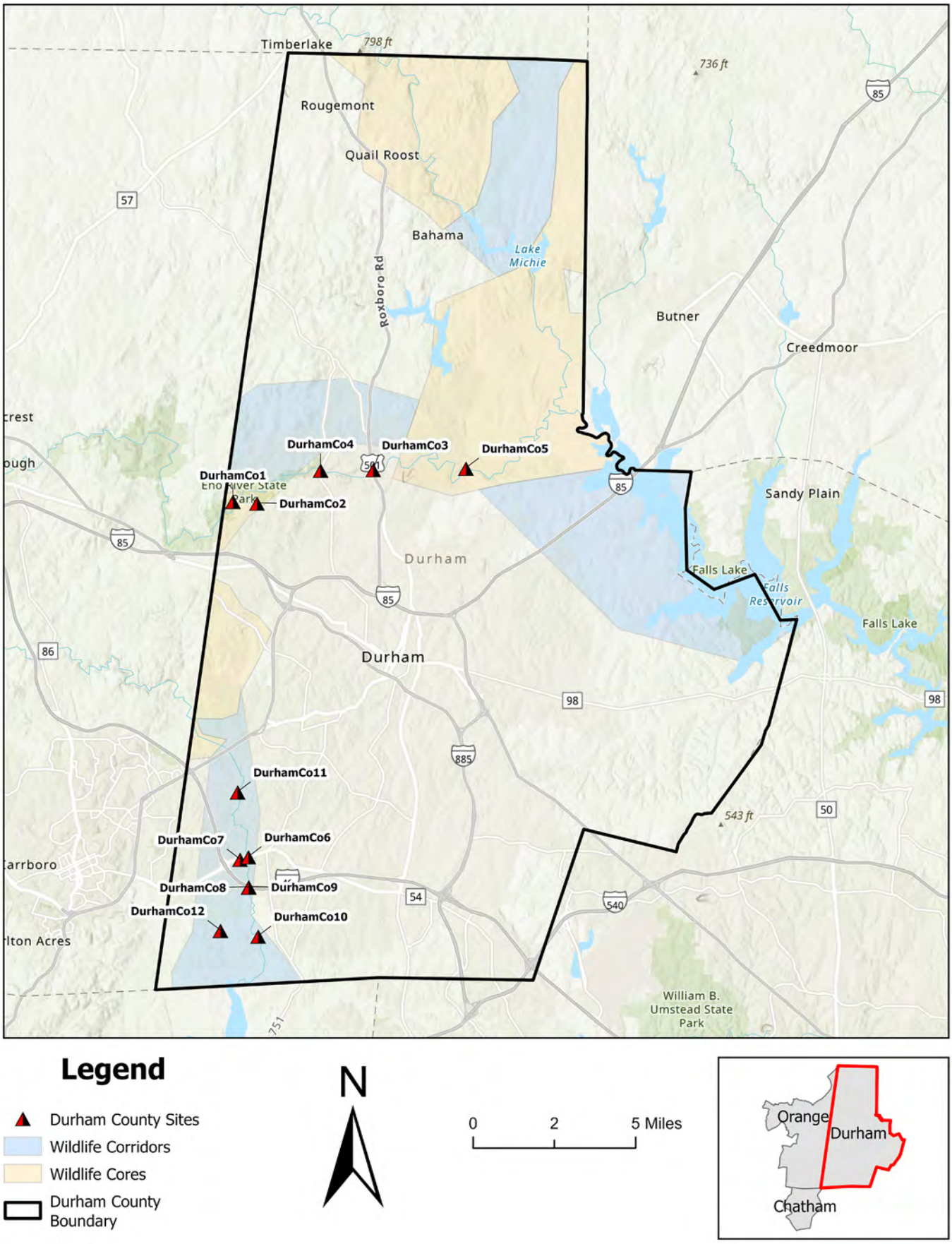


Figure 3.2: Map of complete list of wildlife crossing project recommendations in Durham County.

Durham County

Cole Mill Road over Eno River

Summary and Problem Statement

Cole Mill Road over the Eno River has been identified as a priority wildlife crossing. This crossing resides within a wildlife core identified by the Wildlands Network. The bridge at this site is a two-lane undivided with no bicycle and pedestrian facilities. This site has 10 reported WVCs within a one-mile buffer, has a posted speed limit of 45 mph, and garners 8,600 vehicles per day (2021 AADT). This site is adjacent to natural managed lands. The NC DNCR, Division of Parks and Recreation maintains Eno River State Park along the western side of the crossings, the Mountains-to-Sea Trail, the Middle Eno River Bluffs and Slope, and the Eno River Aquatic Habitat. The US Fish and Wildlife Service has identified the site as a critical habitat for the Altantic Pigtoe, Carolina Madtom, Neuse River Waterdog, and Green Floater.

Barriers to wildlife travel exist within this core and under the bridge, which encourages wildlife travel on the roadway and results in conflicts with motorists. Riprap placed on the east side of the bridge on the north bank from the top of the steep slope all the way into the river to the base of the incised bank prevents dry passage for wildlife at any elevation. A bench created midway up this riprap slope that has been choked with pea gravel has not been connected to the habitat up or downstream. The natural surface slope under the bridge is steeply sloping from abutment at the top to the riverbank. The remains of the eroded and abandoned Pea Creek Trail (wood boardwalk, steps) interfere with dry passage on the north bank from the east, and the entire north bank is steeply sloped with no benches for wildlife access or human foot traffic. On the south bank, scour has narrowed to the width of the dry passage between the toe of the steep concrete paved slope protection surrounding the abutment, and woody vegetation at the top of the eroding bank interferes with passage of both wildlife and foot traffic of the Mountains-to-Sea Trail (MST) along the south bank of the Eno River under the bridge. All replacement, repair, and/or remediation work should be closely coordinated between NCDOT staff, Eno River State Park (ERSP) staff (Pea Creek trail, ERSP lands), and NC Division of Parks and Recreation.

East side of Cole Mill Road bridge over Eno River, facing southwest. DCHC MPO.

West side of Cole Mill Road bridge over Eno River, facing northeast. DCHC MPO.

Aerial photograph of Cole Mill Road bridge over Eno River. Nearmap.

Site Facts

Location ID	DurhamCo1
Date of Site Visit	April 17, 2024
Jurisdiction	Durham County
Coordinates	36°03'33.6"N 78°58'41.0"W
NCDOT Crossing/Structure Code	310049
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	CTP Pedestrian: Cole Mill Rd CTP Highway: Cole Mill Rd
Managed and Natural Lands	NC DNCR Division of Parks and Recreation, US Fish and Wildlife Service
Average Annual Daily Traffic (AADT) (2019)	9,500
Average Annual Daily Traffic (AADT) (2021)	8,600
Projected Average Weekday Traffic (AWDT)	10,754
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 10 ($250,000) **Total crashes and cost estimate: 10 ($250,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 85 ($2,125,000) **Total crashes and cost estimate: 85 ($2,125,000)**

10
Reported WVCs within 1-mile buffer (2018-2022)

$250,000
Reported WVCs cost estimate

8,600
Annual average daily traffic (2021)

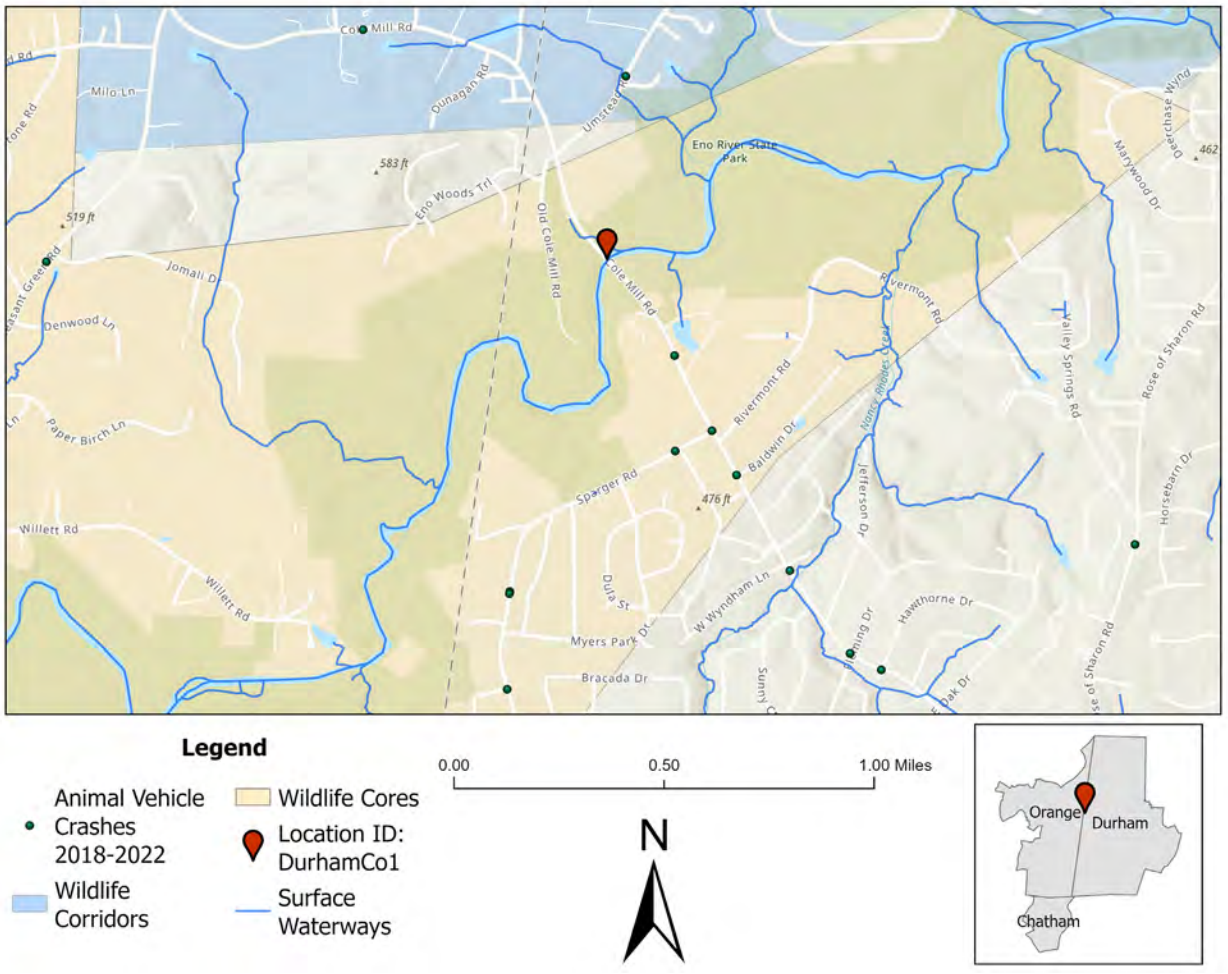
Adjacent managed natural land

Preferred Scenario

Replace the bridge with a longer span that provides sufficient room for dry wildlife and trail passage on both banks of the river. Vertical bents at the abutments are recommended to maximize low slope dry passages and provide additional high water flow capacity to minimize bank scour. Connect dry passages to habitat up and downstream on both sides of the river.

Alternate Scenario

Bench into the north bank slope to provide a minimum of 8 feet of dry passage for wildlife and trail foot traffic. Similarly, bench into the paved slope protection on the south bank. Connect dry passages to habitat up and downstream on both sides of the river. Repair the scour around the bent piers that are eroding into both banks and potentially threatening the integrity of the piers.



Durham County

Rivermont Road over Nancy Rhodes Creek

Summary and Problem Statement

Rivermont Road over Nancy Rhodes Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife core identified by Wildlands Network, and 11 WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities. Since there are no active ordinances for this route, the roadway falls under statutory speed limits, which is 55 mph outside of city limits. However, the road's gravel surface, curves, and narrow bridge suggests that a maximum safe speed would be closer to 35 mph.

This site is adjacent to several managed and natural lands. The N.C. Department of Natural & Cultural Resources Division of Parks & Recreation maintains Eno River State Park along the north side of the site, and the Middle Eno River Bluffs and Slope natural heritage area. The Eno River Association maintains a conservation easement covering 8.84 acres on the southwest side of the site. The City of Durham maintains Valley Spring Park, which covers 124.58 acres on the southeast side of the site.

Barriers to wildlife travel exist within this core and under the bridge, which encourages wildlife travel on the roadway and results in conflicts with motorists. Barriers include scattered riprap, steep and actively eroding and undercut banks, and abandoned temporary silt fence and posts. The banks beneath the bridge appear to need immediate stabilization from creek bank erosion. The once uniformly steep, riprap slopes are now eroded, leaving hardpan and saprolite benches that are discontinuously present on both banks. Neither side provides continuous dry stream bank passage at any stream level.

The slopes from the creek bank to the abutments appear to have been once covered by riprap slope protection, but all that remains is some riprap within a few feet of each abutment; the rest has been eroded away and the underlying subgrades have been significantly scoured away. These slopes should be rebuilt to provide natural surface dry passage benches, while also providing critical stabilization of the abutment slopes. The bridge appears to be a recent replacement span and of adequate span length to provide dry passage on both sides if the slopes are reconstructed and stabilized adequately.

Rivermont Road ridge over Nancy Rhodes Creek looking Southwest. DCHC MPO.

Rivermont Road bridge over Nancy Rhodes Creek looking East. Pete Schubert.

Aerial photograph of Rivermont Road bridge over Nancy Rhodes Creek. Nearmap

Site Facts

Location ID	DurhamCo2
Date of Site Visit	April 17, 2024
Jurisdiction	Durham County
Coordinates	36°03'31.1"N 78°57'58.1"W
NCDOT Crossing/Structure Code	310458
Existing Structure Type	Bridge
Property Owner Type	Local, private, state
Existing Plan Alignment	CTP Pedestrian: Rivermont Rd
Managed and Natural Lands	NC DNCR Division of Parks and Recreation, Eno River Association, City of Durham
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	Unavailable
Speed Limit	55 mph (statutory speed limit outside of city limits)
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 10 ($250,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 11 ($357,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 85 ($2,125,000) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 93.5 ($3,034,500)**

11
Reported WVCs within 1-mile buffer (2018-2022)

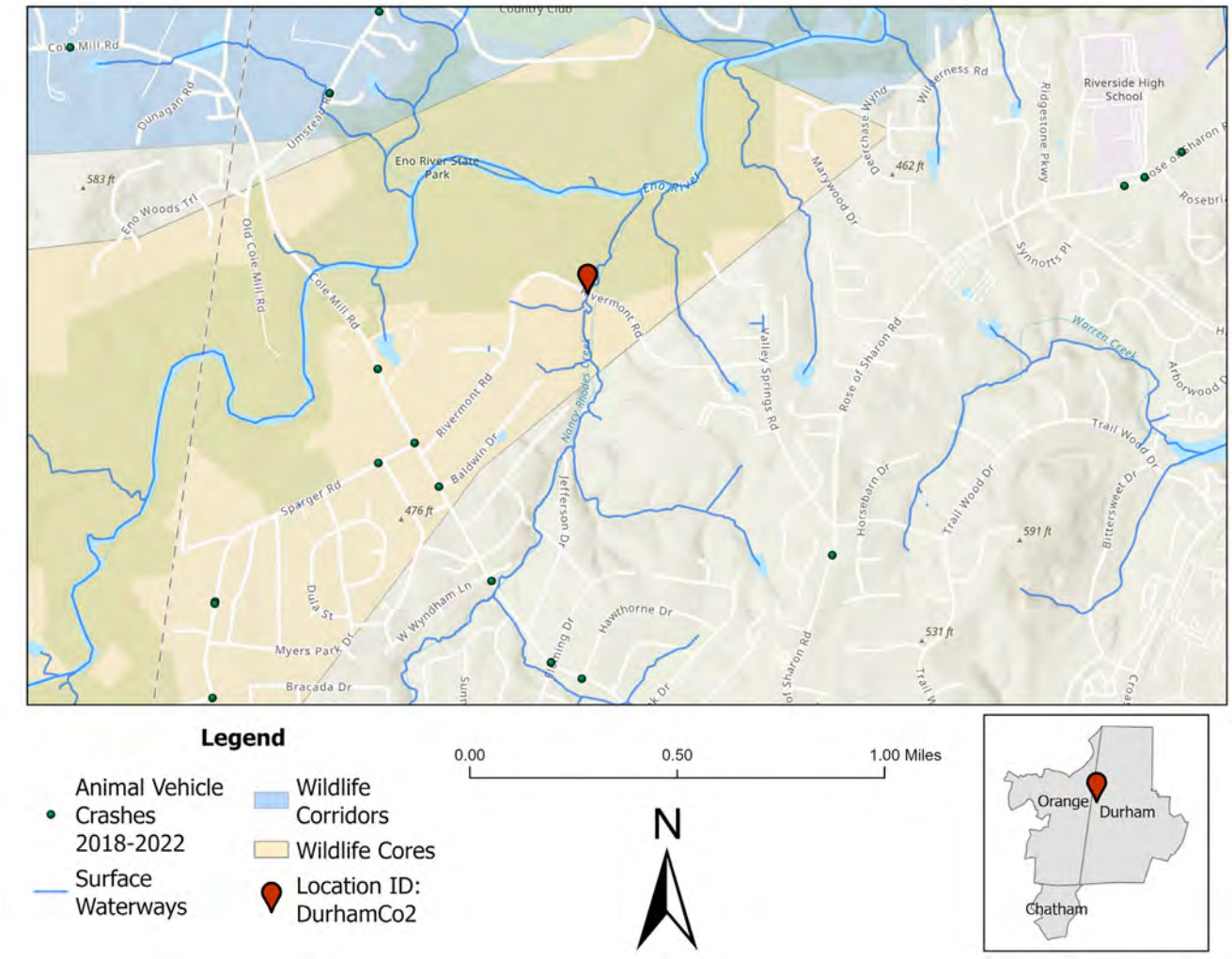
$357,000
Reported WVCs cost estimate

55
mph speed limit

Adjacent managed natural land

Preferred Scenario

Rebuild the eroded abutment slopes with retaining walls to provide a natural surface dry wildlife passage on both sides of the creek. Ensure passages connect into habitat up and downstream.



Durham County

US 501 (Roxboro Road) over Eno River

Summary and Problem Statement

US 501 (Roxboro Road) over the Eno River has been identified as a priority wildlife crossing. This crossing is located within one mile of both a wildlife core and corridor identified by Wildlands Network, making this site important for both. There have been nineteen (19) WVCs reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and garners 30,000 vehicles per day (2021 AADT).

This site is adjacent to several managed and natural lands. The City of Durham maintains West Point Park along the western side of the crossing. The NC DNCR Division of Parks and Recreation maintains the Mountains-to-Sea Trail, Middle Eno River Bluffs and Slope, and the Eno River Aquatic Habitat. The US Fish and Wildlife Service has identified the site as a critical habitat for the Atlantic Pigtoe, Neuse River Waterdog, Carolina Madtom, and Green Floater.

While barriers to wildlife travel under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists, the wildlife passage appears to be highly viable along this section of the river and corridor approaching and under the bridge, and the natural surface stream banks are overall excellent. No major remediation is needed except for the northeast and southeast slopes needing deep erosion/incision and voids backfilled and stabilized to prevent recurrence, and to allow full wildlife passage.

Under US 501 (Roxboro Road) bridge over Eno River, view upstream on the south bank. Pete Schubert.

Under US 501 (Roxboro Road) bridge over Eno River, view downstream from the south bank to the north bank. Pete Schubert.

Aerial photograph of US 501 (Roxboro Road) bridge over Eno River. Nearmap.

Site Facts

Location ID	DurhamCo3
Date of Site Visit	June 13, 2024
Jurisdiction	Durham County
Coordinates	36°04'19.4"N 78°54'31.0"W
NCDOT Crossing/Structure Code	310035
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	2050 MTP Highway: (MTP ID 92) Roxboro Rd (501 N) CTP Highway: US 501 (Roxboro Rd) CTP Multiuse Path: RoxboroA2 CTP Pedestrian: Hwy 501
Managed and Natural Lands	City of Durham, NC DNCR Division of Parks and Recreation, US Fish and Wildlife Service
Average Annual Daily Traffic (AADT) (2019)	31,500
Average Annual Daily Traffic (AADT) (2021)	30,000
Projected Average Weekday Traffic (AWDT)	29,766
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 18 ($450,000) Type B injury crash: 1 ($187,000) **Total crashes and cost estimate: 19 ($637,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 153 ($3,825,000) Type B injury crash: 8.5 ($1,589,500) **Total crashes and cost estimate: 161.5 ($5,414,500)**

19
Reported WVCs within 1-mile buffer (2018-2022)

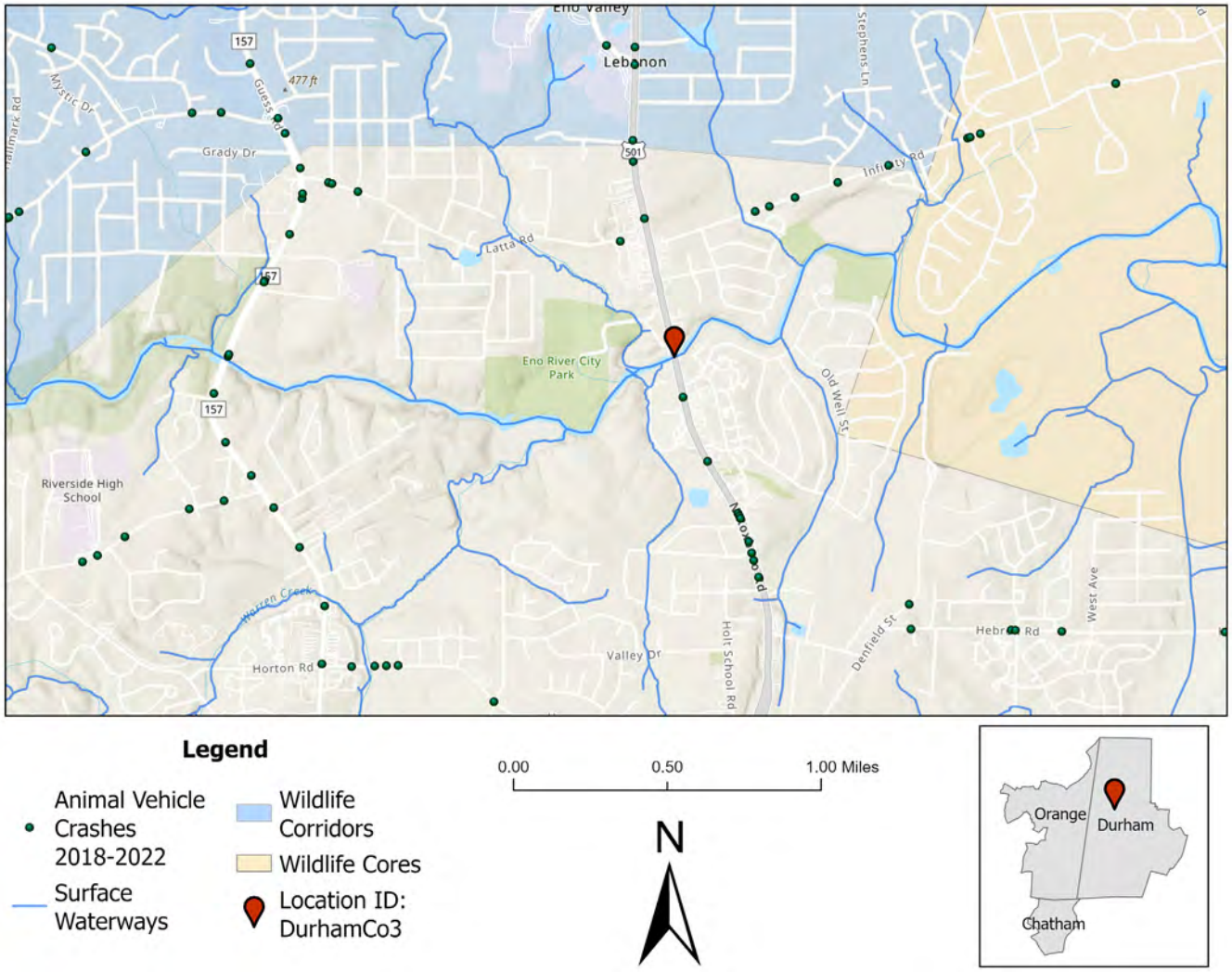
$637,000
Reported WVCs cost estimate

30,000
Annual average daily traffic (2021)

Adjacent managed natural land

Preferred Scenario

Evaluate and permanently repair deep erosion of banks due to stormwater flows coming from the roadway embankments and daylighting downstream of the bridge.



Durham County

Guess Road over Eno River

Summary and Problem Statement

Guess Road (NC 157) over the Eno River has been identified as a priority wildlife crossing. This crossing resides just outside of the boundaries of both a wildlife corridor and core identified by the Wildlands Network, making this site an important travel connection to both. The 5-lane single-span bridge is divided by a median, with two lanes moving southbound, and three lanes moving northbound. There have been 34 WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and garners 20,500 vehicles per day (2021 AADT).

This site is adjacent to natural managed lands. The City of Durham maintains West Point Park, which runs along the eastern side of crossing. The NC DNCR, Division of Parks and Recreation maintains Eno River State Park along the western side of the crossings and the Mountains-to-Sea Trail. The US Fish and Wildlife Service has identified the site as a critical habitat for the Atlantic Pigtoe, Neuse River Waterdog, and Carolina Madtom.

Barriers to wildlife travel under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The substrate is a continuous rocky bottom throughout with large stones and some exposed bedrock. A low-profile concrete weir exists under the bridge perpendicular to the river water flow which may be a remnant from a former abutment. Large riprap covers the slope on both sides, beginning at the river's edge. Both riprap slopes have a shelf that could be remediated for wildlife passage. The south side has a 5-foot wide dry passage near the top of slope but it would be difficult for wildlife to negotiate. The north side has a 50-foot-wide dry passage for the Mountains-to-Sea Trail. All entryways to the bridge appear to be clear of obstructions including any dense vegetation. Wildlife passage is not possible on the south side due to the placement of exposed, oversize riprap. Riprap on existing shelves could be relocated or removed to expose a natural surface, or it could be left in place and the voids filled with fine aggregate and alluvial materials to create a natural surface.

East side of Guess Road bridge over Eno River. Pete Schubert.

West side of Guess Road bridge over Eno River. Pete Schubert.

Aerial photograph of Guess Road bridge over Eno River. Nearmap.

Site Facts

Location ID	DurhamCo4
Date of Site Visit	June 13, 2024
Jurisdiction	Durham County
Coordinates	36°04'18.7"N 78°56'04.8"W
NCDOT Crossing/Structure Code	310050
Existing Structure Type	Bridge
Property Owner Type	Public, private
Existing Plan Alignment	CTP Pedestrian: Guess Rd (Bicycle Lane) CTP Highway: NC 157 (Guess Rd)
Managed and Natural Lands	City of Durham, NC DNCR Division of Parks and Recreation, US Fish and Wildlife Service
Average Annual Daily Traffic (AADT) (2019)	22,500
Average Annual Daily Traffic (AADT) (2021)	20,500
Projected Average Weekday Traffic (AWDT)	31,230
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 33 ($825,000) Type B injury crash: 1 ($187,000) **Total crashes and cost estimate: 34 ($1,012,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 280.5 ($7,012,500) Type B injury crash: 8.5 ($1,589,500) **Total crashes and cost estimate: 289 ($8,602,000)**

34
Reported WVCs within 1-mile buffer (2018-2022)

$1,012,000
Reported WVCs cost estimate

20,500
Annual average daily traffic (2021)

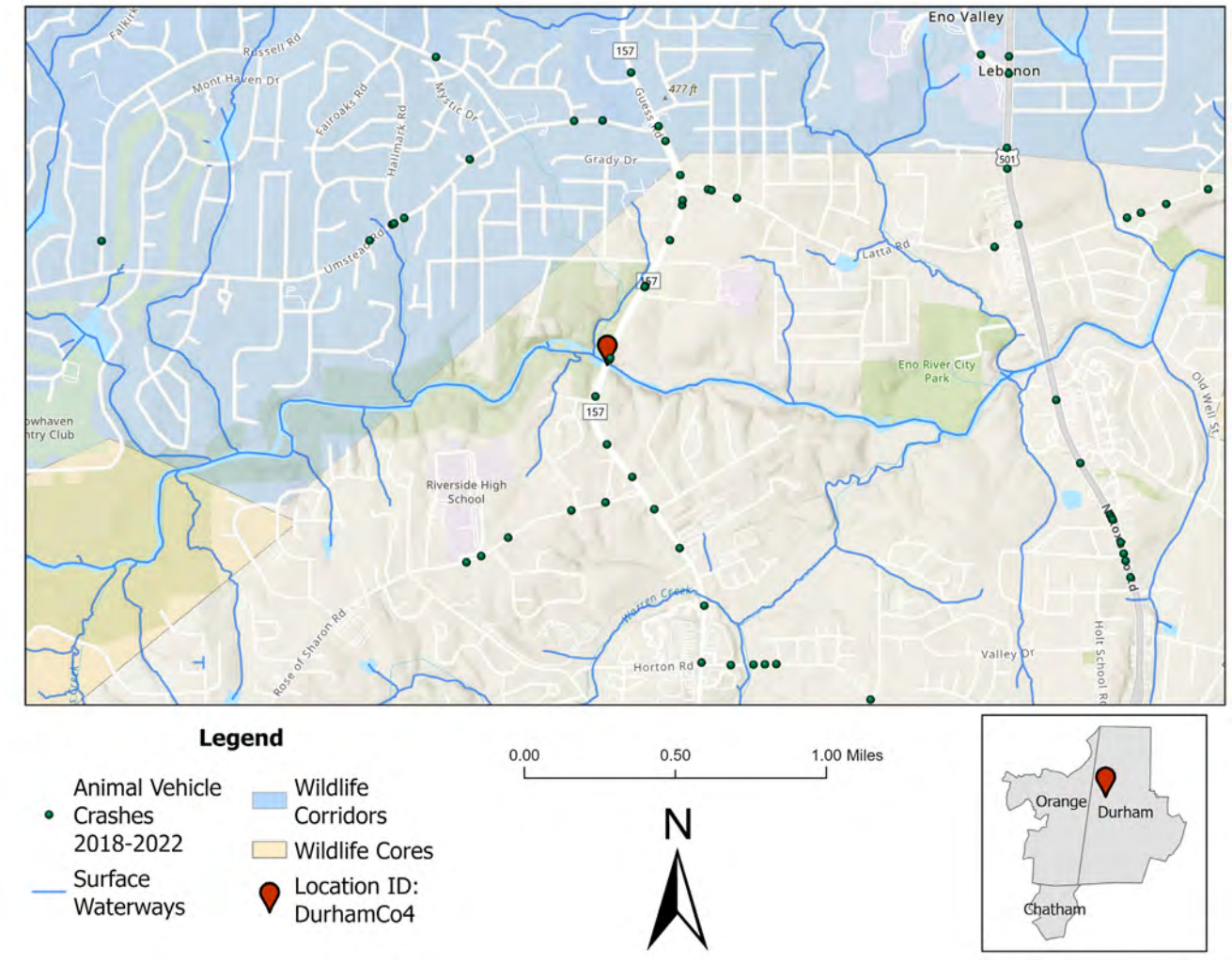
Adjacent managed natural land

Preferred Scenario

Remove some of the large riprap slope protection from existing shelves under the bridge on both sides (including entryways) to allow wildlife passage on natural surfaces.

Alternate Scenario

Use small stones to choke/fill the voids within the shelf portions of the existing riprap slope to allow for a 12-foot-wide passage on both slopes. Continue shelves for about 30 feet beyond the underside of bridge to allow for adequate approaches for wildlife.



Durham County

Old Oxford Road over Eno River

Summary and Problem Statement

Old Oxford Road over the Eno River has been identified as a priority wildlife crossing. This crossing resides within a wildlife core identified by the Wildlands Network, and five WVCs have been reported within a one-mile buffer of this site. The bridge is a 2-lane undivided with no bicycle and pedestrian facilities. This site has a posted speed limit of 45 mph, and garners 7,700 vehicles per day (2021 AADT).

This site is adjacent to several managed and natural lands. The US Army Corps of Engineers maintains Falls Lake managed area on both sides of the roadway and crossing. The NCWRC maintains Butner-Falls of Neuse Game Land on the eastern side of the crossing. The Catsburg Registered Heritage area (NHNA) covers 100 areas to the southwest side of the crossing, which is maintained by NC DNCR Natural Heritage Program, NC Department of Agriculture Plan Conservation Program, and the US Army Corps of Engineers. The US Fish and Wildlife Service has identified the site as a critical habitat for the Neuse River Waterdog, Carolina Madtom, and Green Floater. The NC DNCR Natural Heritage Program maintains the Penny's Bend/Eno River Bluffs Registered Heritage Area (NHNA) on the western side of crossing following the bank of the Eno River.

Barriers to wildlife travel within this core and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. Above the river there are steep slopes with little to no riprap. The north slope contains many stranded debris at a high bench with about 12 feet of clearance. The bench is impassible due to the debris, and the highest portion has some riprap. There is a narrow semi-dry passage (4-5 feet wide) along the river edge with some gravel substrate. The south slope above the abutment wall is dry natural substrate with concrete on portions of the upper slope. There is approximately 8-10 feet of dry upper passage. At the bottom of the slope there is 5-6 feet of semi-dry passage with 7 feet of clearance.

Old Oxford Road bridge over Eno River looking South. Pete Schubert.

Old Oxford Road bridge over Eno River looking North. Pete Schubert.

Aerial photograph of Old Oxford Road bridge over Eno River. Nearmap.

Site Facts

Location ID	DurhamCo5
Date of Site Visit	June 13, 2024
Jurisdiction	Durham County
Coordinates	36°04'21.5"N 78°51'45.9"W
NCDOT Crossing/Structure Code	310024
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	CTP Highway: Old Oxford Rd CTP Bicycle: Roxboro to US 70 CTP Pedestrian: Old Oxford Hwy
Managed and Natural Lands	US Army Corps of Engineers, NCWRC, NC DNCR Natural Heritage Program, NC Department of Agriculture Plan Conservation program, US Fish and Wildlife Service
Average Annual Daily Traffic (AADT) (2019)	6,600
Average Annual Daily Traffic (AADT) (2021)	7,700
Projected Average Weekday Traffic (AWDT)	8,971
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 4 ($100,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 5 ($207,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 34 ($850,000) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 42.5 ($1,759,500)**

5
Reported WVCs within 1-mile buffer (2018-2022)

$207,000
Reported WVCs cost estimate

45
mph speed limit

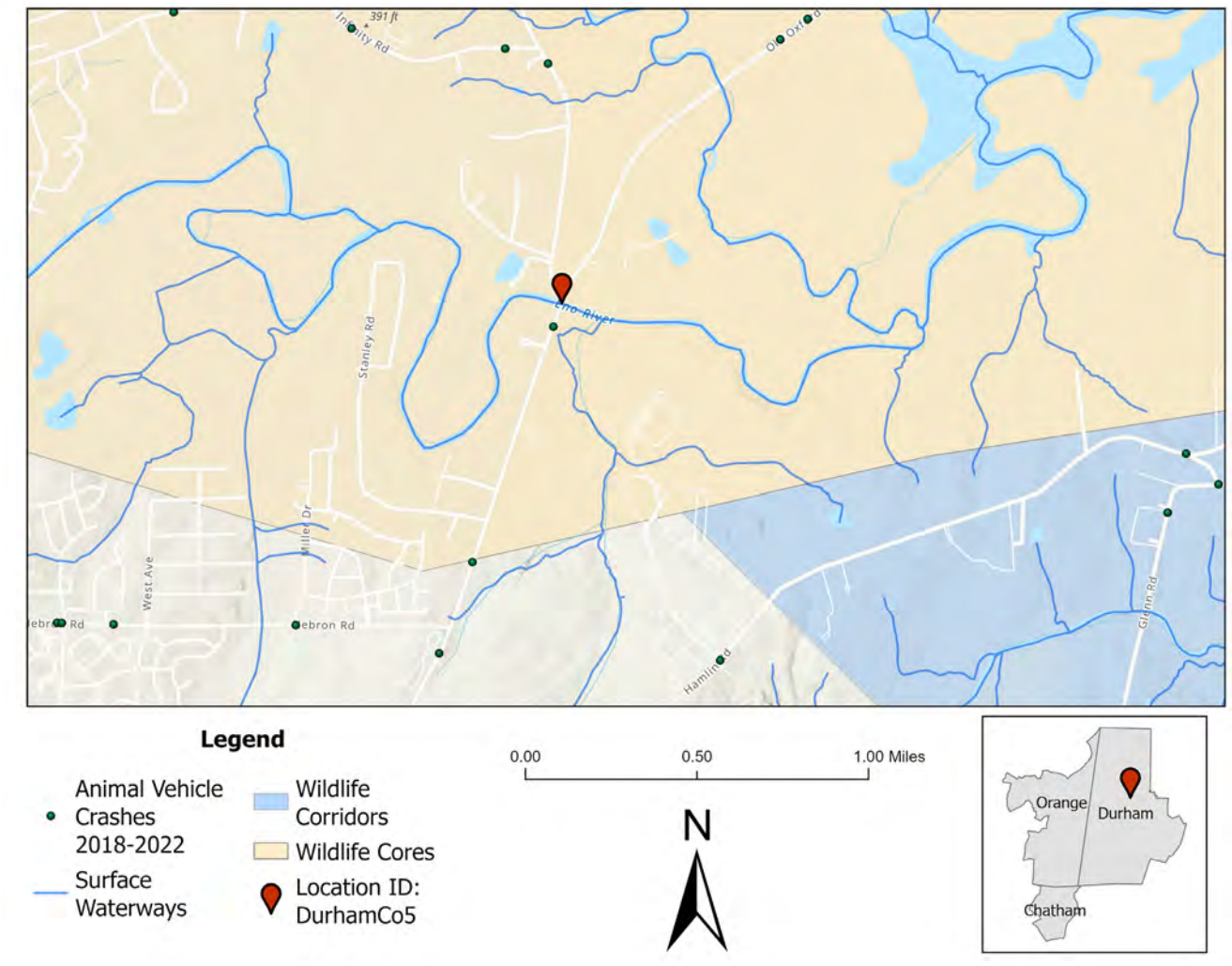
Adjacent managed natural land

Preferred Scenario

Replace the bridge and lengthen the span from the current hourglass-shaped causeway (and incised riverbank) that creates a choke point for wildlife (and fishers) and catches debris both at water's edge and up the slope.

Alternate Scenario

Remove considerable large debris from the upper northern side slope and lower southern slope to enable wildlife passage, which is currently impassible.



Durham County

NC 54 over New Hope Creek

Summary and Problem Statement

NC 54 at New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and twenty-one WVCs have been reported within a one-mile buffer of this site. This crossing recommendation encompasses two separate structures along NC 54 that are 0.25 miles apart: a culvert to the west, and a bridge to the east. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and garners 13,500 vehicles per day (2021 AADT).

This site is adjacent to several managed and natural lands. The U.S. Army Corps of Engineers manages land as part of the B. Everret Jordan Lake and Dam managed area. The U.S. Army Corps of Engineers, NC DNCR, and the Natural Heritage Program manages land as part of the Lower New Hope Creek Floodplain Forest and Slopes Registered Heritage Area- managed area covering 1,601.41 acres to the south of the crossing sites (registered heritage area). The U.S. Army Corps of Engineers, NC DNCR, and the Natural Heritage Program also manages land as part of the New Hope Creek Bottomland Forest Registered Heritage Area-managed area covering 739.85 acres to the North of the crossing sites (registered heritage area).

Barriers to wildlife travel along this corridor and under the bridge and through the culvert exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. While the bridge span does have dry passage on both sides of the channel, it does not during flood stage. Though the overhead clearance is marginal at present, it may be possible to install stepped natural soil benches against each abutment slope to provide some high-water access. Additional dry culverts (with natural soil bottoms at adjacent floodplain level with at least one bay stepped up) should be considered on both the bridge structure, and the 4-bay box culvert.

Approximately 500 feet upstream of NC 54 in the New Hope Creek floodplain is the New Hope Waterfowl Impoundment, which consists of two low (5-foot rise) earthen causeway/embankments (roughly 1,950 feet west and 250 feet east), connected by a 490-foot flat topped concrete spillway and a 2-bay stoplog control structure across the creek channel. Immediately downstream and parallel to the spillway and outlet structure is a 490-foot by 130-foot open water stilling basin, which provides a significant barrier to wildlife passage along the creek up and downstream, forcing movement away from the banks to cross the sub-impoundment structures, and then to return to the narrowed banks approaching the NC 54 bridge and causeway. Additionally, when seasonally impounded (fall/early winter), terrestrial wildlife passage is forced to the far edges of the inundated floodplain. Though the grassed, low slope sub-impoundment embankments are not significant barriers, the NC 54 embankment and motor vehicle traffic is. Additional dry culverts should be added to NC 54 at the causeway ends to allow for dry passage of wildlife when the impoundments above and/or below NC 54 are flooded.

Aerial photograph of NC 54 culvert (west) and bridge (east) over New Hope Creek. Nearmap.

NC 54 culvert over New Hope Creek. Pete Schubert.

Site Facts

Location ID	DurhamCo6 (Bridge) DurhamCo7 (Culvert)
Date of Site Visit	April 19, 2024
Jurisdiction	City of Durham
Coordinates	Bridge: 35°55'00.4"N 78°58'13.6"W Culvert: 35°54'56.8"N 78°58'28.5"W
NCDOT Crossing/Structure Code	Bridge: 310041 Culvert: 310013
Existing Structure Type	Bridge, culvert
Property Owner Type	Public
Existing Plan Alignment	2050 MTP: U-5774G CTP Highway: NC 54 CTP Bicycle & Pedestrian: W Hwy 54 CTP Bicycle & Pedestrian: Durham-Chapel Hill Greenway
Managed and Natural Lands	US Army Corps of Engineers, NC DNCR, Natural Heritage Program
Average Annual Daily Traffic (AADT) (2019)	16,500
Average Annual Daily Traffic (AADT) (2021)	13,500
Projected Average Weekday Traffic (AWDT)	27,742
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 20 ($500,000) Total C injury crash: 1 ($107,000) **Total Crashes and cost estimate: 21 ($607,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 170 ($4,250,000) Total C injury crash: 8.5 ($909,500) **Total Crashes and cost estimate: 178.5 ($5,159,000)**

21
Reported WVCs within 1-mile buffer (2018-2022)

$607,000
Reported WVCs cost estimate

13,500
Annual average daily traffic (2021)

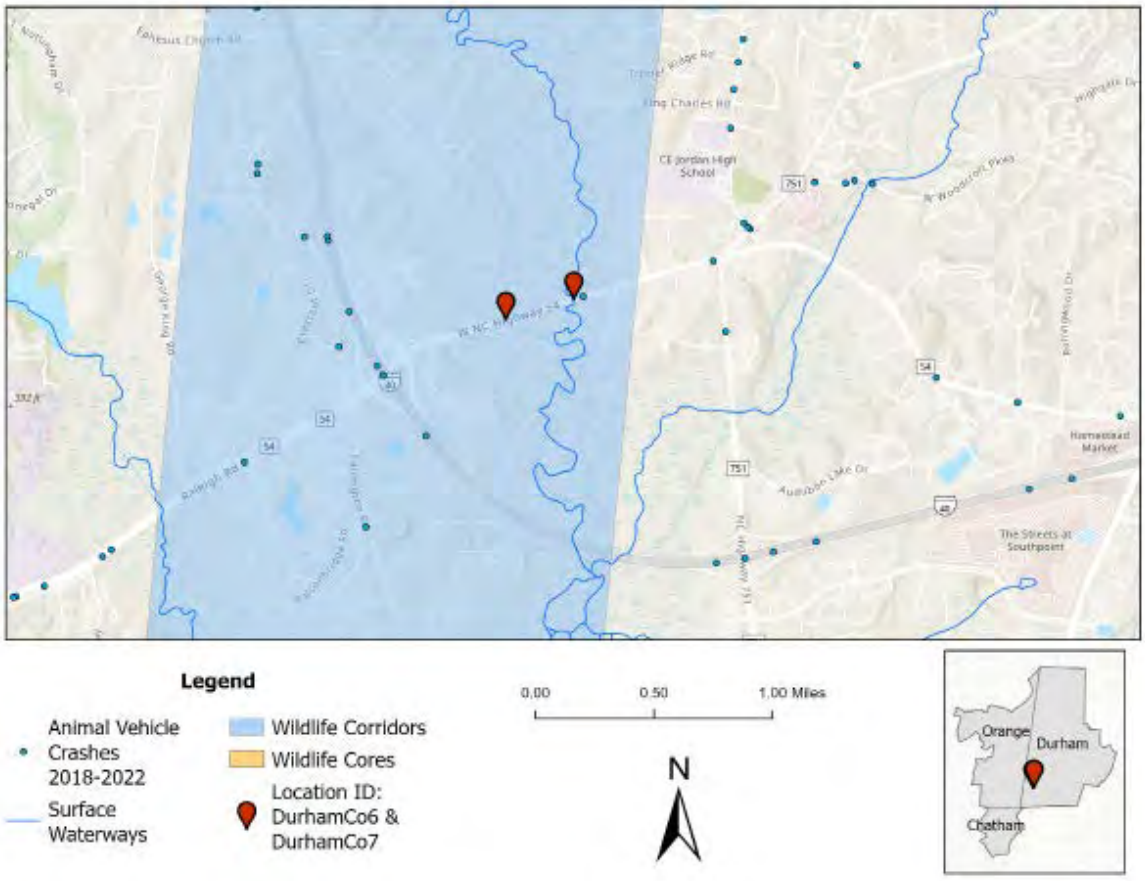
Adjacent managed natural land

Preferred Scenario

Replace the bridge with a longer and higher span to allow for the construction of dry wildlife passages above the floodplain on both sides of the creek, with at least 8 feet of vertical clearance beneath the new structure. Elsewhere along the raised and widened NC 54 causeway, construct at least two multi-bay box culverts away from the active or any abandoned channels, to provide dry passage for wildlife within the wide New Hope Creek floodplain, aligned due south (downstream) of the ends of the upstream wildlife sub-impoundment structure (spillway and control structure including stilling basin). One of the bays should be floored above the floodplain elevation to provide dry passage during flood events. Similarly, replace the existing 4-bay box culvert with a single span bridge of sufficient length and height to provide dry passage for wildlife on both sides of the high-water channel.

Alternate Scenario

Raise a section of the banks under the bridge against the abutment slopes on both sides of the creek to provide a high-water dry wildlife passage.



Durham County

I-40 Bridge over New Hope Creek

Summary and Problem Statement

The I-40 bridge over New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, has been identified by Wildlands Network as a priority wildlife crossing site, and thirteen WVCs have been reported within a one-mile buffer of this site. This crossing recommendation encompasses two separate bridge structures along I-40, both with three lanes in each direction – making this a six-lane transportation facility. This site has no bicycle and pedestrian facilities, has a posted speed limit of 65 mph, and garners 124,000 vehicles per day (2019 AADT).

This site is adjacent to several managed and natural lands. The U.S. Army Corps of Engineers manages land as part of the B. Everret Jordan Lake and Dam managed area. The U.S. Army Corps of Engineers, NC DNCR, and the Natural Heritage Program manages land as part of the Lower New Hope Creek Floodplain Forest and Slopes Registered Heritage Area- managed area covering 1601.41 acres to the south of the crossing sites (registered heritage area).

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The barriers include riprap placement, a sub impoundment structure (stoplog control structure and concrete spillway), standing water in the downstream stilling basis, fencing, tributary stream crossing, and noise. Riprap covers the area under the bridge on the west side of the stream, on the steep slopes up to and down from the access road, and the sub impoundment structure on both southeast and southwest sides of bridge. On the southwest side of the bridge, fencing extends from bridge to the width of the ROW (at top of steep riprap slope). On the southeast side of the bridge, fencing extends from bridge to the width of the ROW (perpendicular to end of concrete spillway structure) and then turns parallel to the interstate highway. The steep slopes of the sub impoundment spillway structure eliminate any sightlines wildlife may use.

On the northeast side of bridge, Third Fork Creek flows into New Hope Creek. The Third Fork Creek channel extends parallel to the road about twice the bridge's length and then turns north. The channel appears to be engineered, and there is riprap along portions of the banks. At the confluence with New Hope Creek, there is currently a sediment (sand/silt) bar across the tributary (likely shifting or impermanent). As a result of all the above, there are significant "pathway" barriers for wildlife to move between habitat on the north and south sides of the bridge. The noise generated by vehicular travel on the bridge is exceptionally loud and can be an audible wildlife deterrent.

Aerial photograph of I-40 bridge over New Hope Creek. Nearmap.

Under I 40 bridge facing east over New Hope Creek. Pete Schubert.

Site Facts

Location ID	DurhamCo8 DurhamCo9
Date of Site Visit	April 19, 2024
Jurisdiction	City of Durham
Coordinates	35°54'16.5"N 78°58'13.1"W
NCDOT Crossing/Structure Code	DurhamCo8: 310304 DurhamCo9: 310303
Existing Structure Type	Bridge (2 seperate structures)
Property Owner Type	Public
Existing Plan Alignment	2024-2033 STIP: I-5993 2050 MTP: I-6006 CTP Highway: I-40 CTP Bicycle & Pedestrian: I-40 Multiuse Path
Managed and Natural Lands	US Army Corps of Engineers, NC DNCR, Natural Heritage Program
Average Annual Daily Traffic (AADT) (2019)	124,000
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	Eastbound bridge: 81,571 Westbound bridge: 82,638
Speed Limit	65 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 12 ($300,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 13 ($407,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 102 ($2,550,000) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 110.5 ($3,459,500)**

13
Reported WVCs within 1-mile buffer (2018-2022)

$407,000
Reported WVCs cost estimate

124,000
Annual average daily traffic (2019)

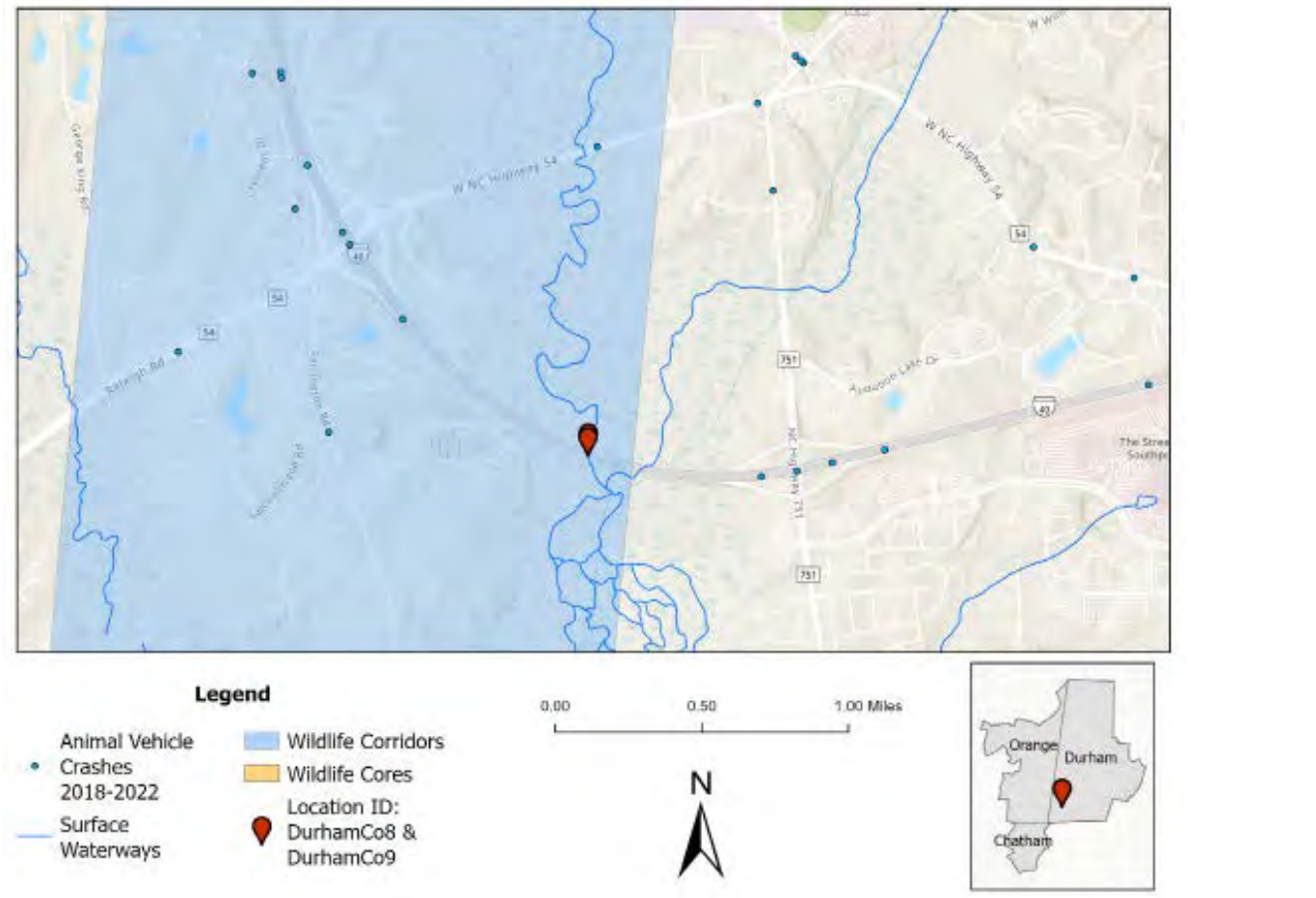
Adjacent managed natural land

Preferred Scenario

Fill the voids in the exposed riprap surfaces under the bridge spans with fine aggregate stone or alluvial fill to provide a continuous dry wildlife passage on the west side. Raise the elevation of the ground surface in the easternmost bay with appropriate material to provide a dry wildlife passage above the floodplain surface. Consult with NCWRC to explore the removal of the sub impoundment structures and significant barrier to wildlife access across the ROW with the New Hope Creek floodplain and stream under the I-40 spans.

Alternate Scenario

Fill the voids in the exposed riprap surfaces under the bridge spans with fine aggregate stone or alluvial fill to provide a continuous dry wildlife passage on the west side. Raise the elevation of the ground surface in the easternmost bay with appropriate material to provide a dry wildlife passage above the floodplain surface.



Durham County

Stagecoach Road over New Hope Creek

Summary and Problem Statement

Stagecoach Road over New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and seven WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and garners 8,300 vehicles per day (2021 AADT).

This site is adjacent to several managed and natural lands. The U.S. Army Corps of Engineers manages land as part of the B. Everret Jordan Lake and Dam managed area. The U.S. Army Corps of Engineers, NC DNCR, and the Natural Heritage Program manages land as part of the Lower New Hope Creek Floodplain Forest and Slopes Registered Heritage Area- managed area covering 1,601.41 acres on both sides of the crossing area (registered heritage area).

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. While the bridge span does have dry passage on both sides of the channel, the exposed riprap is an obstacle that could be alleviated by using small stone fill the voids and create a natural surface. Even with this surface improvement, there is no dry passage during flood stage. Though the overhead clearance of the bridge is marginal at present, it may be possible to install stepped natural soil benches against each abutment slope to provide some high-water access. Additional dry culverts (with natural soil bottoms at adjacent floodplain level with at least one bay stepped up) should be added if Stagecoach Road is widened in the future.

Approximately 270 feet upstream of Stagecoach Road in the New Hope Creek floodplain is the NCWRC's "Stagecoach Road Waterfowl Impoundment", which consists of two low (5-foot rise) earthen causeway/embankments (roughly 830 feet West and 500 feet East), connected by a 590-foot flat-topped concrete spillway and a 2-bay stoplog control structure across the creek channel. Immediately downstream and parallel to the spillway and outlet structure is a 620-foot by 150-foot open water stilling basin, which provides a significant barrier to wildlife passage along the creek up and downstream, forcing movement away from the banks to cross the sub impoundment structures, and then to return to the narrowed banks approaching the Stagecoach Road bridge and causeway. Additionally, when seasonally impounded (fall/early winter), terrestrial wildlife passage is forced to the far edges of the inundated floodplain. Though the grassed, low slope sub impoundment embankments are not significant barriers, the Stagecoach Road embankment and vehicle traffic is. Additional dry culverts should be added to Stagecoach Road at the causeway ends to allow for dry passage of wildlife when the impoundments above and/or below Stagecoach Road (including when Jordan lake rises) are flooded.

Aerial photograph of Stagecoach Road bridge over New Hope Creek. Nearmap.

South side of Stagecoach Road bridge facing North over New Hope Creek. Pete Schubert.

Site Facts

Location ID	DurhamCo10
Date of Site Visit	April 19, 2024
Jurisdiction	Durham County
Coordinates	35°53'05.7"N 78°57'56.3"W
NCDOT Crossing/Structure Code	310111
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	CTP Pedestrian: Stagecoach Rd
Managed and Natural Lands	US Army Corps of Engineers, NC DNCR Natural Heritage Program
Average Annual Daily Traffic (AADT) (2019)	9,700
Average Annual Daily Traffic (AADT) (2021)	8,300
Projected Average Weekday Traffic (AWDT)	18,958
Speed Limit	45
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 7 ($175,000) **Total crashes and cost estimate: 7 ($175,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 59.5 ($1,487,500) **Total crashes and cost estimate: 59.5 ($1,487,500)**

7
Reported WVCs within 1-mile buffer (2018-2022)

$175,000
Reported WVCs cost estimate

8,300
Annual average daily traffic (2021)

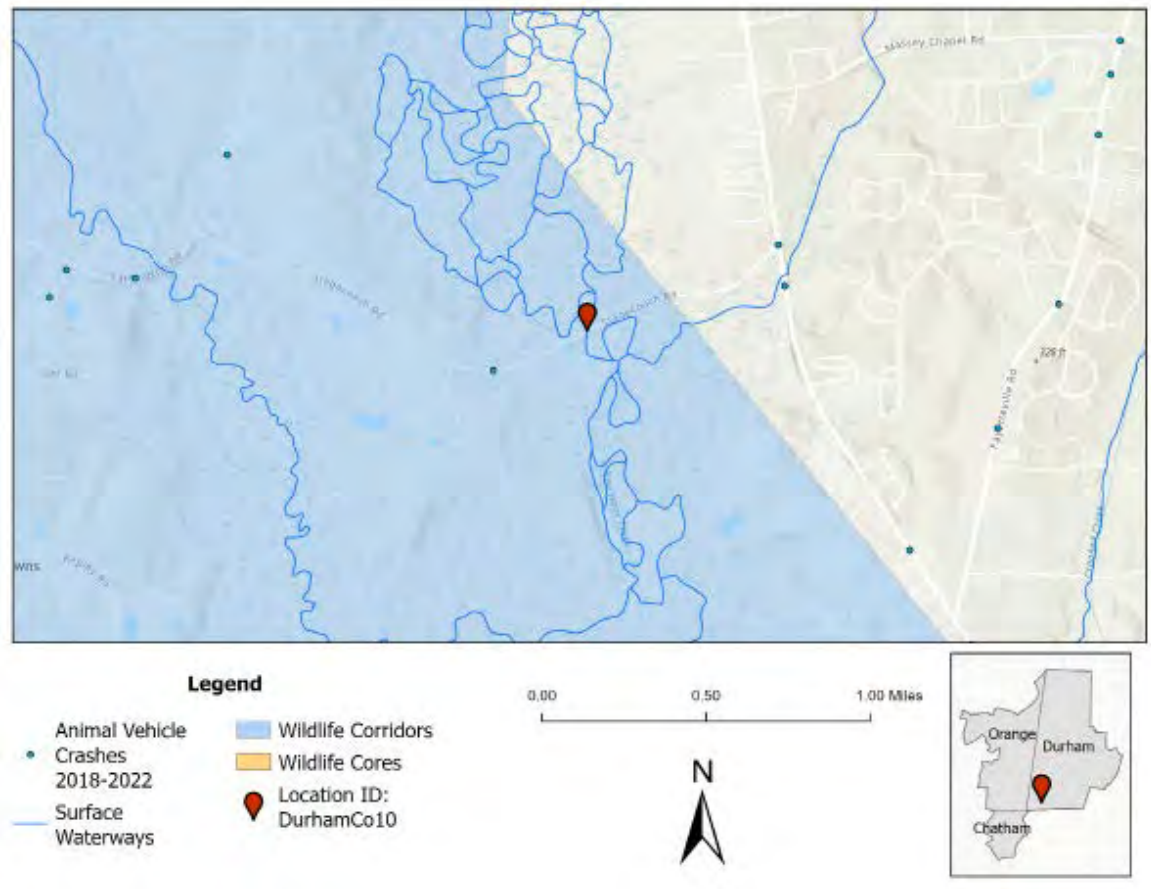
Adjacent managed natural land

Preferred Scenario

Raise the approaches of the bridge and causeway to a minimum of 8 feet vertical clearance for wildlife along dry passages on both sides of the creek. Install two supplementary minimum 2-bay box culverts at points along the causeway downstream of the ends of the upstream wildlife sub impoundment structure (spillway, outlet/control bays, and stilling basin), to allow for dry passage of wildlife within the New Hope Creek floodplain away from the creek banks. All culvert bays shall have natural surface bottoms and at least 8 feet of vertical clearance, with one bay floored above the floodplain to enhance dry passage during flooding events.

Alternate Scenario

Use fine aggregate to fill the voids among the exposed riprap under the existing bridge span to provide natural surface dry passage for wildlife. Build up the elevation of the dry passage nearer the abutments to provide dry passage during flooding events. Install additional, supplementary dry passage culverts to allow for dry passage of wildlife within the New Hope Creek floodplain away from



Durham County

Old Chapel Hill Road over New Hope Creek

Summary and Problem Statement

The bridge at Old Chapel Hill Road at New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and there have been fourteen reported wildlife-vehicle crashes within a one-mile buffer in this identified wildlife corridor. This site is adjacent to managed lands by the NC DNCR Natural Heritage Program, and U.S. Army Corps of Engineers, which is part of the New Hope Creek Bottomland Forest Registered Heritage Area covering 739.85 acres on both sides of the crossing. The crossing site on Old Chapel Hill Road (SR 2220) has bicycle and pedestrian facilities, has a posted speed limit of 40 mph, and garners 13,500 vehicles per day (2021 AADT). This wildlife crossing site is positioned along TIP project EB-4707B: "Old Chapel Hill (SR 2220) Old Durham Rd (SR 1838)", which added bicycle and pedestrian facilities and was completed on July 3, 2019. Wildlife crossing countermeasures were not incorporated as part of this completed project.

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. A significant obstacle to safe wildlife passage under the existing structure is the lack of bare ground between the riprap slope protection and the creek channel. While the lower portions of the riprap have trapped some interstitial sediment, there are many voids and a very uneven surface that would prevent smaller wildlife from crossing.

South side of Old Chapel Hill Road bridge over New Hope Creek looking north. DCHC MPO.

North side of Old Chapel Hill Road bridge over New Hope Creek looking south. DCHC MPO.

Aerial photograph of Old Chapel Hill Road bridge over New Hope Creek. Nearmap.

Site Facts

Location ID	DurhamCo11
Date of Site Visit	March 15, 2024
Jurisdiction	Durham County
Coordinates	35°56'34.3"N 78°58'32.6"W
NCDOT Crossing/Structure Code	310215
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	STIP # EB-4707B (completed July 3, 2019) CTP Highway: Old Chapel Hill Rd. CTP Pedestrian: Old Chapel Hill Rd CTP Multiuse Paths: Old Chapel Hill A1
Managed and Natural Lands	NC DNCR, Natural Heritage Program. New Hope Creek Bottomland Forest Registered Heritage Area
Average Annual Daily Traffic (AADT) (2019)	15,000
Average Annual Daily Traffic (AADT) (2021)	13,500
Projected Average Weekday Traffic (AWDT)	20,937
Speed Limit	40
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 13 ($325,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 14 ($432,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 110.5 ($2,762,500) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 119 ($3,672,000)**

14
Reported WVCs within 1-mile buffer (2018-2022)

$432,000
Reported WVCs cost estimate

13,500
Annual average daily traffic (2021)

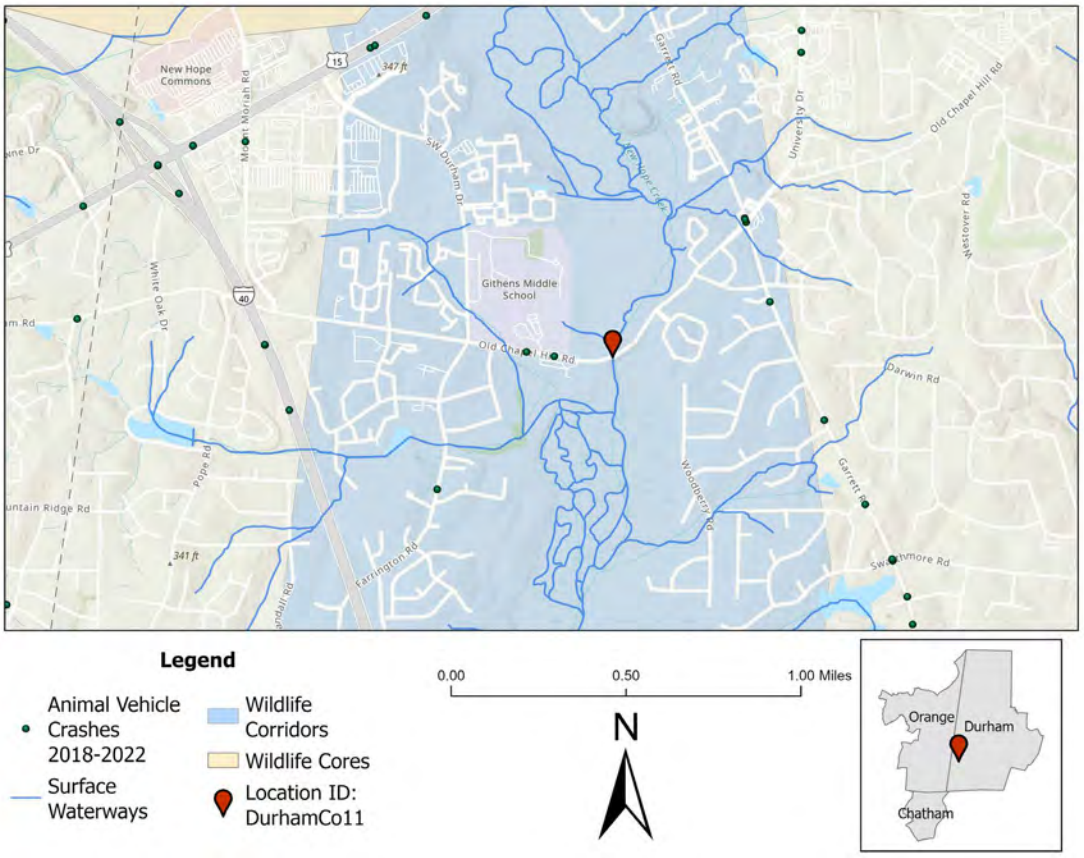
Adjacent managed natural land

Preferred Scenario

The preferred recommendation of this site includes lengthening the bridge span and removing approach embankment fills to leave room for continuous floodplain on both sides under the bridge; create benching into the riprap to provide a terrace parallel to the bank (on each side), which would then be choked and filled with gravel and rock fines; to suspend or otherwise support a shelf from the deck that wildlife could use; and then install quality fencing on both sides of the bridge to guide wildlife under the structure and off of the road. However, this crossing aligns with a TIP project (EB-4707B) completed in July 2019 – therefore, a new bridge (while preferred) may be unlikely.

Alternate Scenario

Remove considerable large debris from the upper northern side slope and lower southern slope to conduct a riprap remediation to reposition existing riprap to create a wildlife bench on both sides of the creek. Once the benches are built, install fencing of sufficient length on both sides of the bridge to guide wildlife under the structure and off the road.



Durham County

Farrington Road over Little Creek

Summary and Problem Statement

Farrington Road over Little Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and seven (7) WVCs have been reported within a one-mile buffer of this site. The single-span bridge is a 2-lane undivided with no bicycle and pedestrian facilities. This site has a posted speed limit of 45 mph and garners 13,000 vehicles per day (2021 AADT). The NCDOT is currently conducting environmental, planning, and design studies to support the future replacement of this bridge (Bridge Replacement: BP5-R117), which presents a timely opportunity to help inform this project. The current let date is October 2030.

This site is adjacent to natural managed lands. The US Army Corps of Engineers maintains the B. Everret Jordan Lake and Dam managed area. The NC DNCR Natural Heritage Program maintains Little Creek Bottomlands and Slopes Registered Heritage Area, which covers 1,088.6 acres on the south side of crossing and 160 ft north of the crossing in the Jordan Lake Managed area.

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. Barriers include standing water, riprap placement, and the upstream sub impoundment spillway, outlet structure, and earth embankments with steep riprapped slopes. There are areas of permanent flooding upstream and downstream of the crossing – the upstream flooding is due to the sub impoundment structure and was created to support waterfowl habitat for hunting. The cause of the downstream flooding is likely to be the result of backwater from Jordan reservoir, perhaps amplified by downstream beaver damming in the extensive floodplain. An earthen causeway extends from the ends of the spillway structure. Riprap slopes extend down the road causeway at the corners of the spillway structure and along the causeway slopes. There are also riprap slopes leading to the corners of the underpass opening, blocking the approach to the underpass. The riprap slopes wrap entirely around the causeway. All riprap slope protection so described and observed extends into standing water. Dense vegetation may block visibility of approach to the underpass area for wildlife. Wildlife has no path from floodplain to or through the underpass.

On the west side of the underpass, there exists a natural earth area above the riprap slope protection, approximately 12 feet wide and 7 feet high, that could function for wildlife passage, however, because it is entirely above the riprap and there is no path down the riprap to the floodplain habitat either upstream or downstream, it is not connected. Similarly, on the east side of the underpass, the potential dry area passage is about 12 to 15 feet wide and 7 to 8 feet high, but it is inaccessible to the up and downstream habitat by the continuous riprap slope protection on both the roadway embankment/ causeway and the sub impoundment spillway and embankment. There is a 4 to 6 foot bench in the surface of the riprap near both outer bents, which could be connected to adjacent habitat if the benching was continued to the limits of the riprap and the voids were filled with small stone to provide a natural surface.

Aerial photograph of Farrington Road bridge over Little Creek. Nearmap.

Site Facts

Location ID	DurhamCo12
Date of Site Visit	June 13, 2024
Jurisdiction	Durham County
Coordinates	35°53'14.0"N 78°59'03.3"W
NCDOT Crossing/Structure Code	310110
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	Bridge Replacement: BP5-R117 CTP Multiuse Path: Farrington Rd CTP Pedestrian: Farrington Rd CTP Highway: Farrington Rd
Managed and Natural Lands	US Army Corps of Engineers, NC DNCR Natural Heritage Program, UNC Chapel Hill
Average Annual Daily Traffic (AADT) (2019)	14,500
Average Annual Daily Traffic (AADT) (2021)	13,000
Projected Average Weekday Traffic (AWDT)	20,177
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 7 ($175,000) **Total crashes and cost estimate: 7 ($175,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 59.5 ($1,487,000) **Total crashes and cost estimate: 59.5 ($1,487,000)**

7
Reported WVCs within 1-mile buffer (2018-2022)

$175,000
Reported WVCs cost estimate

Environmental, planning, and design studies underway for future bridge replacement

Adjacent managed natural land

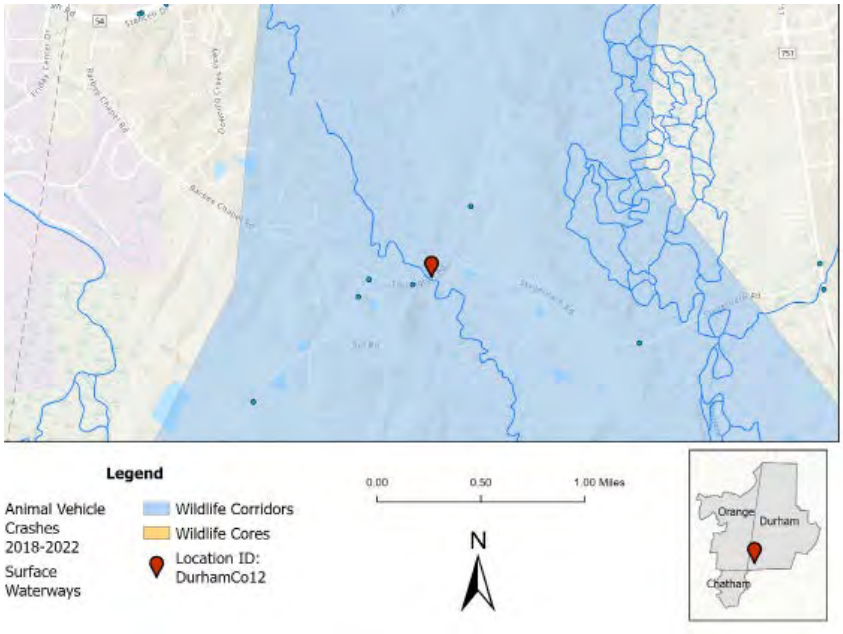
Preferred Scenario

Bench, choke (fill voids) with small stone, and flatten the slopes of riprap to tie the benches into adjacent habitat areas to provide natural surface wildlife pathways that cross under the bridge at the current top of the riprap slope protection. This must be done on both sides of the bridge and across the full length of the riprap until it can tie into undisturbed habitat up and down stream, including making natural surface connections across the grassed sub impoundment dikes.

Alternate Scenario

In addition to the preferred recommendation, or as an alternative wildlife pathway, install dry culverts that are at least 8 feet high and 12 feet wide under the road at the floodplain elevation, on both sides of the bridge area, so that wildlife can move from non-flooded habitat directly to and through an underpass into non-flooded habitat on the other side of the road. These underpasses would then allow wildlife to bypass the now impenetrable obstacles in place along the streambanks. Fencing to guide wildlife to these passages and away from the road and riprap would be necessary.

Consider changing (flattening) the artificially steep slopes of the road berm and earthen causeway to gentler slopes, which could be a (re-)design principle that might also improve/reduce structural needs for riprap slope protection and to prevent fill collapse. Consideration should also be given to the need for the upstream sub impoundment in light of back flooding from Jordan Reservoir. The elimination/deconstruction of the frequently flooded spillway stilling basin, outlet structure channel, and removal of the no longer needed concrete spillway and embankment riprap slope protection would simplify the scope of the preferred scenario for the bridge and road causeways. Though the sub impoundment provides for seasonal waterfowl management upstream, it is a continuous wildlife passage impediment for all terrestrial species in the bottomlands.



Section 3.3

ORANGE COUNTY RECOMMENDATIONS

The DCHC MPO is recommending thirteen (13) projects for Orange County as part of this plan. The list of projects can be found below in Table 3.3, and a map showing these sites are found in Figure 3.3: Map of complete list of wildlife crossing project recommendations in Orange County.

Project ID	Project Name	Jurisdiction
OrangeCo1	Pleasant Green Road over Eno River	Orange County
OrangeCo2	US 70 over Stony Creek	Orange County
OrangeCo3	I-85 over Stony Creek	Orange County
OrangeCo4	University Station Road over Stony Creek	Orange County
OrangeCo5	Old NC Highway 10 over Stony Creek	Orange County
OrangeCo6	Halls Mill Road over Eno River	Orange County
OrangeCo7	Jones Ferry Road over Neville Creek	Orange County
OrangeCo8	Neville Road over Phil's Creek	Orange County
OrangeCo9	NC 54 over Morgan Creek	Orange County
OrangeCo10	Damascus Church Road over Pritchard Mill Creek	Orange County
OrangeCo11	New Hope Church Road over New Hope Creek	Orange County
OrangeCo12	NC 86 over New Hope Creek	Orange County
OrangeCo13	I-40 Culvert over New Hope Creek	Orange County

Table 3.3: Complete list of wildlife crossing project recommendations in Orange County.

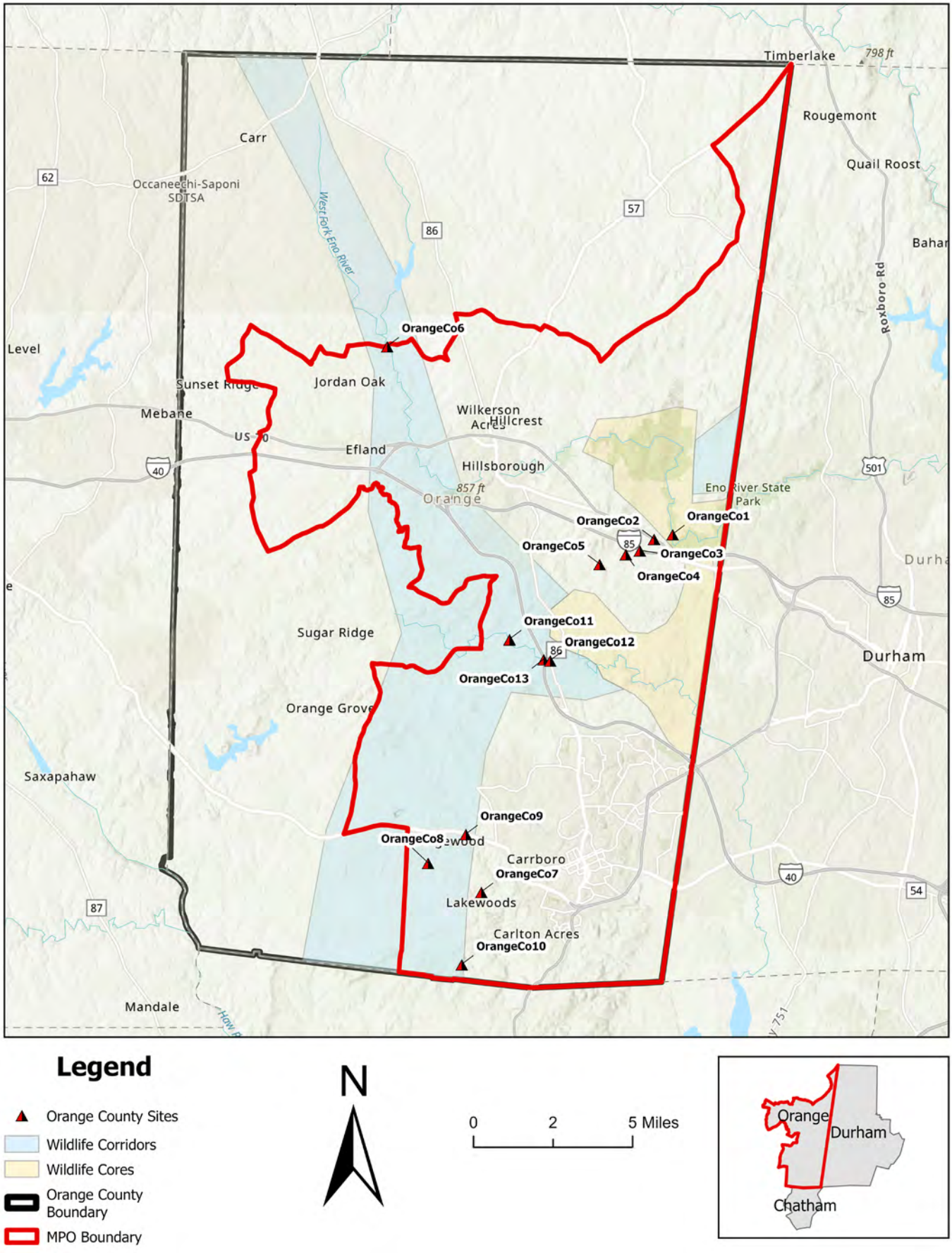


Figure 3.3: Map of complete list of wildlife crossing project recommendations in Orange County.

Orange County

Pleasant Green Road over Eno River

Summary and Problem Statement

Pleasant Green Road over the Eno River has been identified as a priority wildlife crossing. This crossing resides within a wildlife core identified by the Wildlands Network, and eleven WVCs have been reported within a one-mile buffer of this site. Additionally, the two-lane undivided bridge is expected to be replaced (Bridge Replacement: BP7-R007), with a current let date of September 5, 2030. This site has no bicycle and pedestrian facilities, has a speed limit of 45 mph, and garners 3,400 vehicles per day (2021 AADT).

This site is adjacent to several managed and natural lands. The NC Department of Natural & Cultural Resources Division of Parks & Recreation maintains the Eno River State Park along both sides of the road, the Mountains-to-Sea Trail (MST) is in the vicinity of the crossing site, and the Eno River Aquatic Habitat. The US Fish and Wildlife Service has also identified this site as a critical habitat for the Atlantic Pigtoe, Neuse River Waterdog, and Carolina Madtom.

Barriers to wildlife travel within this core and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. Current site conditions show that while the bench on the west side is serving as both wildlife passage and the MST alignment, the east side of the bridge is not conducive to wildlife movement due to the steep concrete slope and moderately steep natural surface embankment with no functional bench. Note that the master plan for continuation of the MST to the north (upstream) has the MST crossing the Eno River on or adjacent to the Pleasant Green Road bridge. As such, the new bridge must include enough new bend on the river's east side to accommodate wildlife passage and trail passage needed once the MST is open on the east side. The east side is presently used by fisherfolk to access bank fishing, which is likely to continue.

Pleasant Green Road bridge over Eno River facing East. DCHC MPO.

Pleasant Green Road bridge over Eno River looking southwest. DCHC MPO.

Aerial photograph of Pleasant Green Road bridge over Eno River. Nearmap.

Site Facts

Location ID	OrangeCo1
Date of Site Visit	April 12, 2024
Jurisdiction	Orange County
Coordinates	36°02'47.9"N 79°00'38.6"W
NCDOT Crossing/Structure Code	670063
Existing Structure Type	Bridge
Property Owner Type	Public, private
Existing Plan Alignment	Bridge Replacement: BP7-R007 CTP Pedestrian: Pleasant Green Rd CTP Highway: Pleasant Green Rd
Managed and Natural Lands	NC DNCR Division of Parks and Recreation, US Fish and Wildlife Service
Average Annual Daily Traffic (AADT) (2019)	4,100
Average Annual Daily Traffic (AADT) (2021)	3,400
Projected Average Weekday Traffic (AWDT)	4,767
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 23 ($575,000) Type C injury crash: 2 ($214,000) **Total crashes and cost estimate: 25 ($789,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 195.5 ($4,887,500) Type C injury crash: 17 ($1,819,000) **Total crashes and cost estimate: 212.5 ($6,706,500)**

25
Reported WVCs within 1-mile buffer (2018-2022)

$789,000
Reported WVCs cost estimate

Bridge replacement in progress

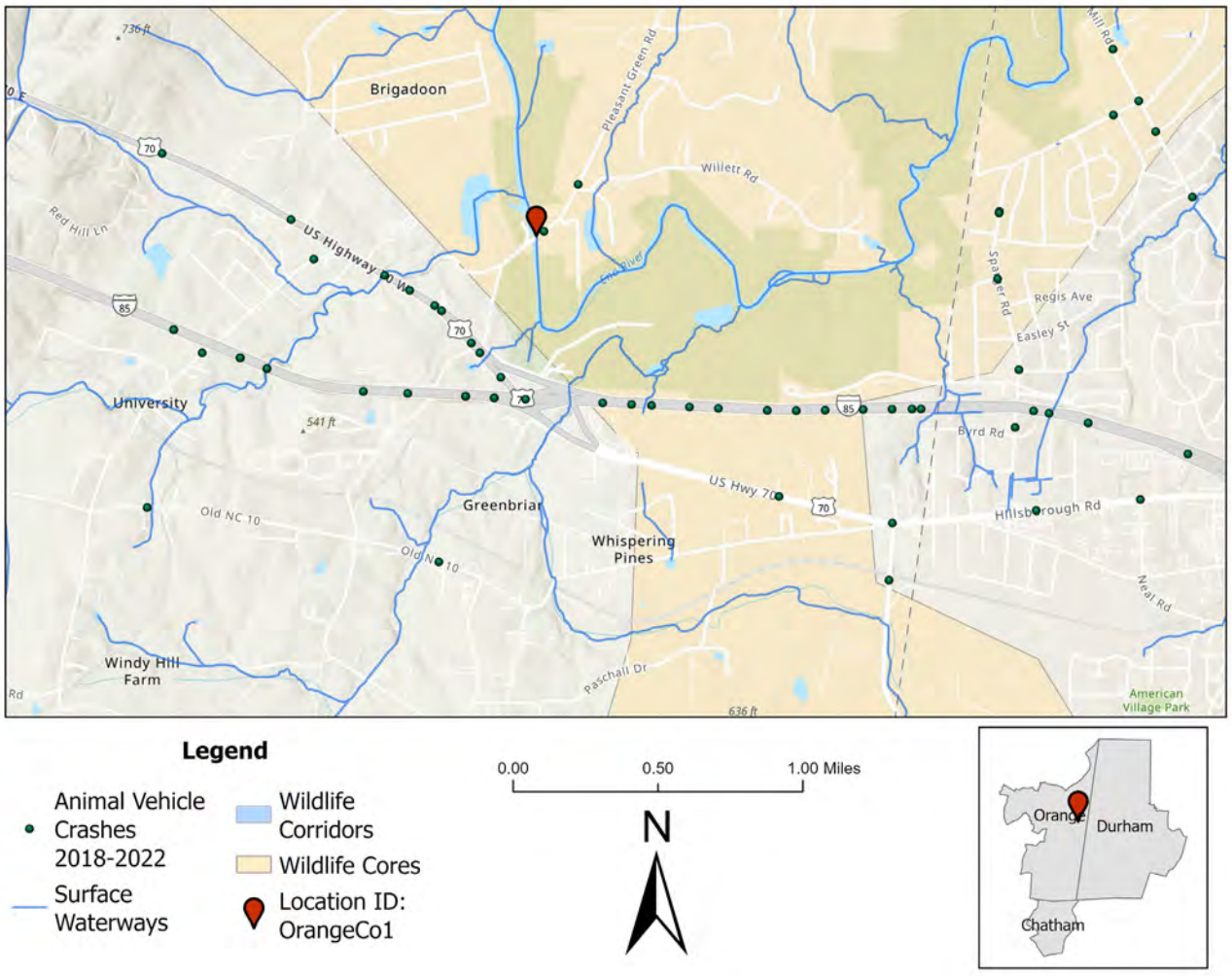
Adjacent managed natural land

Preferred Scenario

Provide a replacement bridge that maintains or extends the dry wildlife passage and MST footprint on natural benches on both sides of the river/ends of the bridge. Provide safe pedestrian crossing of the Eno River for the MST, either on the new bridge (preferably both sides) with connecting trails down to the benches below. Alternatively, pedestrian river crossing may be provided by a standalone pedestrian bridge upstream of the existing bridge if bridge sidewalks are not provided..

Alternate Scenario

Until the new bridge is constructed, install a natural surface wildlife passage bench under the east side of the bridge in the 2nd bay from the abutment, including tie-ins to habitat up and downstream.



Orange County

US 70 over Stony Creek

Summary and Problem Statement

US 70 over Stony Creek (a tributary of the Eno River) has been identified as a priority wildlife crossing. This crossing resides within a wildlife core identified by the Wildlands Network, and thirty WVCs have been reported within a one-mile buffer of this site. Providing wildlife crossing countermeasures at all crossings along Stony Creek will extend the network where wildlife can travel safely while reducing the amount of WVCs along this riparian corridor. This site has no bicycle and pedestrian facilities, has a speed limit of 45 mph, and garners 14,000 vehicles per day (2021 AADT).

The structure at this site is a bottomless, single-cell culvert. The Stony Creek bed generally consists of sound bedrock, with varying depths, which continues through the culvert, providing a solid natural creek bottom within the culvert. Barriers to wildlife travel through the culvert exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The barriers include standing water in the channel, lack of continuous dry bank on one side, narrow and ephemeral dry banks on side, diminishing height of culvert at banks (sloping culvert walls), and steep embankments. The roadway has standard guardrail along both sides, which is porous to terrestrial wildlife.

US 70 culvert over Stony Creek, facing south-west upstream. DCHC MPO.

US 70 culvert over Stony Creek, facing south-west upstream. Pete Schubert.

Aerial photograph of US 70 culvert over Stony Creek. Nearmap.

Site Facts

Location ID	OrangeCo2
Date of Site Visit	March 15, 2024
Jurisdiction	Orange County
Coordinates	36°02'41.0"N 79°01'12.4"W
NCDOT Crossing/Structure Code	670056
Existing Structure Type	Pipe (bottomless culvert)
Property Owner Type	Private
Existing Plan Alignment	CTP Highway: US 70A
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	15,500
Average Annual Daily Traffic (AADT) (2021)	14,000
Projected Average Weekday Traffic (AWDT)	20,285
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 30 ($750,000) **Total crashes and cost estimate: 30 ($750,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 255 ($6,375,000) **Total crashes and cost estimate: 255 ($6,375,000)**

30
Reported WVCs within 1-mile buffer (2018-2022)

$750,000
Reported WVCs cost estimate

14,000
Annual average daily traffic (2021)

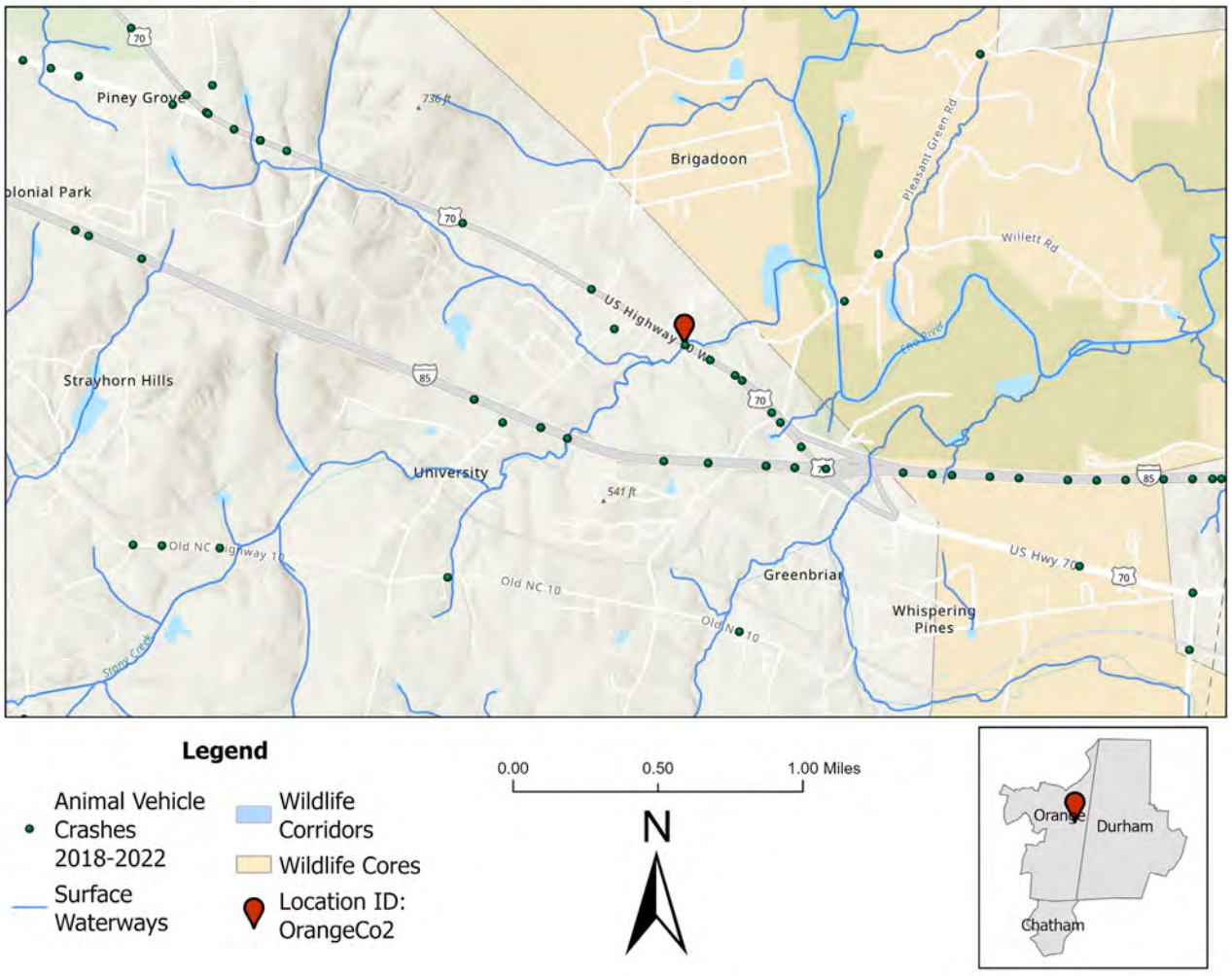
45
mph speed limit

Preferred Scenario

Provide a replacement bridge that maintains or extends the dry wildlife passage and MST footprint on natural benches on both sides of the river/ends of the bridge. Provide safe pedestrian crossing of the Eno River for the MST, either on the new bridge (preferably both sides) with connecting trails down to the benches below. Alternatively, pedestrian river crossing may be provided by a standalone pedestrian bridge upstream of the existing bridge if bridge sidewalks are not provided.

Alternate Scenario

Until the new bridge is constructed, install a natural surface wildlife passage bench under the east side of the bridge in the 2nd bay from the abutment, including tie-ins to habitat up and downstream.



Orange County

I-85 over Stony Creek

Summary and Problem Statement

The bottomless pipe culvert at I-85 over Stony Creek (a tributary of the Eno River) has been identified as a priority wildlife crossing. This site has garnered twenty-eight reported wildlife-vehicle crashes within a one-mile buffer in this identified wildlife corridor. While this specific crossing does not reside within a wildlife corridor or core identified by the Wildlands Network, the northeast portion of Stony Creek does reside within a wildlife core. Providing wildlife crossing countermeasures at all crossings along Stony Creek will extend the network where wildlife can travel safely while reducing the amount of WVCs along this riparian corridor. The roadway has two lanes going both north- and southbound divided by a 20-foot grass median, and steel guardrails (with gap underneath the rail between the posts) extend along top of I-85 road embankment mostly ahead of the culvert on both sides of the 65 MPH divided highway. This site has no bicycle and pedestrian facilities, has a posted speed limit of 65 mph, and garners 56,000 vehicles per day (2019 AADT).

Barriers to wildlife travel through the culvert exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. This site does provide dry passage (approximately 25 feet) on the east side of the stream during low water conditions. However, there is no dry passage on the west side of stream, and the stream bank leading up to the culvert on the west side is extremely steep. As a result, wildlife will be forced around the steep stream bank (and the concrete wingwall extending from the culvert inlet) and up the road embankment to the roadway. However, the stream channel itself is narrow, shallow, and slow enough (at least during the low water conditions) that many wildlife species would be able to cross the stream to dry passage on the east side. During times of high and fast water flow, wildlife would be prevented from crossing the stream and could attempt to cross on the roadway.

I-85 culvert over Stony Creek, facing north, downstream. Pete Schubert.

I-85 culvert over Stony Creek, facing north, downstream. Pete Schubert.

Aerial photograph of I-85 culvert over Stony Creek. Nearmap.

Site Facts

Location ID	OrangeCo3
Date of Site Visit	April 26, 2024
Jurisdiction	Orange County
Coordinates	36°02'24.0"N 79°01'38.3"W
NCDOT Crossing/Structure Code	670097
Existing Structure Type	Pipe culvert
Property Owner Type	Private
Existing Plan Alignment	2024-2033 STIP: # I-0305 2050 MTP: I-85, MTP ID: 48 CTP Highway: I-85
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	56,000
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	56,467
Speed Limit	65 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 28 ($700,000) **Total crashes and cost estimate: 28 ($700,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 238 ($5,950,000) **Total crashes and cost estimate: 238 ($5,950,000)**

28
Reported WVCs within 1-mile buffer (2018-2022)

$700,000
Reported WVCs cost estimate

56,000
Annual average daily traffic (2019)

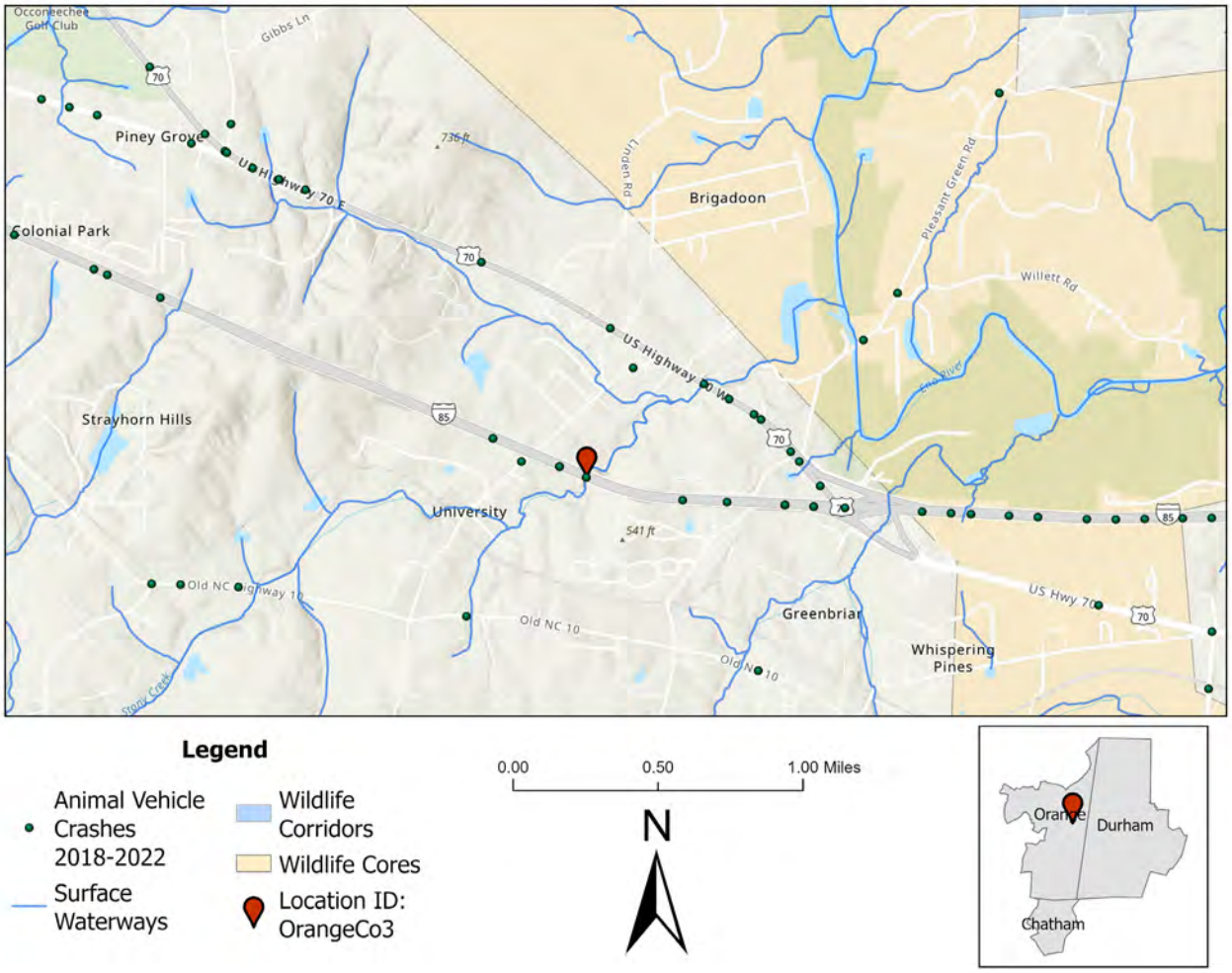
55 / 65
mph speed limit

Preferred Scenario

Replace the culvert with a bridge of sufficient span length to provide dry passage for wildlife on natural surfaces on atop both east and west stream banks, with such passage constructed continuous with habitat up and down stream. Provide two separate spans (eastbound and westbound) with a median gap to allow daylight to penetrate to the stream and banks below the bridge. Install fencing along the roadway ROW / toes of the embankment (both sides) of sufficient length to guide large wildlife through the culvert.

Alternate Scenario

If hydraulic and hydrologic analyses allow, construct a permanent dry passage within the culvert on the west side, tied into the stream banks up and downstream.



Orange County

University Station Road over Stony Creek

Summary and Problem Statement

University Station Road over Stony Creek (a tributary of the Eno River) has been identified as a priority wildlife crossing. While this specific crossing does not reside within a wildlife corridor or core identified by the Wildlands Network, the northeast portion of Stony Creek does reside within a wildlife core. Providing wildlife crossing countermeasures at all crossings along Stony Creek will extend the network where wildlife can travel safely while reducing the amount of WVCs along this riparian corridor. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and seventeen WVCs have been reported within a one-mile buffer.

Barriers to wildlife travel under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. Identified barriers include concrete walls and steep, exposed riprap slopes that cover the entire area under the bridge. There is also a steep riprap slope on the northeast side extending from the streambank/underpass area up to the road. Stream fills the channel between concrete walls with no dry passage. Remnants of wooden piers are embedded in what are likely concrete footings for former bridge piers, now abandoned in place and confining the channel under the current bridge. Because these old structures confine the channel, the adjacent riprapped slopes could be benched / terraced and choked with fines to provide stabilized natural surface dry passages under the bridge. These could easily be connected to dry banks up and down stream. Due to the close proximity of driveways and private parcels, wildlife fencing may not be appropriate.

East side of University Road bridge over Stony Creek, facing northwest. Pete Schubert.

Underneath University Road bridge over Stony Creek, facing northwest. Pete Schubert.

Aerial photograph of University Station Road. Nearmap.

Site Facts

Location ID	OrangeCo4
Date of Site Visit	April 26, 2024
Jurisdiction	Orange County
Coordinates	36°02'18.4"N 79°02'03.7"W
NCDOT Crossing/Structure Code	670104
Existing Structure Type	Bridge
Property Owner Type	Private
Existing Plan Alignment	CTP Pedestrian: University Station Rd
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	928
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 17 ($425,000) **Total crashes and cost estimate: 17 ($425,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 144.5 ($3,612,500) **Total crashes and cost estimate: 144.5 ($3,612,500)**

17
Reported WVCs within 1-mile buffer (2018-2022)

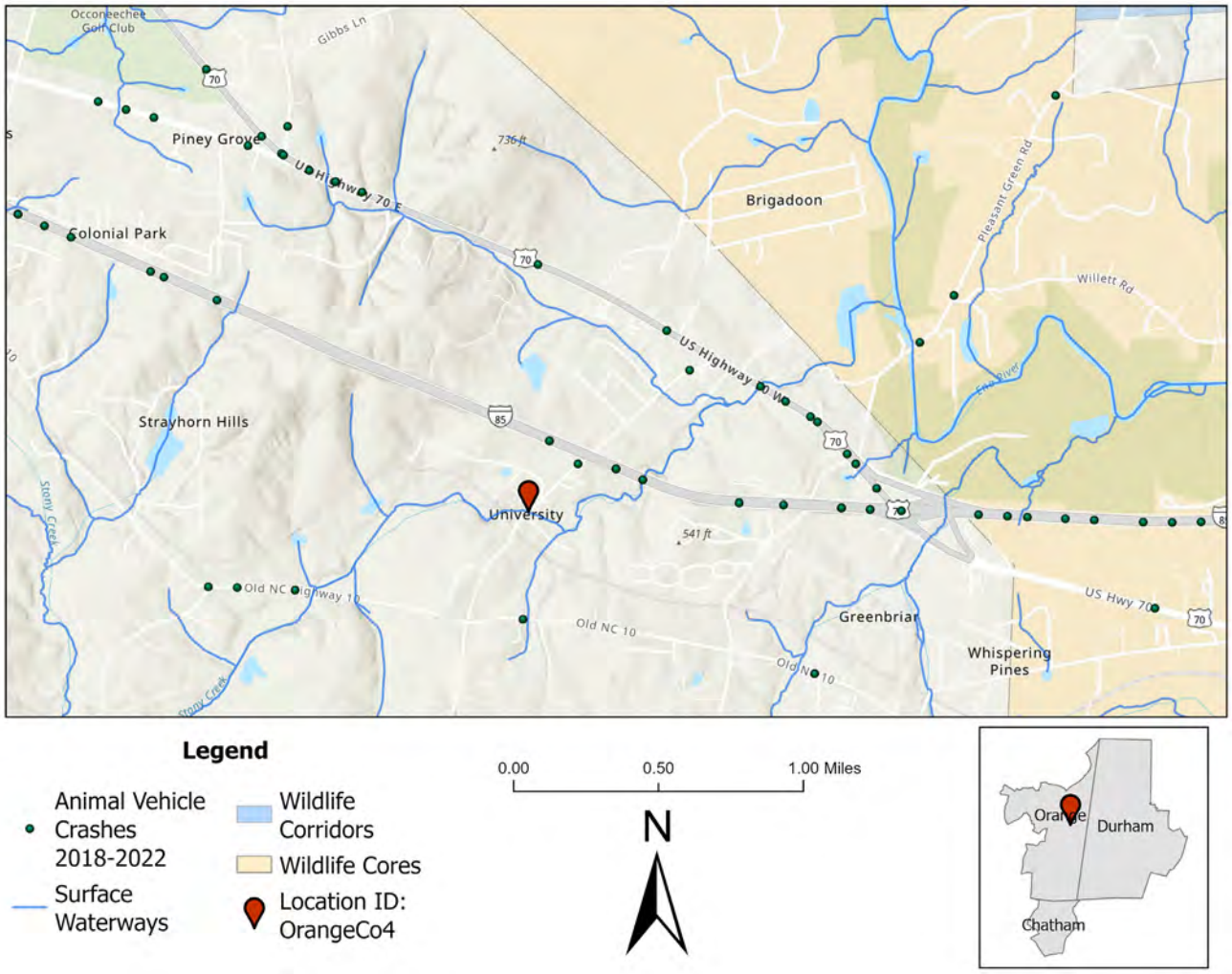
$425,000
Reported WVCs cost estimate

928
Projected annual daily traffic

45
mph speed limit

Preferred Scenario

Create a bench in the existing riprap slope protection on each side of the creek under the bridge, and use small stones to fill the voids to create a natural surface wildlife passage that is connected upstream and downstream to existing habitat areas.



Orange County

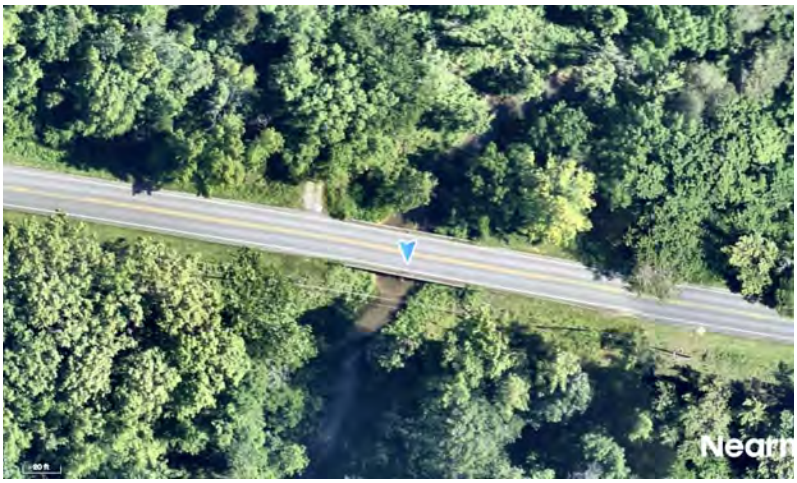
Old NC Highway 10 over Stony Creek

Summary and Problem Statement

Old NC Highway 10 over Stony Creek (a tributary of the Eno River) has been identified as a priority wildlife crossing. While this specific crossing does not reside within a wildlife corridor or core identified by the Wildlands Network, the northeast portion of Stony Creek does reside within a wildlife core. Providing wildlife crossing countermeasures at all crossings along Stony Creek will extend the network where wildlife can travel safely while reducing the amount of WVCs along this riparian corridor. This site has no bicycle and pedestrian facilities, has a posted speed limit of 45 mph, and seven WVCs have been reported within a one-mile buffer.

This site is adjacent to several managed and natural lands. The Eno River Association maintains a conservation area on both sides of the site. The NC Department of Natural and Cultural Resources Land and Water Fund maintains a conservation easement along the waterway and table. The Triangle Land Conservancy maintains a conservation area covering 606.75 acres of land on both sides of roadway, covers all other overlapping conservations. Orange County government maintains an easement covering 163 acres along the northern side of the roadway, which aligns with the plot as the Triangle Land Conservancy land north of roadway.

Barriers to wildlife travel under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The barriers include riprap on abutment slopes under the bridge, on both sides; lack of natural surface dry passage benches on either side; and marginally sufficient vertical clearance under the bridge for high water passage for large mammals. There is no ROW fencing or guardrail along the roadway except as railing for the bridge itself. At a minimum, the riprap slope protections should be benched and choked with gravel or alluvial material to create dry passages on both sides. However, as these will need to be partway up the abutment slopes, they will have less than five feet of vertical clearance. Consideration should be given to replacing this bridge with a single span at least double the current span length, to both remove the bent from the channel and to provide width for dry wildlife passage on both sides. Ideally, the road profile should be raised at least two feet to provide adequate vertical clearance for larger mammals under the bridge. Fencing should also be considered along the roadway at the base of the causeway to funnel wildlife under the bridge after it has been improved and if AADT warrants.



Aerial photograph of Old NC Highway 10 bridge over Stony Creek. Nearmap.

Underneath Old NC Highway 10 bridge over Stony Creek, facing west. Pete Schubert.

Site Facts

Location ID	OrangeCo5
Date of Site Visit	April 18, 2024
Jurisdiction	Orange County
Coordinates	36°02'03.8"N 79°02'51.4"W
NCDOT Crossing/Structure Code	670102
Existing Structure Type	Bridge
Property Owner Type	Private, public
Existing Plan Alignment	CTP Pedestrian: Old NC 10 CTP Highway: Old NC 10
Managed and Natural Lands	Eno River Association, NC DNCR Land and Water Fund, Orange County, Triangle Land Conservancy
Average Annual Daily Traffic (AADT) (2019)	3,300
Average Annual Daily Traffic (AADT) (2021)	2,500
Projected Average Weekday Traffic (AWDT)	2,301
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 7 ($175,000) **Total crashes and cost estimate: 7 ($175,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 59.5 ($1,487,500) **Total crashes and cost estimate: 59.5 ($1,487,500)**

7
Reported WVCs within 1-mile buffer (2018-2022)

$175,000
Reported WVCs cost estimate

2,500
Annual average daily traffic (2021)

Adjacent managed natural land

Preferred Scenario

Raise the road and causeway profile and replace the existing narrow bridge with a single or multiple span of adequate length to provide for dry passage of wildlife on both sides of the creek and a minimum of eight feet vertical clearance. Install fencing of adequate length on both sides and approaches to channel wildlife movement under the improved bridge.

Alternate Scenario

Construct benches in the existing riprap slope protection for each abutment including choking the riprap with fine aggregate to provide a natural surface for wildlife passage. Benches shall be tied into habitat up and down stream.

Orange County

Halls Mill Road over Eno River

Summary and Problem Statement

The bridge at Halls Mill Road (SR 1336) over the Eno River has been identified as a priority wildlife crossing as it resides within a wildlife corridor identified by the Wildlands Network, and the bridge is currently scheduled to be replaced. The existing two-lane bridge (Br# 670011) is 125 feet long and 18 feet wide. Located in rural Elfland, Orange County, Halls Mill Road has no bicycle and pedestrian facilities, and has a posted speed limit of 55 mph. The closest 2021 AADT station data is located at Efland Cedar Grove Road approximately one-mile to the west of the site, is a major collector which counted 4,500 vehicles per day.

This site serves as an important corridor for wildlife, including rare and threatened species. The bridge crosses a section of the Eno River identified by the U.S. Fish and Wildlife Service as Critical Habitat for the Federally Threatened Neuse River Waterdog. The N.C. Natural Heritage Program has identified this section of the river as aquatic habitat of national significance – Eno River Aquatic Habitat. At this location, the Eno River contains a significant number of rare aquatic species, including the federally threatened and state endangered Atlantic pigtoe, and the federally threatened and state special concern Neuse River waterdog. Several other rare species have been identified downstream such as state endangered green floater and yellow lampmussel, state threatened eastern lampmussel and triangle floater, state species of concern Carolina darter, and state significantly rare Roanoke bass. In addition, the Orange County Future Land Use Map (Orange County 2030 Comprehensive Plan), the 2004 Inventory of Natural Areas and Wildlife Habitat for Orange County, NC (NC Natural Heritage Program), and A Landscape Plan for Wildlife Habitat Connectivity in the Eno River and New Hope Creek Watersheds, North Carolina (2019) identifies this segment of the Eno River, and more specifically under this bridge, as a highly important wildlife corridor.

The following are wildlife crossing improvements to this site based on review of the new bridge's plans:

- Replacement bridge span has an increase of approximately 20 feet. This bridge lengthening allows greater opportunity to create dry passage underneath and along the embankments for wildlife to travel.
- Details for the shoulder berm gutter shows a mountable curb inside of a standard steel guardrail set on posts. This can contribute to adequate passage for smaller wildlife.
- The bridge profile depicts an increase in clear span height from a 13-foot average (existing) to 21.5-foot average (new/replacement), providing a clear span at the toe of the Class II Riprap slope protection of 13 feet on west end and 14 feet on east end. This increase can help create dry wildlife passage at low flow/discharge.

Aerial photograph of Halls Mill Road bridge over Eno River. Nearmap.

Site Facts

Location ID	OrangeCo6
Date of Site Visit	May 16, 2024
Jurisdiction	Orange County
Coordinates	36°07'25.1"N 79°09'18.3"W
NCDOT Crossing/Structure Code	670011
Existing Structure Type	Bridge
Property Owner Type	Private
Existing Plan Alignment	WBS No. BP7.R009.1
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	Unavailable
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 1 ($25,000) **Total crashes and cost estimate: 1 ($25,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 8.5 ($212,500) **Total crashes and cost estimate: 8.5 ($212,500)**

1
Reported WVCs within 1-mile buffer (2018-2022)

$25,000
Reported WVCs cost estimate

Bridge replacement in progress

55
mph speed limit

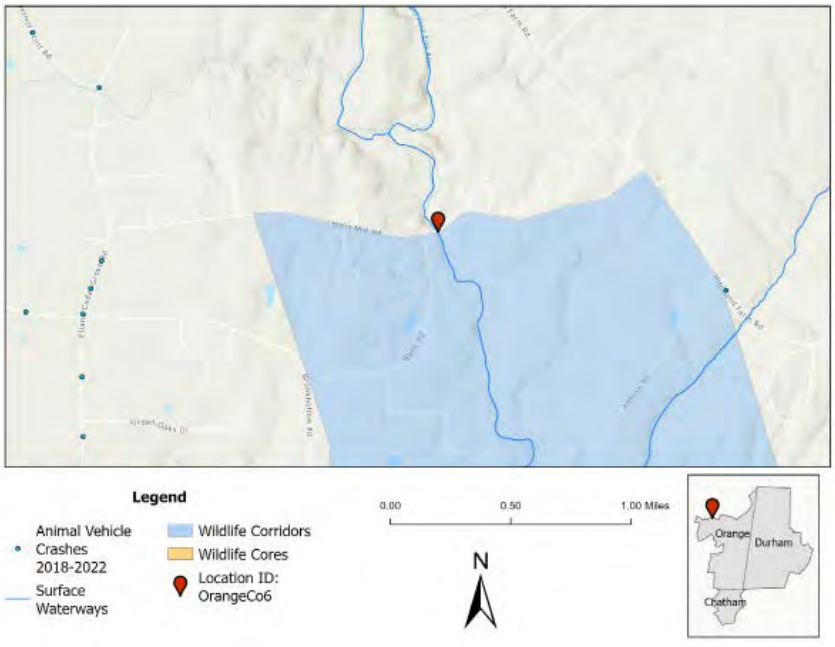
Preferred Scenario

As the planning and design for this project moves forward, the following elements are recommended to be considered to promote wildlife connectivity in the identified wildlife corridor and eliminate fatalities and serious injuries as a result of WVCs in the project's location:

- Avoid installing riprap slope protection under the span. Riprap should not be placed within the area of wildlife passage as it creates a barrier for wildlife movement. Instead, provide full height full wall end bents as are currently in place, which would eliminate the need for slope protection under the span.
- The replacement bridge should have a span at least as long as the current span; longer if there will be a slope up to the abutments instead of a vertical end bent. The replacement bridge should provide no less capacity for wildlife to cross as is presently afforded, consisting of a range of elevations of dry passage on both sides of the bridge, tied into the habitat up and down stream.
- Once the bridge replacement has been completed, perform annual vegetation management in accordance with the NCDOT Vegetation Management Manual and standard practices to eradicate invasive bamboo, selectively clear other dense woody vegetation, and allow wildlife full access to the dry passages under the span.

Alternate Scenario

If new riprap slope protection is incorporated, then natural surface (i.e., choked riprap) benches at least 6 feet below the new bridge deck are recommended. Until the bridge is replaced, perform annual vegetation management in accordance with the NCDOT Vegetation Management Manual and standard practices to eradicate invasive bamboo, selectively clear other dense woody vegetation, and allow wildlife full access to the dry passages under the span.



Orange County

Jones Ferry Road over Neville Creek

Summary and Problem Statement

Jones Ferry Road over Neville Creek has been identified as a priority wildlife crossing. This site has garnered thirteen reported wildlife-vehicle crashes within a one-mile buffer in this identified wildlife corridor, and is located just outside of a wildlife corridor identified by the Wildlands Network. The bridge is a two-lane undivided with a speed limit of 45 mph. This site has no bicycle and pedestrian facilities, and garners 8,300 vehicles per day (2021 AADT). This site is adjacent to the University of North Carolina's managed natural lands of University Lake and McCauley Mountain Slopes.

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The barriers include standing water, riprap, and low visibility. Standing water is present just outside of the bridge underpass area and extends into habitat areas that are in the direct path for wildlife toward the dry underpass. The low visibility of the passage area under the bridge is caused by dense vegetation near openings and (possibly) the metal wings extending from the ends of bridge.

East side of Jones Ferry Road bridge over Neville Creek. Pete Schubert.

Underneath Jones Ferry Road bridge over Neville Creek, facing Northeast. Pete Schubert.

Aerial photograph of Jones Ferry Road bridge over Neville Creek. Nearmap.

Site Facts

Location ID	OrangeCo7
Date of Site Visit	May 31, 2024
Jurisdiction	Orange County
Coordinates	35°54'00.3"N 79°06'25.8"W
NCDOT Crossing/Structure Code	670092
Existing Structure Type	Bridge
Property Owner Type	Public
Existing Plan Alignment	CTP Pedestrian: Jones Ferry Rd. CTP Highway: Jones Ferry Rd.
Managed and Natural Lands	UNC Chapel Hill
Average Annual Daily Traffic (AADT) (2019)	9,800
Average Annual Daily Traffic (AADT) (2021)	8,300
Projected Average Weekday Traffic (AWDT)	5,692
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 13 ($325,000) **Total crashes and cost estimate: 13 ($325,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 110.5 ($2,762,500) **Total crashes and cost estimate: 110.5 ($2,762,500)**

13
Reported WVCs within 1-mile buffer (2018-2022)

$325,000
Reported WVCs cost estimate

8,300
Annual average daily traffic (2021)

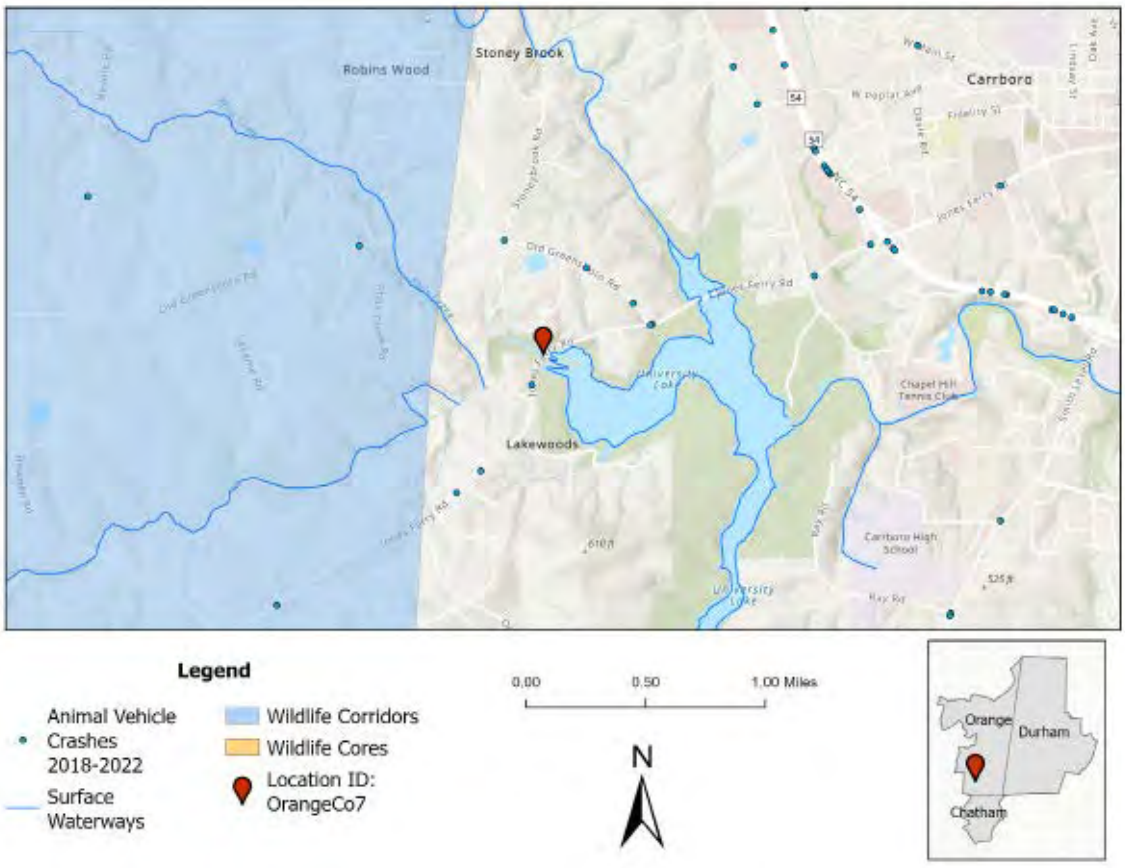
Adjacent managed natural land

Preferred Scenario

Replace the existing bridge and raise the road's approach to it to increase the height clearance for the dry passage areas. The bridge span should be long enough, and above flood level, to allow for dry passage on both sides of the creek. Fencing to guide wildlife into the underpass should then be installed.

Alternate Scenario

A temporary solution to consider is to excavate down in the earthen areas on each streambank and leave an earthen "table", to get an additional 2-3 feet of height (with about 4 feet of width). Perform vegetation management in accordance with the NCDOT Vegetation Management Manual and standard practices to ensure visibility of the existing dry opening for wildlife.



Orange County

Neville Road over Phil's Creek

Summary and Problem Statement

Neville Road over Phil's Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and six WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities and has a posted speed limit of 55 mph. The Triangle Land Conservancy manages a short stretch of the creek on the east side of the road.

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The bridge at this site was replaced within the past few years. While the footings for the previous bridge were left in place to minimize disturbance to the creek channel, they are constraining the flow and some wildlife access to the creek under the bridge. However, the outer footings stabilize the low-slope abutment embankment toes, providing considerable space for dry wildlife passage. But such passage is not possible due to the placement of exposed, oversize riprap. Given the low slope, the riprap could be removed, but the sheer size of the riprap and the low overhead clearance makes heavy equipment access difficult. If the riprap can be relocated or removed to expose a natural surface, it can be left in place with the voids filled with fine aggregate and alluvial materials to create a natural surface at all points with at least 4-feet of vertical clearance to the deck bottom above. Under the bridge, there is ephemeral dry passage through only the north channel, and only at low flow. At higher flows, both channels have standing water and there is no dry passage due to the riprap slope lining on both sides, except on the narrow (one-foot wide) flat footing tops.

Under Neville Road bridge over Phil's Creek, facing East. Pete Schubert.

Under Neville Road bridge over Phil's Creek, facing South. Pete Schubert.

Aerial photograph of Neville Road bridge over Phil's Creek. Nearmap.

Site Facts

Location ID	OrangeCo8
Date of Site Visit	May 31, 2024
Jurisdiction	Orange County
Coordinates	35°54'43.1"N 79°08'02.5"W
NCDOT Crossing/Structure Code	670232
Existing Structure Type	Bridge
Property Owner Type	Public, private
Existing Plan Alignment	CTP Multiuse Path: Phils Creek Trail
Managed and Natural Lands	Triangle Land Conservancy
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	920
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 5 ($125,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 6 ($232,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 42.5 ($1,062,500) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 51 ($1,972,000)**

6
Reported WVCs within 1-mile buffer (2018-2022)

$232,000
Reported WVCs cost estimate

55
mph speed limit

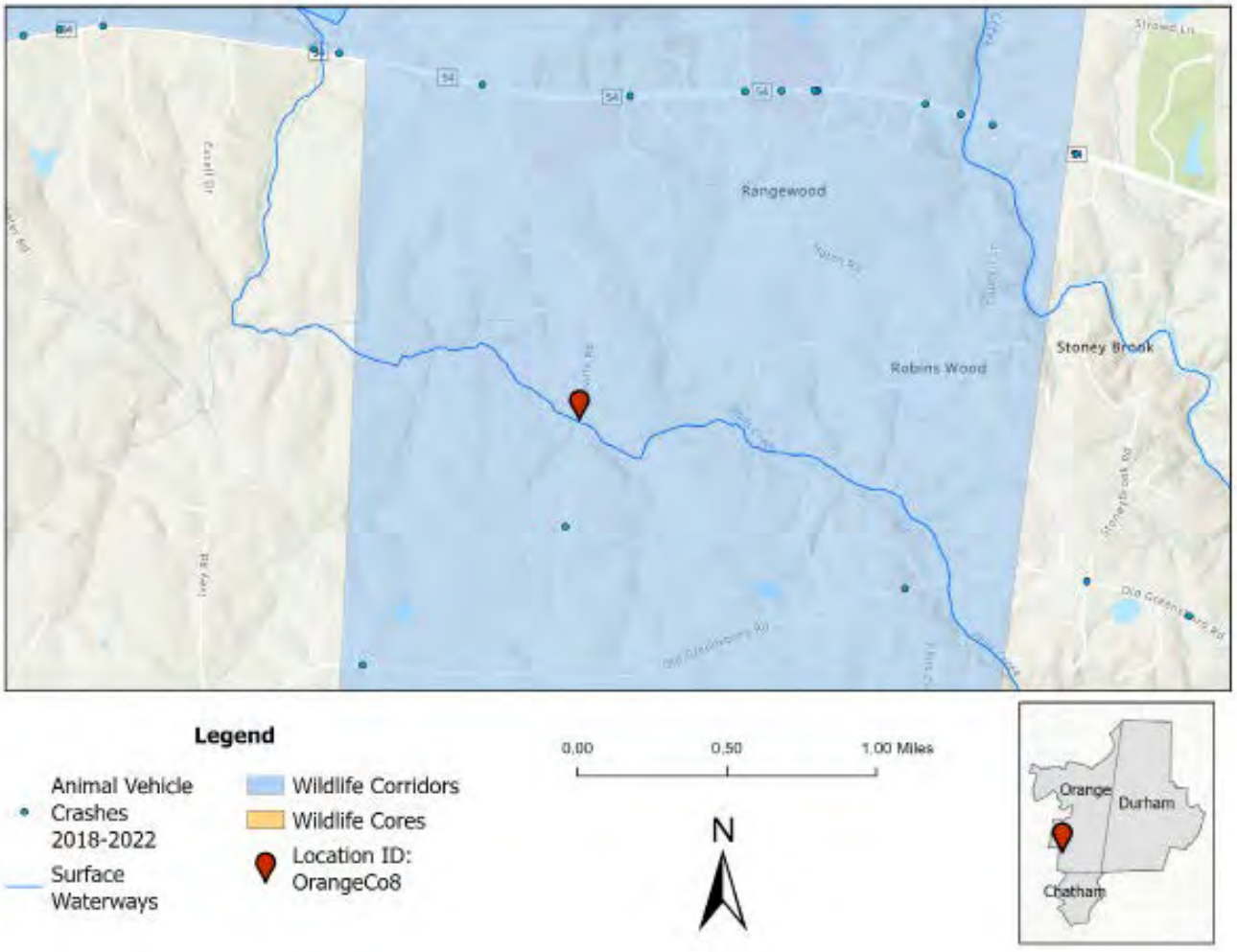
Adjacent managed natural land

Preferred Scenario

Remove the riprap slope protection under the bridge on both sides up to within 4 feet of the underside of the deck, leaving a low-slope natural surface dry passage for wildlife on both sides of the creek.

Alternate Scenario

Use small stones to choke/fill the voids in all riprap slope protection up to within 4 feet of the underside of the deck to create a low-slope natural surface dry passage for wildlife on both sides of the creek.



Orange County

NC 54 over Morgan Creek

Summary and Problem Statement

NC 54 over Morgan Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and fourteen WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities and has a posted speed limit of 55 mph. The culvert at this site is set to be replaced (BR-0091), which presents an opportunity to enhance wildlife connectivity and create a safer roadway for wildlife and drivers alike. While this site is not currently adjacent to natural managed land, the Triangle Land Conservancy owns conservation land upstream to the north of the crossing site, and University Lake land is owned by the University of North Carolina along with an NC Land and Water Fund Conservation Agreement downstream to the south of the crossing site.

Barriers to wildlife travel along this corridor and through the culvert exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The two-bay box culvert has standing water in both cells, which provides no dry and safe passage for wildlife. Wildlife that encounters this flooded culvert may move up the slope and onto NC 54 to cross the roadway. Additionally, dense vegetation on the north side of the road (such as dense non-native wisteria extending from the road bank down to the stream on the northeast side) poses an additional barrier and obstacle for wildlife to travel through the natural habitat.

North side of NC 54 culvert, facing South.
Pete Schubert.

South side of NC 54 culvert, facing North.
Pete Schubert.

Aerial photograph of NC 54 culvert over Morgan Creek. Nearmap.

Site Facts

Location ID	OrangeCo9
Date of Site Visit	July 26, 2024
Jurisdiction	Orange County
Coordinates	35°55'25.6"N 79°06'54.0"W
NCDOT Crossing/Structure Code	670036
Existing Structure Type	Culvert
Property Owner Type	Private
Existing Plan Alignment	Bridge Replacement: BR-0091 2050 MTP Highway: NC 54 CTP Highway: NC 54 CTP Pedestrian: NC 54
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	15,500
Average Annual Daily Traffic (AADT) (2021)	12,500
Projected Average Weekday Traffic (AWDT)	21,211
Speed Limit	55 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 13 ($325,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 14 ($432,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 110.5 ($2,762,500) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 119 ($3,672,000)**

14
Reported WVCs within 1-mile buffer (2018-2022)

$432,000
Reported WVCs cost estimate

Bridge replacement in progress

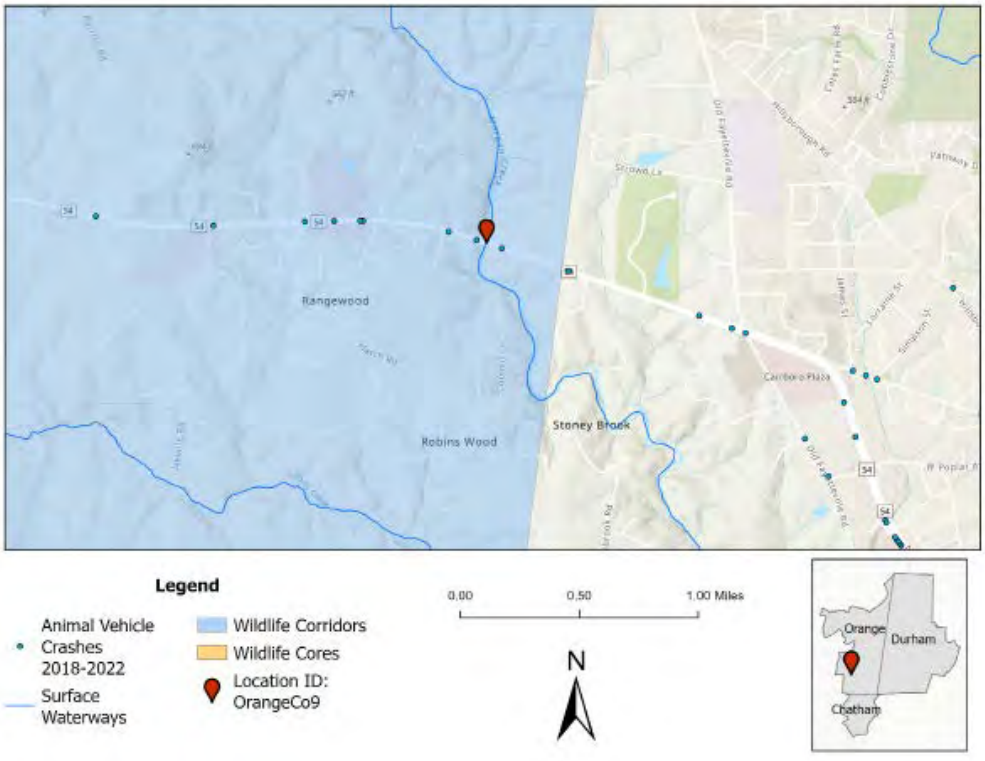
12,500
Annual average daily traffic (2021)

Preferred Scenario

Replace the flooded bottom box culvert with a single span bridge of adequate span length and height to provide dry passage for wildlife on both sides of the creek under the structure. Connect new dry passages to adjacent habitat up and downstream on both sides of the stream. Install fencing along the ROW approaching the bridge to guide wildlife into the dry crossings under the new bridge and deter crossing NC 54. Perform annual vegetation management in accordance with the NCDOT Vegetation Management Manual and standard practices.

Alternate Scenario

Install new higher bottom elevation culverts away from the existing culverts to provide dry passage for wildlife away from the creek entering the flooded culverts. Culverts shall be at a location to provide a minimum height of 8 feet and minimum width of 12 feet, and a bottom elevation that ties into adjacent habitats' elevations up and downstream. Install fencing along the ROW approaching the new dry culverts to guide wildlife into the crossings and deter crossing the busy NC 54. Perform annual vegetation management in accordance with the NCDOT Vegetation Management Manual and standard practices.



Orange County

Damascus Church Road over Pritchard Mill Creek

Summary and Problem Statement

Damascus Church Road over Pritchard Mill Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and one WVC has been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities and has a posted speed limit of 45 mph. The bridge at this site is set to be replaced (BP7-R013), which presents an opportunity to enhance wildlife connectivity and create a safer roadway for wildlife and drivers alike. While this site is not currently adjacent to natural managed land, the Triangle Land Conservancy owns conservation land upstream to the north of the crossing site, and University Lake land is owned by the University of North Carolina along with an NC Land and Water Fund Conservation Agreement downstream to the south of the crossing site.

Barriers to wildlife travel along this corridor under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The creek channel has migrated to the south vertical abutment and scoured/exposed the concrete abutment wall footing, leaving no dry passage, and no dry connection to upstream or downstream habitat on that side. Scattered rocks and debris (wooden boards) do not seem to represent significant barriers.

West side of Damascus Church Road bridge over Pritchard Mill Creek, facing east. DCHC MPO.

East side of Damascus Church Road bridge over Pritchard Mill Creek, facing west. DCHC MPO.

Aerial photograph of Damascus Church Road bridge over Pritchard Mill Creek. Nearmap.

Site Facts

Location ID	OrangeCo10
Date of Site Visit	July 26, 2024
Jurisdiction	Orange County
Coordinates	35°52'13.4"N 79°07'01.2"W
NCDOT Crossing/Structure Code	670090
Existing Structure Type	Bridge
Property Owner Type	Private
Existing Plan Alignment	Bridge Replacement: BP7-R013
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	Unavailable
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	1,636
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 1 ($25,000) **Total crashes and cost estimate: 1 ($25,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 8.5 ($212,500) **Total crashes and cost estimate: 8.5 ($212,500)**

1
Reported WVCs within 1-mile buffer (2018-2022)

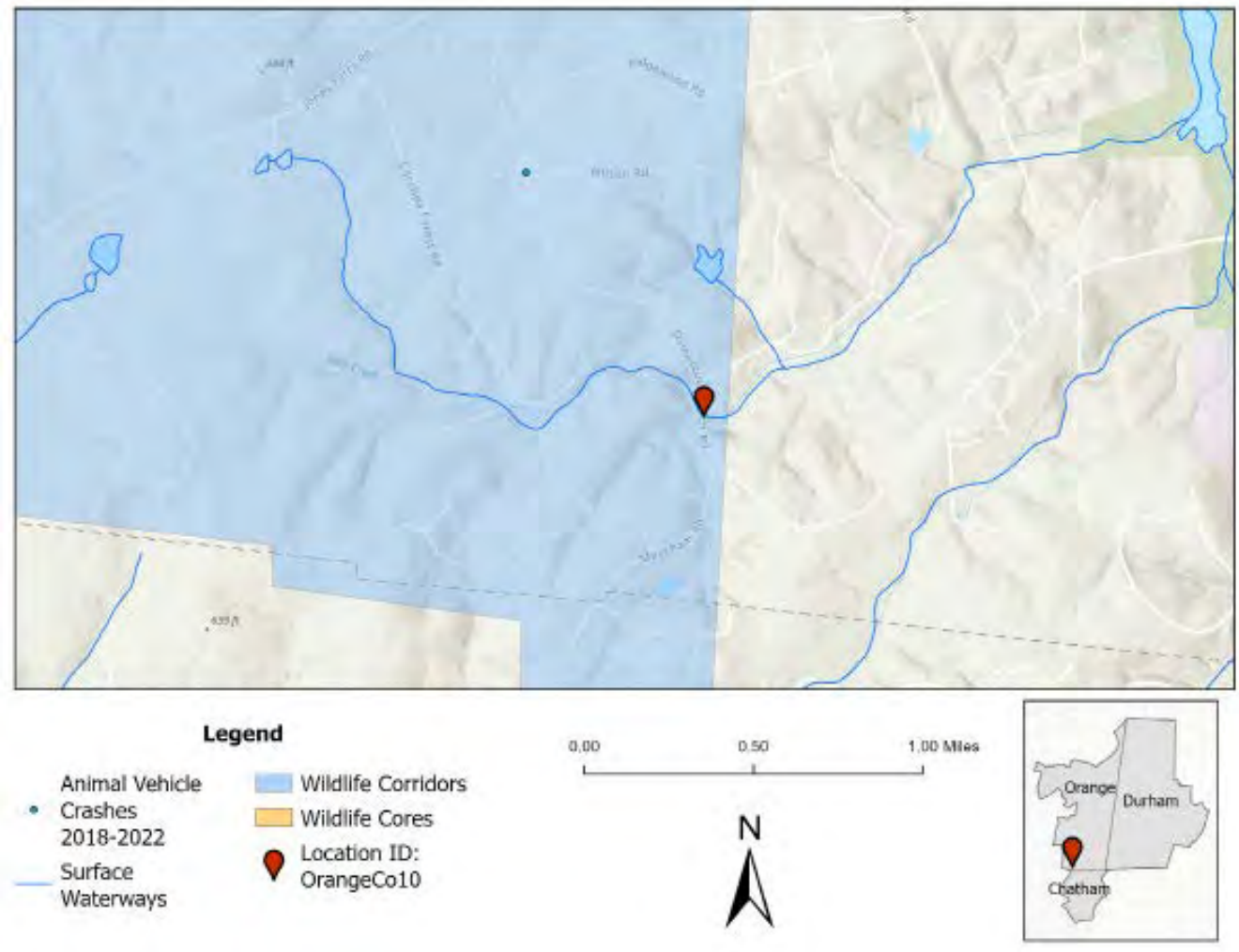
$25,000
Reported WVCs cost estimate

Bridge replacement in progress

45
mph speed limit

Preferred Scenario

As part of this bridge replacement, ensure the replacement bridge is high and long enough to allow for dry passage on both sides of the creek, especially during times of high flood. It is recommended that the span be lengthened, especially to the south where there is currently no dry passage, and the creek channel is against the footing of the abutment wall. Connect new natural surface dry passages to up and downstream habitat on both sides of the creek.



Orange County

New Hope Church Road over New Hope Creek

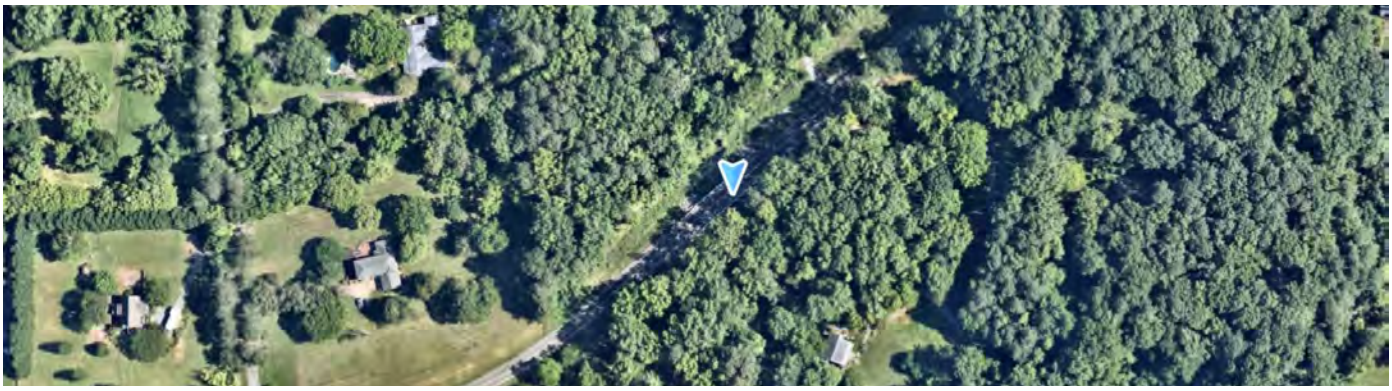
Summary and Problem Statement

New Hope Church Road over New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and fourteen WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities and has a posted speed limit of 45 mph. The 13.2-acre parcel to the north of the bridge is the former Girl Scout Camp Pipsissewa that is actively managed as natural habitat land by private owners, which elevates this site as a good candidate for permanent protection. Additionally, smaller upstream and downstream parcels contain an average of at least 100 feet of wide floodplain, which are also good candidates for permanent habitat protection.

Barriers to wildlife travel along this corridor and under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. The east bank slope is completely covered with gently sloping riprap from the abutment 2 feet below the deck to the bottom of the bank, interfering with dry passage on this side only. However, the west bank has a level dry passage, but will not function at high water due to riprap covering the balance of the slope up to the 2 feet abutment under the deck. The bridge span is of adequate distance and has gentle dry slopes underneath to accommodate wildlife passage if the riprap placed above the top of the bank is choked with small stone to provide a natural surface to within 2 feet vertically of the underside of the bridge deck.

View of west bank, under New Hope Church Road bridge over New Hope Creek. Pete Schubert.

East bank, under New Hope Church Road bridge over New Hope Creek. Pete Schubert.



Aerial photograph of New Hope Church Road bridge over New Hope Creek. Nearmap.

Site Facts

Location ID	OrangeCo11
Date of Site Visit	May 22, 2024
Jurisdiction	Orange County
Coordinates	36°00'12.8"N 79°05'35.1"W
NCDOT Crossing/Structure Code	670099
Existing Structure Type	Bridge
Property Owner Type	Private
Existing Plan Alignment	CTP Highway: New Hope Church Rd. CTP Pedestrian: New Hope Church Rd
Managed and Natural Lands	N/A
Average Annual Daily Traffic (AADT) (2019)	3,900
Average Annual Daily Traffic (AADT) (2021)	3,200
Projected Average Weekday Traffic (AWDT)	4,966
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 13 ($325,000) Type B injury crash: 1 ($187,000) **Total crashes and cost estimate: 14 ($512,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 110.5 ($2,762,500) Type B injury crash: 8.5 ($1,589,500) **Total crashes and cost estimate: 119 ($4,352,000)**

14
Reported WVCs within 1-mile buffer (2018-2022)

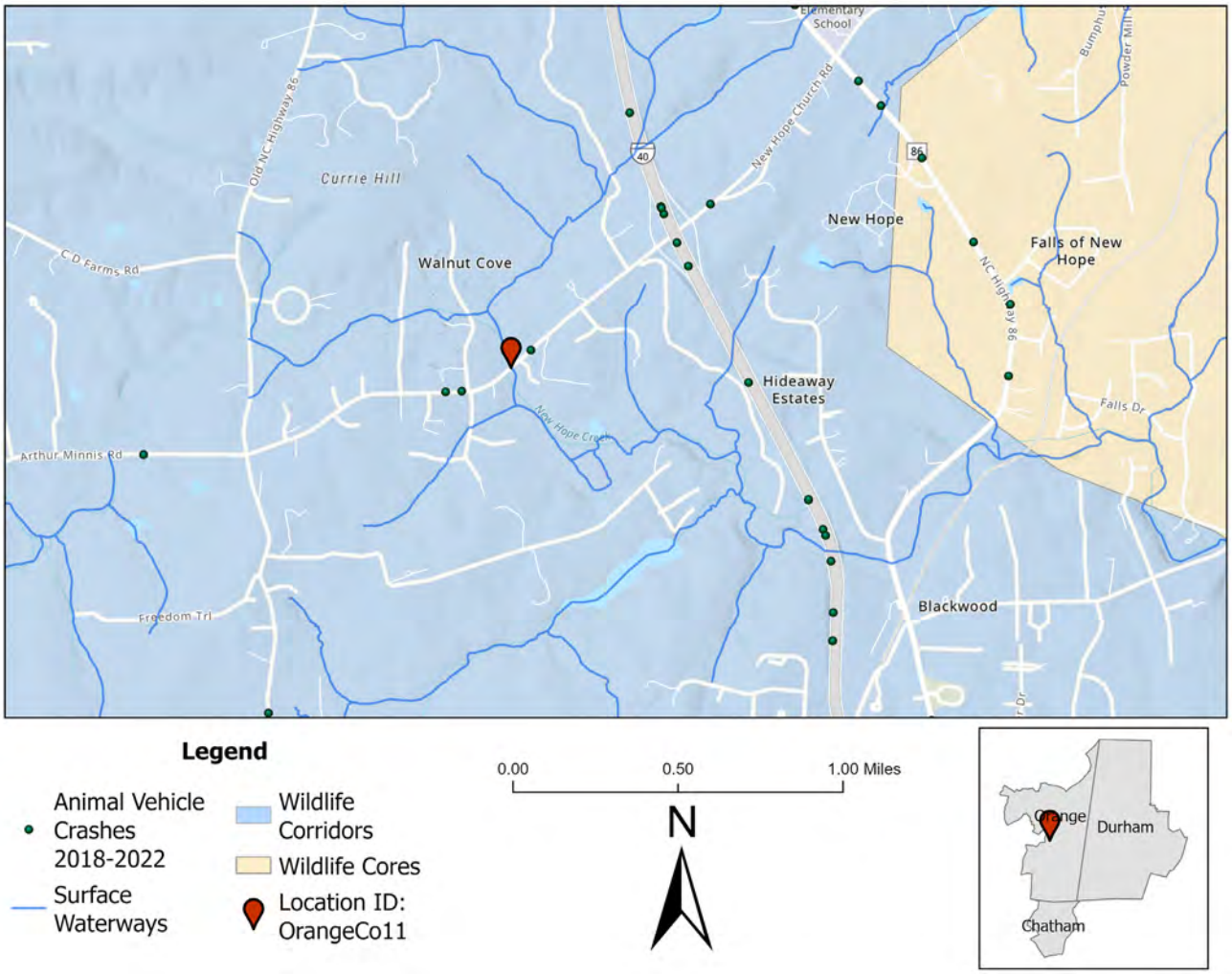
$512,000
Reported WVCs cost estimate

45
mph speed limit

Adjacent managed natural land

Preferred Scenario

Create a natural, dry surface for wildlife passage by using small stones to choke/fill the voids within the portions of the existing riprap slope that is below 2 feet from the underside of the deck to the top of the creek bank.



Orange County

NC 86 over New Hope Creek

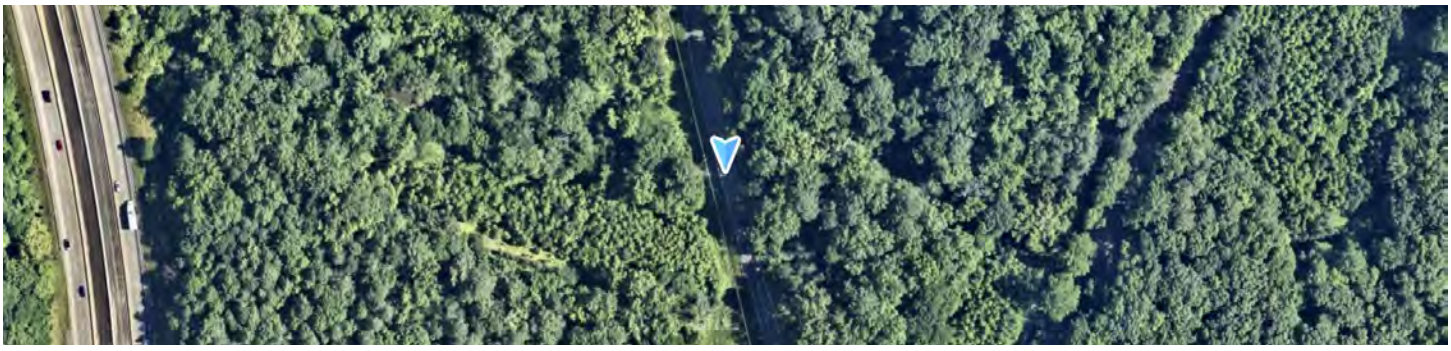
Summary and Problem Statement

NC 86 over New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and thirteen WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities and has a posted speed limit of 45 mph. The bridge at this site is set to be replaced (Bridge Replacement: BR-0092), which presents an opportunity to enhance wildlife connectivity and create a safer roadway for wildlife and drivers alike. Upstream and downstream along New Hope Creek and Mountain Creek are conservation lands owned by Duke Forest and Triangle Land Conservancy.

Barriers to wildlife travel along this corridor under the bridge exist, which encourages wildlife travel on the roadway and results in conflicts with motorists. Barriers include riprap on the entire south abutment slope, and old construction debris in the lower portion of the north slope and bank. The existing bridge span is of insufficient length to fully accommodate dry passage on both banks at high creek levels, as evidenced by stranded woody debris and flotsam. The existing bridge is low and narrow and appears to have been structurally repaired and augmented many times over the years, and a replacement bridge provides the opportunity to improve dry wildlife passage along both creek banks. Lengthening the bridge span as part of the replacement is the most critical, combined with replacing the multiple bents with a single span across the entire crossing.

West side of NC 86 bridge over New Hope Creek, facing east. DCHC MPO.

East side of NC 86 bridge over New Hope Creek, facing west. DCHC MPO.



Aerial photograph of NC 86 bridge over New Hope Creek. Nearmap.

Site Facts

Location ID	OrangeCo12
Date of Site Visit	July 26, 2024
Jurisdiction	Orange County
Coordinates	35°59'42.1"N 79°04'21.1"W
NCDOT Crossing/Structure Code	670037
Existing Structure Type	Bridge
Property Owner Type	Private
Existing Plan Alignment	Bridge Replacement: BR-0092 CTP Highway: NC 86 CTP Pedestrian: NC 86 CTP Multiuse Paths: New Hope Creek Trail
Managed and Natural Lands	Duke Forest, Triangle Land Conservancy
Average Annual Daily Traffic (AADT) (2019)	5,900
Average Annual Daily Traffic (AADT) (2021)	5,200
Projected Average Weekday Traffic (AWDT)	1,949
Speed Limit	45 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 12 ($300,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 13 ($407,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 102 ($2,550,000) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 110.5 ($3,459,500)**

13
Reported WVCs within 1-mile buffer (2018-2022)

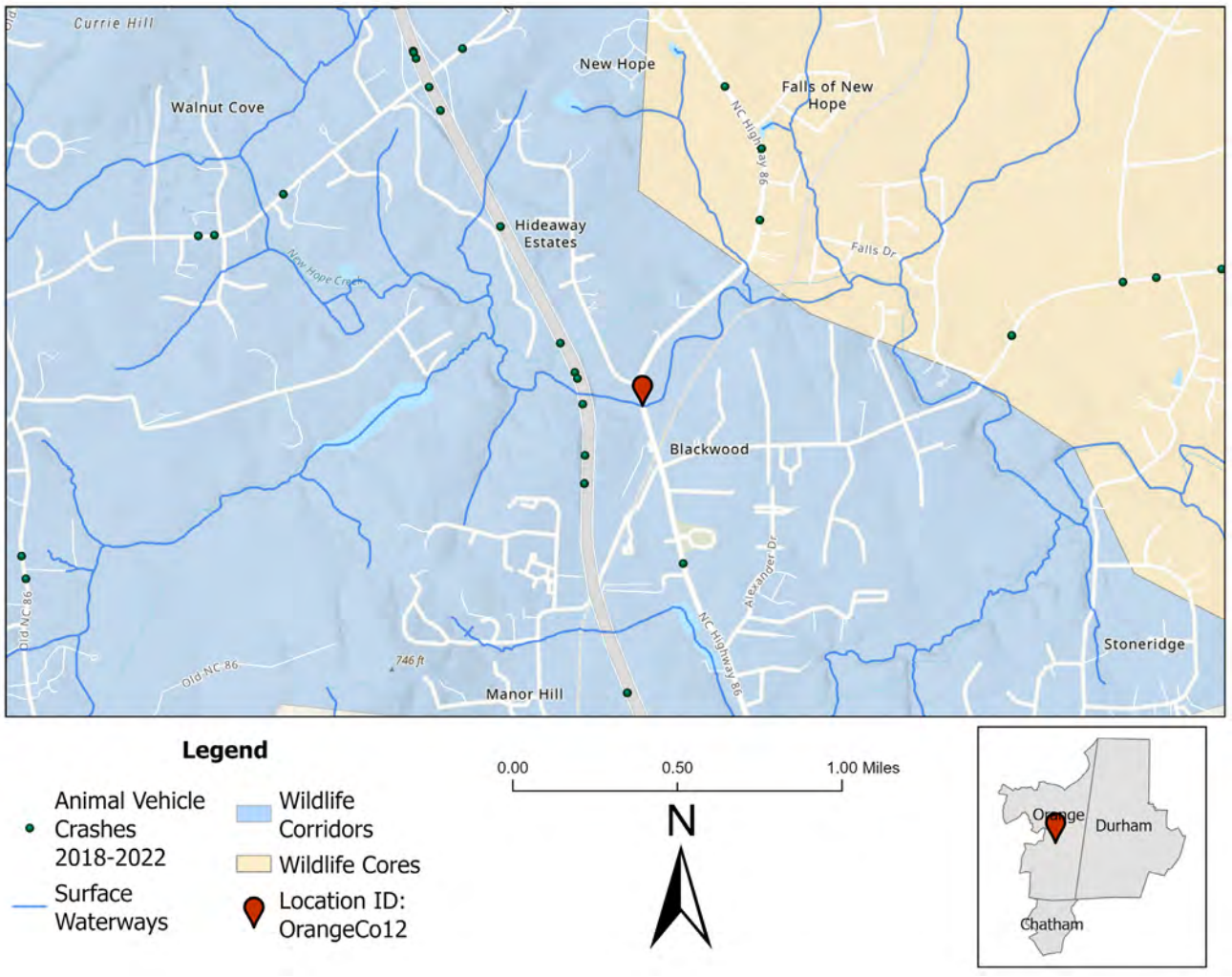
$407,000
Reported WVCs cost estimate

Bridge replacement in progress

Adjacent managed natural land

Preferred Scenario

As part of the bridge replacement project, raise the NC 86 causeway profile through the entire New Hope Creek floodplain and install a replacement bridge with a span high and long enough to create a passage bench for wildlife on both sides of the creek, which must remain dry during times of high flood. Avoid placing riprap slope protection on abutment slopes, and provide dry connection to adjacent habitat up and downstream on both banks.



Orange County

I-40 Culvert over New Hope Creek

Summary and Problem Statement

The I-40 culvert over New Hope Creek has been identified as a priority wildlife crossing. This crossing resides within a wildlife corridor identified by the Wildlands Network, and fourteen WVCs have been reported within a one-mile buffer of this site. This site has no bicycle and pedestrian facilities, has a posted speed limit of 65 mph, and garners 74,000 vehicles per day (2019 AADT). Upstream and downstream along New Hope Creek and Mountain Creek are conservation lands owned by Duke Forest and Triangle Land Conservancy.

Barriers to wildlife travel along this corridor through the culvert exist. No dry passage for wildlife exists at this site due to continued standing water in the culvert. Combined with ROW fencing that was installed on both sides of the creek, this stie creates an ecological dead end for wildlife. However, white-tailed deer have navigated through the existing ROW fence and onto the roadway as indicated by the reported WVCs.

East side of I-40 culvert over New Hope Creek, facing west. DCHC MPO.

Aerial photograph of I-40 culvert over New Hope Creek. Nearmap.

Site Facts

Location ID	OrangeCo13
Date of Site Visit	July 26, 2024
Jurisdiction	Orange County
Coordinates	35°59'43.9"N 79°04'33.0"W
NCDOT Crossing/Structure Code	670263
Existing Structure Type	Culvert
Property Owner Type	Private
Existing Plan Alignment	2050 MTP Highway: I-40 CTP Highway: I-40 CTP Multiuse Paths: New Hope Creek Trail
Managed and Natural Lands	Duke Forest, Triangle Land Conservancy
Average Annual Daily Traffic (AADT) (2019)	74,000
Average Annual Daily Traffic (AADT) (2021)	Unavailable
Projected Average Weekday Traffic (AWDT)	58,239
Speed Limit	65 mph
Reported Wildlife-vehicle collisions (WVCs) within 1-mile Buffer (2018-2022) and Comprehensive Crash Cost Estimate	Non-injury crash: 13 ($325,000) Type C injury crash: 1 ($107,000) **Total crashes and cost estimate: 14 ($432,000)**
Likely Wildlife-vehicle collisions (WVCs) within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	Non-injury crash: 110.5 ($2,762,500) Type C injury crash: 8.5 ($909,500) **Total crashes and cost estimate: 119 ($3,672,000)**

14
Reported WVCs within 1-mile buffer (2018-2022)

$432,000
Reported WVCs cost estimate

65
mph speed limit

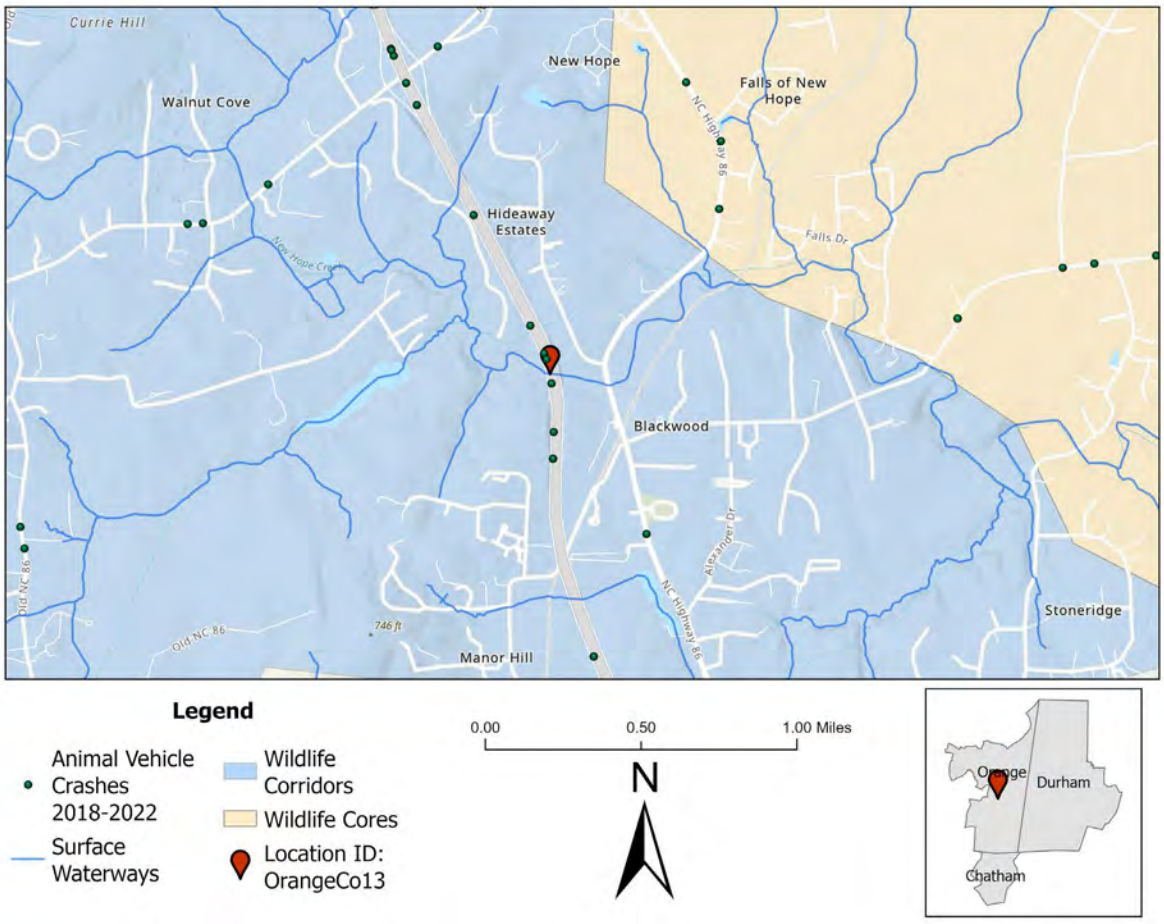
Adjacent managed natural land

Preferred Scenario

Replace the existing 4-cell culvert with a multicell culvert which includes additional outer raised bottom elevation culverts to accommodate dry passage for both creek banks. Construct these new dry passage culverts with natural surface floors. Connect these new dry passages to adjacent habitat up and downstream.

Alternate Scenario

Construct separate, new dry culverts through the I-40 embankment out from the existing flooded culvert to accommodate dry passage for both creek banks. These two new culverts should be at least 8 feet high and 12 feet wide, with a natural surface floor and be straight with no offset or skew. Replace existing ROW fencing with taller fencing to guide wildlife into the dry passes from the adjacent habitat areas and deter wildlife climbing the embankment to attempt to cross I-40.



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Section 3.4

WILDLIFE CROSSING CORRIDOR RECOMMENDATIONS

Many of the wildlife crossing projects that DCHC MPO has identified and is recommending as part of this plan align with corridors of wildlife travel. Identifying and implementing wildlife crossing projects within corridors can help create both a connected network for wildlife travel by ensuring there are no gaps, and enhance roadway safety for drivers due to wildlife being guided along the natural corridor, and off the road. Additionally, presenting a slate of wildlife crossing projects within a corridor could be a priority for funding agencies who seek to enhance and make a connected safety network.

DCHC MPO has identified two corridors as part of this plan:

- The Eno River Corridor
- The New Hope Creek Corridor

US 15-501 bridge over New Hope Creek in Durham County. DCHC MPO.

Eno River Corridor

The DCHC MPO has identified eleven (11) project recommendations and sites as part of the Eno River Corridor within this plan. The projects span both Durham and Orange counties. A complete list of projects along this corridor is described in Table 3.4.1, and a map showing these projects is shown in Figure 3.4.1.

Project ID	Project / Crossing Name	County
DurhamCo1	Cole Mill Road over Eno River	Durham
DurhamCo2	Rivermont Road over Nancy Rhodes Creek	Durham
DurhamCo3	US 501 (Roxboro Road) over Eno River	Durham
DurhamCo4	Guess Road over Eno River	Durham
DurhamCo5	Old Oxford Road over Eno River	Durham
OrangeCo1	Pleasant Green Road over Eno River	Orange
OrangeCo2	US 70 over Stony Creek	Orange
OrangeCo3	I-85 over Stony Creek	Orange
OrangeCo4	University Station Road over Stony Creek	Orange
OrangeCo5	Old NC Highway 10 over Stony Creek	Orange
OrangeCo6	Halls Mill Road over Eno River	Orange

Table 3.4.1: Complete list of wildlife crossing project recommendations in the Eno River Corridor.

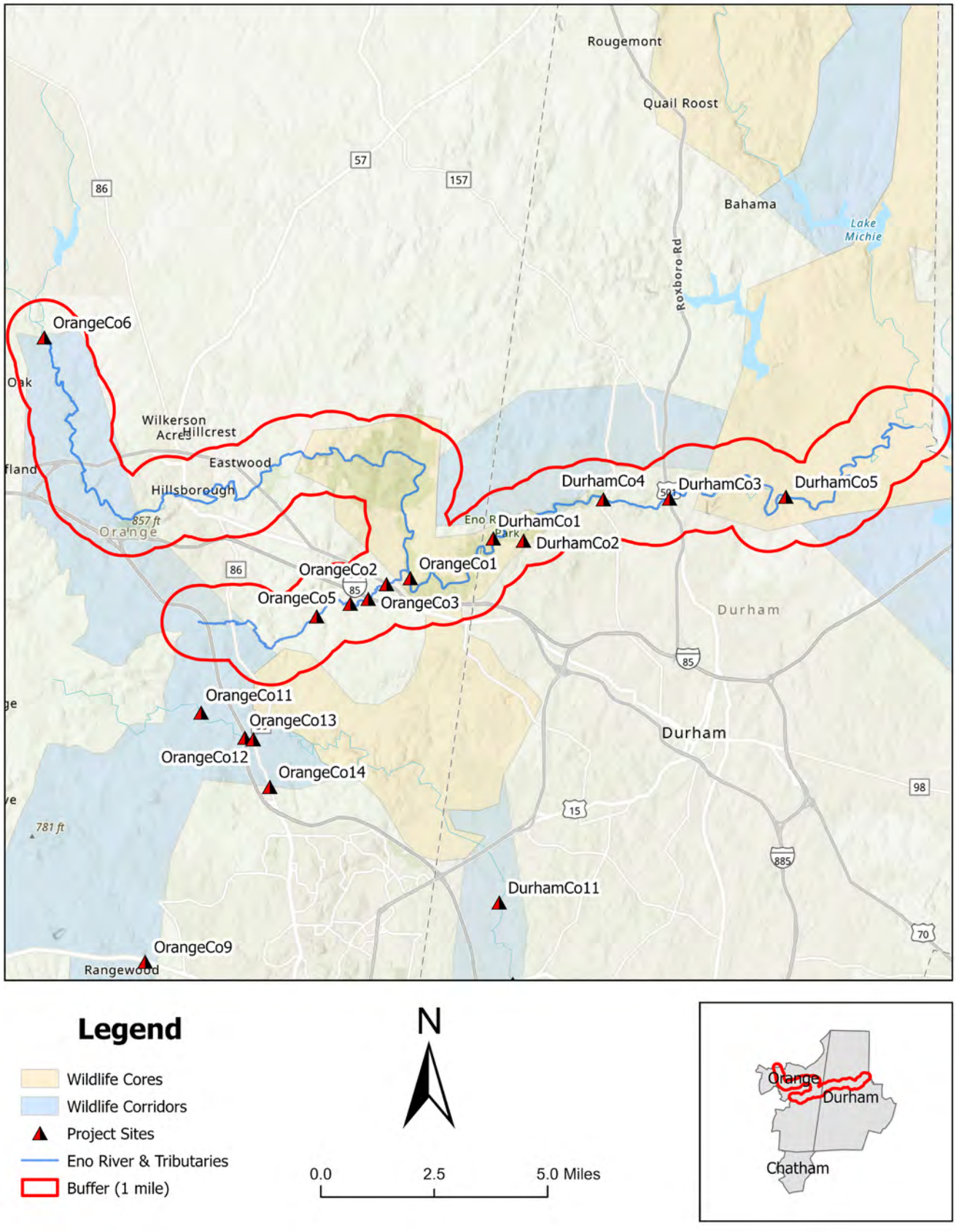

Figure 3.4.1: Map of complete list of wildlife crossing project recommendations in the Eno River Corridor.

New Hope Creek Corridor

The DCHC MPO has identified eight (8) project recommendations and sites as part of the New Hope Creek Corridor within this plan. The projects span both Durham and Orange counties. A complete list of projects along this corridor is described in Table 3.4.2, and a map showing these projects is shown in Figure 3.4.2. Projects that have two Project IDs indicate two separate structures at this site.

Project ID	Project / Crossing Name	County
DurhamCo6 DurhamCo7	NC 54 over New Hope Creek	Durham
DurhamCo8 DurhamCo9	I-40 Bridge over New Hope Creek	Durham
DurhamCo10	Stagecoach Road over New Hope Creek	Durham
DurhamCo11	Old Chapel Hill Road over New Hope Creek	Durham
DurhamCo12	Farrington Road over Little Creek	Durham
OrangeCo11	New Hope Church Road over New Hope Creek	Orange
OrangeCo12	NC 86 over New Hope Creek	Orange
OrangeCo13	I-40 Culvert over New Hope Creek	Orange

Table 3.4.2: Complete list of wildlife crossing project recommendations in the New Hope Creek Corridor.

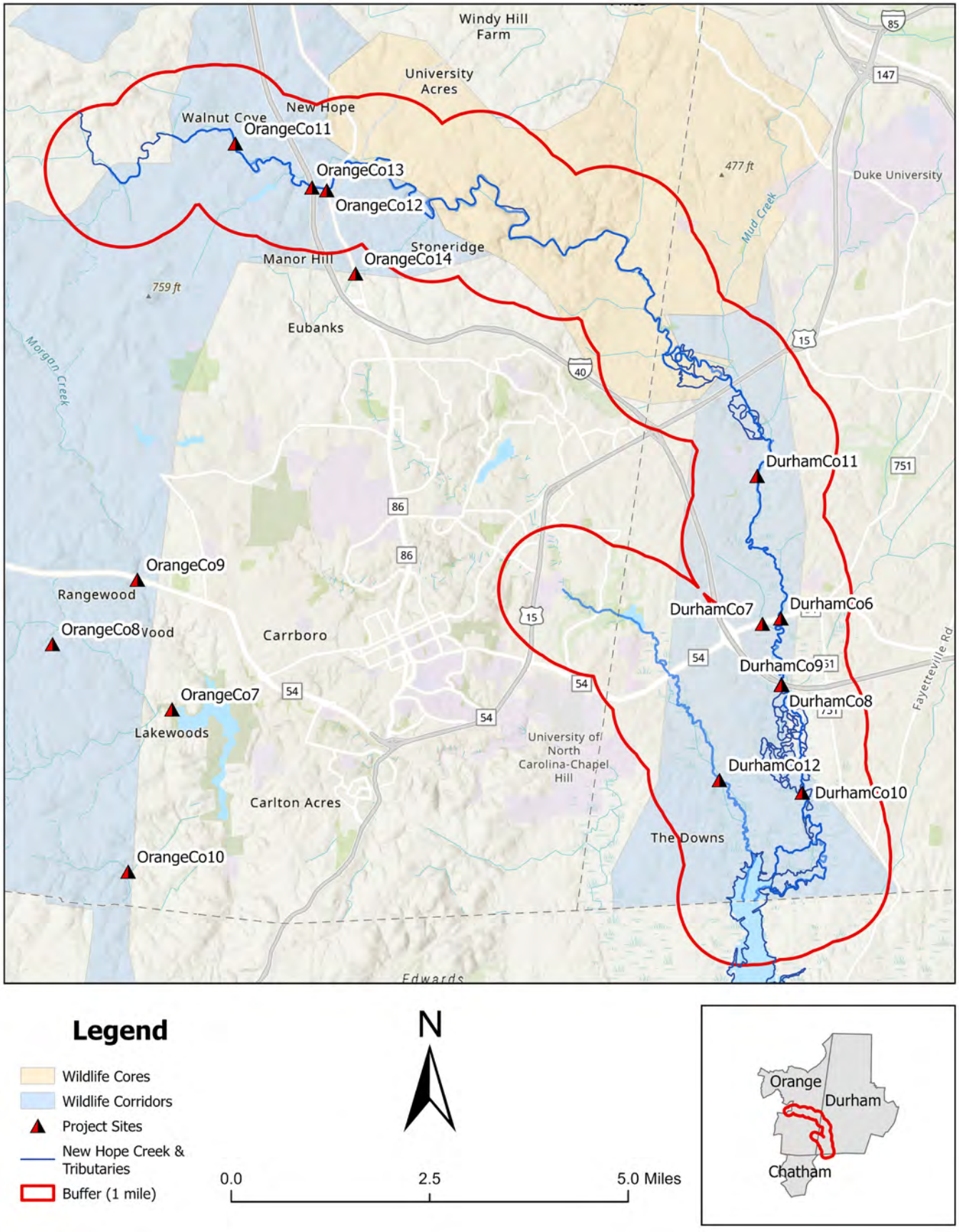

Figure 3.4.2: Map of complete list of wildlife crossing project recommendations in the New Hope Creek Corridor.

Section 3.5

ADDITIONAL WILDLIFE CROSSING CONSIDERATIONS

To help enhance roadway safety for both people and wildlife, wildlife crossing sites and structures in the DCHC MPO planning area should continue to be identified, analyzed, and assessed. While not exhaustive, the following is a list of wildlife crossing sites for future consideration that have been identified as part of this planning process.

#	Project / Crossing Name	County
1	I-0305 Project Corridor	Durham, Orange
2	I-40 at Sevenmile Creek	Orange
3	NC-54 at Willow Creek	Orange
4	NCRR over Stony Creek	Orange
5	Jones Ferry Road over University Lake	Orange
6	Lawrence Road over Eno River	Orange
7	Eno Mountain Road over Eno River	Orange
8	New Hope Church Road over Stony Creek	Orange
9	NC 86 over Stony Creek	Orange
10	I-40 over Stony Creek	Orange

#	Project / Crossing Name	County
11	St. Mary's Road over Buckwater Creek	Orange
12	South Church Street over Eno River	Orange
13	Mount Sinai Road over New Hope Creek	Orange
14	Mount Sinai Road over Piney Mountain Creek	Orange
15	Old NC 86 over New Hope Creek	Orange
16	Erwin Road over New Hope Creek	Orange
17	Turkey Farm Road over New Hope Creek	Orange
18	US 15/501 over Morgan Creek	Orange
19	I-85 / I-40 over Rocky Run	Orange
20	Old Greensboro Road over Phils Creek	Orange
21	Smith Level Road over Morgan Creek	Orange
22	I-40 over Old Field Creek	Orange
23	I-85 over Rhodes Creek	Durham
24	Old Oxford Highway over Flat River	Durham
25	Old Oxford Road over Little River	Durham
26	Old NC 75 over Knap of Reeds Creek	Durham
27	S Lowell Road over Mountain Creek	Durham
28	US 501S over Little River	Durham
29	US 501 N over Little River	Durham
30	US 501 over Mountain Creek	Durham

#	Project / Crossing Name	County
31	N Roxboro Road over Mountain Creek	Durham
32	S Lowell Road over South Fork Little River	Durham
33	S Lowell Road over North Fork Little River	Durham
34	NC 751 over Third Fork Creek	Durham
35	Barbee Chapel Road over Little Creek tributary	Durham
36	Red Mill Road over Eno River	Durham
37	Red Mill Road over Ellerbee Creek	Durham
38	US 15/US 501 over Mud Creek/New Hope Creek	Durham
39	Farrington Point Road over Cub Creek	Chatham
40	US 15-501 over Haw River	Chatham
41	Old Farrington Road over Morgan Creek	Chatham
42	US 64 over Haw River	Chatham
43	US 15-501 over Cub Creek	Chatham

Table 3.5: Complete list of additional wildlife crossing projects for future consideration in the DCHC MPO planning area.

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Section 4

IMPLEMENTATION STRATEGIES

4.1 Funding

Several opportunities and methods exist to fund and implement wildlife crossing projects. It is best practice to include wildlife crossing elements in future transportation projects as they are being planned, as it often will cost less than to retrofit existing structures and sites to promote wildlife movement. Funding for and delivering wildlife crossing projects exist at the federal and state level, as well as through foundational giving.

Federal

Federal funding is available to support wildlife crossing efforts. The *Wildlife Infrastructure Funding Guide Funding Opportunities within the Infrastructure Investment and Jobs Act* (2024) is a comprehensive document detailing federal funding opportunities that can serve to reduce WVCs and improve habitat connectivity. Authored in partnership with ARC Solutions, National Parks Conservation Association, and Wildlands Network, this in-depth guide includes an overview of discretionary and formula allocation programs, and information including eligibility, selection criteria, set-asides, and other considerations alongside sample grant award descriptions from successful applicants in previous funding cycles. The guide can be accessed at https://arc-solutions.org/wp-content/uploads/2024/06/Wildlife-Infrastructure-Funding-Guide.pdf.

Additionally, ARC Solutions developed a table listing federal funding opportunities in North Carolina through the Infrastructure Investment and Jobs Act (IIJA) for DCHC MPO as part of this planning process. The funding table can be found in Appendix L.

State

Transportation Project Considerations at the Planning Phase

Incorporating wildlife crossing solutions for consideration during the planning phase of transportation projects, such as for bridge and culvert replacement projects, can help address and prioritize safety, WVCs and their related impacts, and wildlife connectivity from the start. Retrofitting wildlife crossing countermeasures after a project has been completed often requires more financial resources than if the solutions were implemented during initial project delivery. During a project's planning phase, NCDOT's Wildlife Passage Guidance document can be consulted, and both local jurisdictions and DCHC MPO may include the projects and example countermeasures in this plan as part of project input for consideration by NCDOT.

Strategic Transportation Investments (STI)

The STI law establishes the Strategic Mobility Formula, which allocates available revenues based on data-driven scoring and local input. This prioritization process – known as SPOT – is administered by NCDOT for the development of the State Transportation Improvement Program (STIP), which identifies the projects that will

receive funding during a 10-year period. Federal law requires the STIP to be updated at least every four years, and NCDOT administers the SPOT process approximately every two years.

NCDOT and MPOs submit their most competitive projects in the SPOT process. Wildlife crossing improvements could be incorporated into project submittals and could increase a project's score for safety. More information can be found at https://www.ncdot.gov/initiatives-policies/transportation/stip/Pages/default.aspx

N.C. Wildlife Resources Commission's Partners for Green Growth Program

This cost-share funding opportunity is offered by the NCWRC's Green Growth Toolbox program annually. The goal of Partners for Green Growth is to provide support for local government planning projects that consider wildlife and natural resource conservation in land use and development planning, incentives, and ordinances. Eligible applicants are local governments (North Carolina counties and incorporated municipalities) and Councils of Government. Partnerships between local governments and non-governmental, non-profit (NGO) conservation-related organizations are also eligible.

Eligible projects include but are not limited to:

- Planning that supports conservation of wildlife travel corridors.
- A land use, transportation or other plan draft that considers effective wildlife conservation.
- Creation or improvement of incentives for conservation-based land use and or development through local ordinances.

The NCWRC is the state government agency created by the General Assembly in 1947 to conserve and sustain the state's fish and wildlife resources through research, scientific management, wise use and public input. More information about this program can be found at https://www.ncwildlife.org/Conserving/Programs/Green-Growth-Toolbox/Technical-Assistance

Foundations

Wildlife crossings have been implemented throughout the United States with the support of foundations whose giving policies align with wildlife conservation and connectivity. From the groundbreaking wildlife crossing project in progress that will protect and restore wildlife habitats in Southern California supported by the Annenberg Foundation,[46] to the Community Foundation of Western North Carolina supporting the advancement of wildlife connectivity and crossings in their region of North Carolina,[47] opportunities exist to align philanthropic giving to wildlife crossing efforts. The North Carolina Office of State Budget and Management has developed a list of resources (https://www.osbm.nc.gov/documents/files/grant-seeking-resources-may-2022/open) for grant seekers that can help identify funding opportunities.

4.2 Land Acquisition and Conservation

Land use is an important consideration in planning for wildlife crossing projects. To reduce the likelihood of ecological dead ends and gaps in an identified wildlife corridor, it is ideal to implement wildlife crossing solutions within and adjacent to natural and managed lands which offer opportunities for wildlife to move and thrive within their natural habitat. Therefore, the acquisition of land to preserve natural areas and implement wildlife crossing solutions is an important step to take to ensure wildlife connectivity and reduce the likelihood of WVCs.

Transportation agencies and funding entities, such as state DOTs, may be more inclined to incorporate wildlife crossing countermeasures into projects if there is reasonable guarantee

that the effectiveness of the project or structure will not be compromised by commercial or residential development in the future. Securing and conserving the land on either side of the road from development can help encourage and generate support for wildlife crossing projects.[48]

Priority sites may also be within or adjacent to property owned by private entities. In cases where implementing wildlife crossing countermeasures at a particular site will have a positive impact on reducing WVCs, engaging these private entities – whether a private owner, company, or business – to consider supporting enhancing wildlife crossings may be worthwhile and align with their interests. Discussion could lead to conservation easements, development rights, or financial assistance.

4.3 Partnerships

Wildlife crossing projects can be realized through partnerships. Agencies such as MPOs, state DOTs, local governments, advisory committees, conservation agencies and organizations, and environmental groups all have resources, expertise, and insight that can be leveraged and combined to thoughtfully plan for wildlife crossing projects and achieve shared goals. Partnerships are essential in the planning process. The DCHC MPO leveraged many existing, and created new, partnerships as part of its wildlife crossing planning study.

Section 5

APPENDICES

APPENDIX A - GLOSSARY

Box culvert: A type of culvert used by NCDOT. The two types of box culverts found in NCDOT Right of Way are Reinforced Concrete and Aluminum. All box culverts require headwalls typically made of concrete or metal, and some may be three-sided (bottomless) due to environmental or constructability reasons, such as fish passage or bedrock.[49] Box culverts provide an opportunity for wildlife to travel through the structure rather than on the roadway.

Bridge: A structure 20 feet in length or more constructed to span over roadways, other bridges (flyovers), streams, wetlands, railroads, or any condition which requires a grade separation.[50]

Comprehensive Transportation Plan (CTP): Developed and adopted by both the DCHC MPO and North Carolina Department of Transportation (NCDOT), the CTP is a long-range, multimodal transportation plan that shows the future plans and projects for the major highways, intersections, bus transit, passenger rail, bicycle and pedestrian, and other transportation facilities. The CTP shows expected new facilities and whether there are planned improvements for current facilities. The CTP is not fiscally constrained.[51]

Connectivity (landscape, habitat, or ecological connectivity, landscape permeability): The degree to which the landscape facilitates or impedes movement of organisms or processes.[52] The extent to which a species or population can move among landscape elements in a mosaic of habitats. This necessitates linkages among individuals, species, communities, and ecosystems at appropriate spatial and temporal scales. Corridors are one means of achieving connectivity.[53] A measure of the ability of organisms, gametes, and propagules to move among separated patches of suitable habitat. Ideally, corridors serve to facilitate connectivity over time and can operate at a range of spatial scales.[54]

Conservation planning: The process that occurs when a group of stakeholders consider the status of an area's natural environment and identify goals and strategies for conserving the area's natural heritage and biological diversity.[55]

Corridor (landscape, habitat, or wildlife corridor): Avenues along which wide-ranging animals can travel, plants can propagate, genetic interchange can occur, populations can move in response to environmental changes and natural disasters, and threatened species can be replenished from other areas (The Ninth US Circuit Court of Appeals 1997 in Walker and Craighead 1997). Any space that facilitates the movement of populations, individuals, gametes or propagules, and plant parts capable of vegetative reproduction in a matter of minutes, hours, or over multiple generations of a species. Corridors may encompass altered or natural areas of vegetation and provide connectivity that allows biota to spread or move among habitat fragments through areas otherwise devoid of preferred habitat. Landscape elements that function as corridors may also serve multiple other purposes, providing aesthetic amenities, ecosystem service values, cultural heritage protection, and recreational opportunities.[56]

Culvert: A metal, concrete, or plastic structure that conveys runoff surface water underneath a road, railroad, driveway, or any other obstruction to the natural flow of water rather than a storm drain system. Common types of culverts include round pipes, pipe arches, and box culverts, which may include multiple culverts or a combination of different sizes, types, and elevations at the same location.[57] Culverts provide an opportunity for wildlife to travel through the structure rather than on the roadway.

Ecosystem: An ecosystem is a community of living organisms (plants, animals, and microbes) in conjunction with the nonliving components of their environment (air, water, and mineral soil), interacting as a system. It is a system of environmental conditions, habitats, natural communities, and species that interact.[58]

Ecosystem services: The benefits people obtain, directly or indirectly, from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling. The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services.[59]

Flashing beacon (warning sign): A flashing beacon is a highway traffic signal with one or more signal sections that operates in a flashing mode. It can provide traffic control when used as an intersection control beacon or it can provide warning when used in other applications.[60]

Habitat: The physical features (such as topography, geology, stream flow) and biological characteristics (such as vegetation cover and other species) needed to provide food, shelter, and reproductive needs of animal or plant species.[61]

Habitat fragmentation: The breaking up of previously continuous habitat (or ecosystem) into spatially separated and smaller parcels. Habitat fragmentation results from human land use associated with forestry, agriculture, and settlement, but can also be caused by natural disturbances like wildfire, wind, or flooding. Suburban and rural development commonly changes patterns of habitat fragmentation of natural forests, grasslands, wetlands, and coastal areas as a result of adding fences, roads, houses, landscaping, and other development activities.[62]

Habitat patch: A relatively homogeneous type of habitat that is spatially separated from other similar habitat and differs from its surroundings.[63] A discrete area of contiguous habitat, often above a size threshold representing the habitat needs of an organism or species, or the functional needs of a natural community.

Habitat-corridor network: A connected set of discrete habitat patches and corridors between them.[64]

Landscape bridge: The largest type of wildlife crossing structure designed exclusively for wildlife, not human use. These structures are between 230 to 330 feet in length, are primarily intended to offer continued movement over highways for a variety of wildlife of all sizes, and they incorporate vegetation and habitat elements to encourage use by wildlife.[65]

Landscape connectivity: The degree to which the landscape facilitates wildlife movement and other ecological flows.[66]

Manual on Uniform Traffic Control Devices (MUTCD): A document issued by the Federal Highway Administration of the United States Department of Transportation to specify the standards by which traffic signs, road surface markings, and signals are designed, installed, and used.

Metropolitan Transportation Plan (MTP): The MTP is a fiscally constrained, federally-required long-range transportation plan that identifies how metropolitan areas will manage and operate a multi-modal transportation system (including transit, highway, bicycle, pedestrian, and accessible transportation) to meet the region's economic, transportation, development and sustainability goals – among others – for a 20+-year planning horizon.[67] As a practical matter, the MTP is important because projects to be submitted into the prioritization process for possible state and federal funding must come from the MTP, and local governments use the MTP to reserve right-of-way for future highway and rail transit projects.[68]

Movement barrier: A physical object or environmental condition that obstructs or prohibits animal movement from one part of the landscape to another.[69]

Passage bench (wildlife crossing counter measure): A gravel-surface path that is incorporated into bridge riprap that provides wildlife with continued travel underneath a bridge. Typically built under bridges that are along waterways, this wildlife crossing counter measure is intended to reduce the likelihood of wildlife traveling across roadways and into vehicular traffic.[70]

Passive warning signs: Passive traffic control systems, consisting of signs and pavement markings only, identify and direct attention to the location of a grade crossing and advise road users to reduce their speed or stop at the grade crossing as necessary in order to yield to any rail traffic occupying, or approaching and in proximity to, the grade crossing. Signs and markings regulate, warn, and guide the road users so that they, as well as LRT vehicle operators on mixed-use alignments, can take appropriate action when approaching a grade crossing.[71]

Retrofit (wildlife crossing countermeasure): An action to existing infrastructure (bridge, culvert, etc.) that helps to encourage wildlife movement and thus makes the existing infrastructure functional for wildlife connectivity.[72]

Resilience: The ability to retain essential processes in the face of disturbances or expected shifts in ambient conditions; ecosystem resilience provides the ability to support native diversity.[73]

Riprap: Riprap is a layer of large stones that protects soil from erosion in areas of high or concentrated flows. It is especially useful for armoring channel and ditch banks, among other features.[74] Since riprap can pose an obstacle for wildlife underneath bridges, remediation has been done that repositions riprap along banks and hills to create a gravel path for wildlife travel referred to as a wildlife bench.

Road ecology: The subject of ecological investigation building on the mounting evidence that roads are having dramatic effects on ecosystem components, processes and structures, and that the causes of these effects are as much related to engineering as to land use planning and transportation policy. Road ecology is rooted in ecology, geography, engineering and planning.[75]

Round pipe: The most common type of culvert used within the NCDOT Right of Way. Sizes begin at 15 inches and continue from 18 to 144 inches in half foot increments.[76] Round pipes, depending on the size, can provide an opportunity for wildlife to travel through the structure rather than on the roadway.

Wetland: Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.[77]

Wildlife crossing (wildlife road crossing, wildlife crossing structure): A structure that allows wildlife to pass over or under a roadway without crossing the flow of traffic, reconnecting severed habitat and reducing wildlife-vehicle collisions.[78]

Wildlife guard: "Wildlife guards – essentially larger versions of the cattleguards used in ranch country – consist of a grate of rounded metal bars installed at road grade (and tied into fencing on either side), strong enough to support passing vehicles, but difficult for hoofed animals to safely navigate.[79]

Wildlife overpass: The second largest type of wildlife crossing structure designed exclusively for wildlife (next to the landscape bridge), not human use. These structures are between 130 to 230 feet in length, are primarily intended to offer continued movement over highways for a variety of wildlife of all sizes, and they incorporate vegetation and habitat elements to encourage use by wildlife.[80]

APPENDIX B - ACRONYMS

The following is a list of acronyms, and their complete terms used in this plan.

Acronym	Term
AADT	Annual average daily traffic
AVC	Animal-vehicle crash
AWDT	Average weekday traffic
CTP	Comprehensive Transportation Plan
CTT	Core Technical Team
DCHC MPO	Durham-Chapel Hill-Carrboro Metropolitan Planning Organization
FHWA	Federal Highway Administration
GIS	Geographic information system(s)
MTP	Metropolitan Transportation Plan
MUTCD	Manual on Uniform Traffic Control Devices
NCDNCR	North Carolina Department of Natural and Cultural Resources
NCWRC	North Carolina Wildlife Resources Commission
NCDOT	North Carolina Department of Transportation
ROW	Right-of-way
STIP	State Transportation Improvement Program
TCCTW	Triangle Connectivity Collaborative Transportation Workgroup
UNNH	Upper Neuse New Hope
USACE	United States Army Corps of Engineers
WN	Wildlands Network
WVC	Wildlife-vehicle collision

APPENDIX C - WILDLIFE AFFECTED BY CROSSINGS IN THE DCHC MPO PLANNING AREA

The following list of wildlife was researched and retrieved from the North Carolina Wildlife Resources Commission at https://www.ncwildlife.org/wildlife-habitat/species.

Name	Scientific Name	Size	Species
American Toad	Bufo (Anaxyrus) americanus	Small	Amphibian
Bullfrog	*Rana catesbeiana*	Small	Amphibian
Cope's Gray Treefrog	*Hyla chrysoscelis*	Small	Amphibian
Cricket Frogs (Northern and Southern)	*Acris crepitans*	Small	Amphibian
Dwarf Salamander	*Eurycea quadridigitata*	Small	Amphibian
Eastern Newt	*Notophthalmus viridescens*	Small	Amphibian
Eastern Narrowmouth Toad	*Gastrophryne carolinensis*	Small	Amphibian
Eastern Spadefoot	*Scaphiopus holbrookii*	Small	Amphibian
Four-toed Salamander	*Hemidactylium scutatum*	Small	Amphibian
Fowler's Toad	*Bufo (Anaxyrus) fowleri*	Small	Amphibian
Green Frog	*Rana clamitans*	Small	Amphibian
Green Tree Frog	*Hyla cinera*	Small	Amphibian
Marbled Salamander	*Ambystoma opacum*	Small	Amphibian
Mud Salamander	*Pseudotriton montanus*	Small	Amphibian
Northern Dusky Salamander	*Desmognathus fuscus*	Small	Amphibian
Pickerel Frog	*Rana palustris*	Small	Amphibian
Red-backed Salamander	*Plethodon cinereus*	Small	Amphibian
Red Salamander	*Pseudotriton ruber*	Small	Amphibian
Slimy Salamander	*Plethodon cylindraceus*	Small	Amphibian
Southern Leopard Frog	*Rana sphenocephala*	Small	Amphibian
Southern Two-lined Salamander	*Eurycea cirrigera*	Small	Amphibian
Spotted Salamander	*Ambystoma maculatum*	Small	Amphibian
Spring Peeper	*Pseudacris crucifer*	Small	Amphibian
Three-lined Salamander	*Eurycea guttolineata*	Small	Amphibian
Upland Chorus Frog	*Pseudacris feriarum*	Small	Amphibian
Hoary Bat	*Lasiurus cinereus*	Small	Bat
Little Brown Bat	*Myotis lucifugus*	Small	Bat
Seminole Bat	*Lasiurus seminolus*	Small	Bat
Tricolored Bat	*Perimyotis subflavus*	Small	Bat
Canada Goose	*Branta canadensis*	Small	Bird
Eastern Wild Turkey	*Meleagris gallopavo*	Medium	Bird
Turkey Vulture	*Cathartes aura*	Medium	Bird
Beaver	*Castor canadensis*	Small	Mammal
Eastern Chipmunk	*Tamias striatus striatus*	Small	Mammal
Eastern Cottontail	*Sylvilagus floridanus*	Small	Mammal
Eastern Gray Squirrel	*Sciurus carolinensis*	Small	Mammal
Fox Squirrel	*Sciurus niger vulpinus*	Small	Mammal
Groundhog	*Marmota monax*	Small	Mammal
Long-tailed Weasel	*Mustela frenata*	Small	Mammal
Marsh Rabbit	*Sylvilagus palustris*	Small	Mammal
Mink	*Mustela vison*	Small	Mammal

Muskrat	*Ondatra zibethicus*	Small	Mammal
Nine-banded Armadillo	*Dasypus novemcinctus*	Small	Mammal
Nutria	*Myocaster coypus bonariensis*	Small	Mammal
Raccoon	*Procyon lotor*	Small	Mammal
Southern Flying Squirrel	*Glaucomys volans*	Small	Mammal
Striped Skunk	*Mephitis mephitis*	Small	Mammal
Virginia Opossum	*Didelphis virginiana*	Small	Mammal
Bobcat	*Lynx rufus*	Medium	Mammal
Coyote	*Canis latrans*	Medium	Mammal
Feral Swine	*Sus scrofa*	Medium	Mammal
Gray Fox	*Urocyon cinereoargenteus*	Medium	Mammal
North American River Otter	*Lontra canadensis*	Medium	Mammal
Red Fox	*Vulpes vulpes*	Medium	Mammal
White-tailed Deer	*Odocoileus virginianus*	Large	Mammal
Broad-headed Skink	*Plestiodon laticeps*	Small	Reptile
Brown Snake	*Storeria dekayi*	Small	Reptile
Common Musk Turtle	*Sternotherus odoratus*	Small	Reptile
Common Snapping Turtle	*Chelydra serpentina*	Small	Reptile
Copperhead	*Agkistrodon contortrix*	Small	Reptile
Corn Snake	*Elaphe guttata*	Small	Reptile
Eastern Box Turtle	*Terrapene carolina carolina*	Small	Reptile
Eastern Fence Lizard	*Sceloporus undulatus*	Small	Reptile
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	Small	Reptile
Eastern Hognose Snake	*Heterodon platirhinos*	Small	Reptile
Eastern Kingsnake	*Lampropeltis getula*	Small	Reptile
Eastern Milksnake	*Lampropeltis triangulum triangulum*	Small	Reptile
Eastern Mud Turtle	*Kinosternon subrubrum*	Small	Reptile
Eastern Painted Turtle	*Chrysemys picta picta*	Small	Reptile
Eastern Ribbon Snake	*Thamnophis sauritus*	Small	Reptile
Five-lined Skink	*Eumeces (Plestiodon) fasciatus*	Small	Reptile
Green Anole	*Anolis carolinensis*	Small	Reptile
Ground Skink	*Scincella lateralis*	Small	Reptile
Mole Kingsnake	*Lampropeltis rhombomaculata*	Small	Reptile
Northern Watersnake	*Nerodia sipedon*	Small	Reptile
Queen Snake	*Regina septemvittata*	Small	Reptile
Racer	*Coluber constrictor*	Small	Reptile
Rat Snake	*Elaphe obsoleta*	Small	Reptile
Red-bellied Snake	*Storeria occipitomaculata*	Small	Reptile
Red-bellied Watersnake	*Nerodia erythrogaster*	Small	Reptile
Ring-necked Snake	*Diadophis punctatus*	Small	Reptile
River Cooter	*Pseudemys concinna*	Small	Reptile
Rough Earth Snake	*Haldea striatula*	Small	Reptile
Rough Green Snake	*Opheodrys aestivus*	Small	Reptile
Scarlet Kingsnake	*Lampropeltis elapsoides*	Small	Reptile
Scarlet Snake	*Cemophora coccinea*	Small	Reptile
Six-lined Racerunner	*Cnemidophorus sexlineatus*	Small	Reptile
Slender Glass Lizard	*Ophisaurus attenuatus*	Small	Reptile
Smooth Earth Snake	*Virginia valeriae*	Small	Reptile
Southeastern Five-lined Skink	*Plestiodon inexpectatus*	Small	Reptile
Southeastern Crowned Snake	*Tantilla coronata*	Small	Reptile

Spotted Turtle	*Clemmys guttata*	Small	Reptile
Striped Mud Turtle	*Kinosternon baurii*	Small	Reptile
Timber Rattlesnake	*Crotalus horridus*	Small	Reptile
Yellow-bellied Slider	*Trachemys scripta*	Small	Reptile

APPENDIX D - WILDLIFE CROSSING SITE ASSESSMENT FORM

DCHC MPO staff and Triangle Connectivity Collaborative Transportation Workgroup members utilized a Wildlife Crossing Site Assessment Form for use during onsite assessments. This form was developed in partnership with the North Carolina Wildlife Resources Commission for the MPO's planning process.

WILDLIFE CROSSING SITE ASSESSMENT FORM	
Name of Reviewer:	
Date of Site Assessment:	
Site Name:	
	Assessment Description
1	**What is the existing crossing structure code found in the NCDOT Structure Locations GIS database?**
2	**Corridor IDs (and priority level) associated with this potential crossing site in the Upper Neuse-New Hope Landscape Analysis dataset.**
3	**What is the creek name that is intersected by the structure?**
4	**Provide useful directions for finding the crossing (example: Johnston Mill Nature Preserve - Mt Sinai Access; Off Old NC 86 in Hillsborough).**
5	**Please take a photo of the structure that depicts the general aspect of the crossing, and others as you feel are necessary to help communicate the challenge. Full name of the photo used for ID.**
	Was a photo taken? Yes / No (circle one)
6	**What type of crossing is this? Bridge: a deck supported by abutments (or stream banks); Culvert: a structure buried under some amount of fill; Pipe: a cylinder culvert, typically metal; Other: railroads, fords, or other crossing types.**
	Bridge / Culvert / Pipe / Other (circle one)
7	**What is the width of the underpass? Large: over 60 ft wide with 8 ft vertical clearance; medium: less than 60 ft but more than 4 feet wide; small: less than 4ft/48 inch diameter**
	[May be able to input information from NCDOT's NBS data regarding structure size then confirm that information during site visit] Large / Medium / Small (circle one)
8	**How many cells / openings are there for the bridges or culvert structures?**

9	**Provide a comparison of the substrate (e.g., rock, gravel, sand) inside the structure and the substrate in the natural, undisturbed stream channel.**
	None / Comparable / Contrasting / Not Appropriate / Unknown (circle one)
10	**Barriers associated with the crossing. <u>Indicate all that apply:</u> riprap, debris / sediment / rock, deformation, free fall, fencing, dry, standing water, other -- or none.**
11	**Is there a continuous dry stream bank through at least one side of the structure?**
	Yes / No / Unknown / (circle one)
12	**If a culvert, can you see through to the other side of the structure?**
	Yes / No / Unknown / N/A (circle one)
13	**If a culvert, is dry passage tied into the bank at each end?**
	Yes / No / Only one side / Unknown / N/A (circle one)
14	**Is there is evidence of road kills at the date of the assessment?**
	Yes / No / Unknown (circle one)
15	**Is there evidence of wildlife using the crossing at the date of the assessment?**
	Yes / No / Unknown (circle one)
16	**Identify key species along corridor/crossing.**
	This may have to be researched after the site assessment unless there is evidence or is in existing GIS data.
17	**Provide comments about any aspect of the overall crossing that warrants additional information. What do you see as the main problem with the crossing, and what do you see should be implemented to correct the problem?**
18	**List any known property owners of land adjacent to the crossing.**
19	**Is there a greenway or potential for a future greenway trail?** Existing greenway / Yes, potential presence / No (circle one)

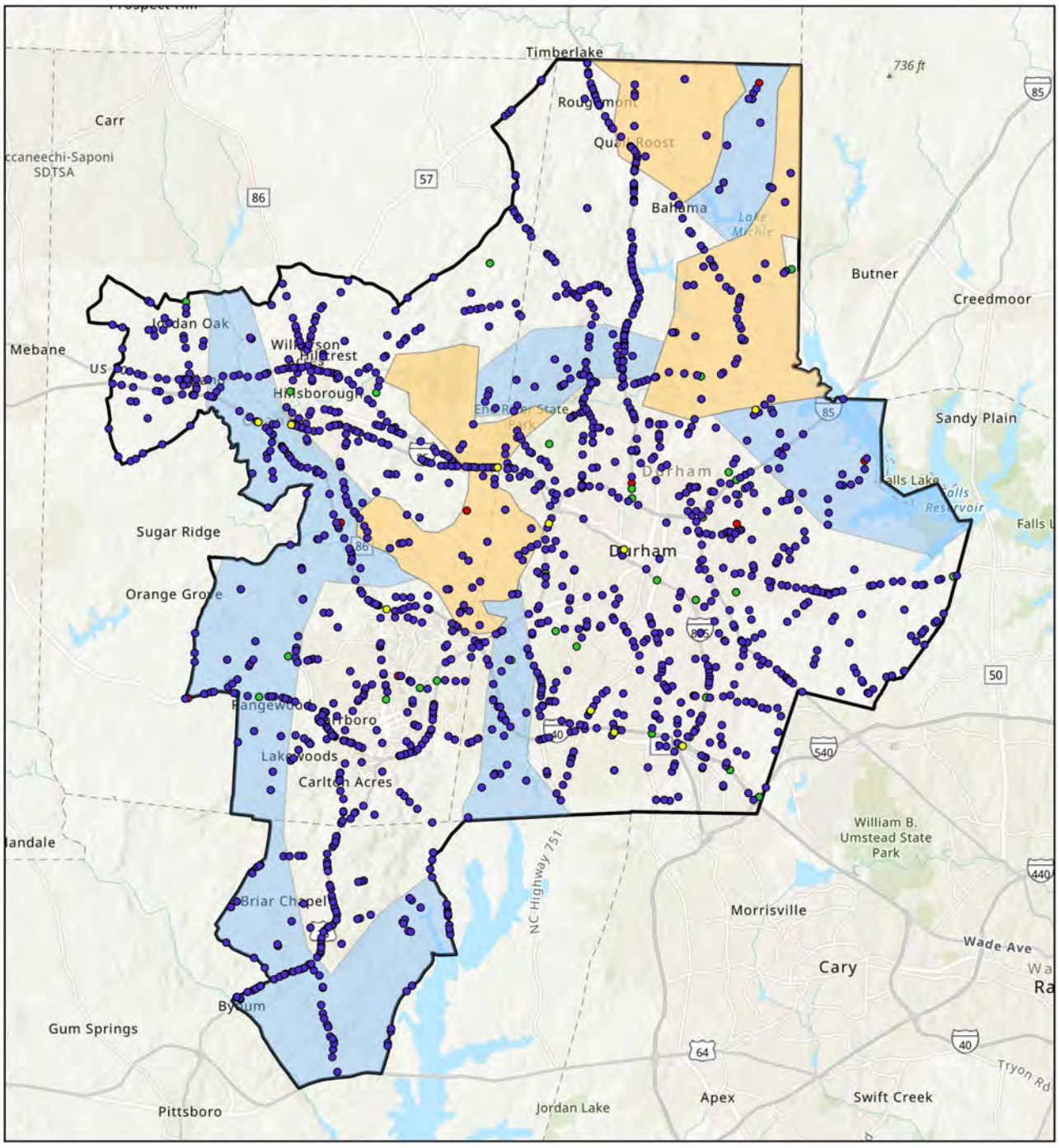
APPENDIX E - WILDLIFE CROSSING PROJECT SHEET DESCRIPTIONS

Each project sheet describes elements associated with the wildlife crossing site that helps guide the wildlife crossing countermeasures for consideration. The following is a description of each element.

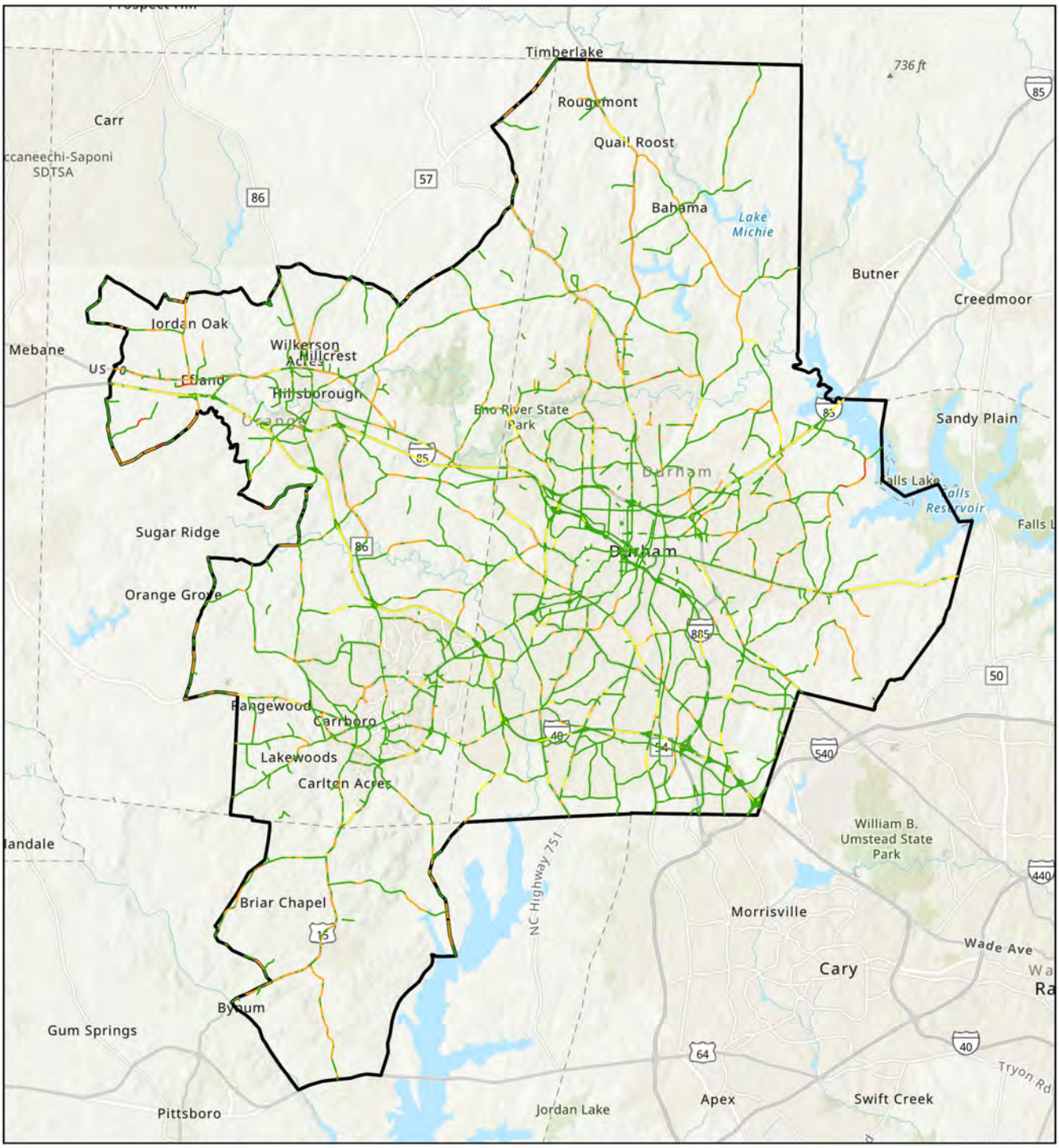
Location ID	Unique number assigned by the MPO to identify the project.
Date of Site Visit	Date that a site assessment was conducted.
Jurisdiction	The jurisdiction that the site resides in.
Coordinates	GPS coordinates of the site.
NCDOT Crossing/Structure Code	Unique number/code assigned by NCDOT to identify a structure (bridge, culvert, etc.).
Existing Structure Type	The type of structure being assessed at the site.
Preferred Scenario	The preferred recommendation for a site to reduce WVCs and allow wildlife to travel under/through a structure.
Alternate Scenario	An alternate recommendation to the preferred scenario for a site to reduce WVCs and allow wildlife to travel under/through a structure.
Property Owner Type	Public or private ownership. Provides insight into feasibility of implementing wildlife crossing solutions at a given site.
Natural/Managed Lands	Each crossing site was reviewed for adjacent natural and managed lands. Natural and managed lands can help create effective wildlife crossing sites due the protected wildlife habitat that they provide.
Existing Plan Alignment	Name of MPO, state or local plan that includes projects that align with the wildlife crossing site.
AADT (2019)	The average annual daily traffic count in 2019 of the road that crosses the site. AADT was analyzed to help determine the likelihood of a WVC.
AADT (2021)	The average annual daily traffic count in 2021 of the road that crosses the site. AADT was analyzed to help determine the likelihood of a WVC.
Projected AWDT	The average weekday traffic of the road that crosses the site. AWDT was analyzed to help determine the likelihood of a WVC.
Speed Limit	The speed limit of the road that aligns with the site was analyzed to help determine driver reaction time and the likelihood of a WVC.
Reported Wildlife-Vehicle Collisions (2018-2022) (1-mile -buffer)	NCDOT's reported WVC data was analyzed for each site using a 1-mile buffer. Each reported WVC was then analyzed for the type of crash/ injury type, and the comprehensive crash cost estimate by crash/injury type was totaled to determine the estimated cost these WVCs caused.
Likely WVCs within 1-mile buffer (based on VDOT study revealing 8.5 times more WVCs are occurring than what DOT reports show)	This section details the potential impact of likely WVCs at the site location. Using NCDOT's reported WVC data as a starting point, each crash and estimate was multiplied by 8.5 to coincide with Virginia DOT's study findings that WVCs are likely occurring 8.5 times more often than what law enforcement reports and DOTs show.

APPENDIX F - MAP OF REPORTED WILDLIFE-VEHICLE CRASHES IN THE DCHC MPO PLANNING AREA (2018-2022, NCDOT)

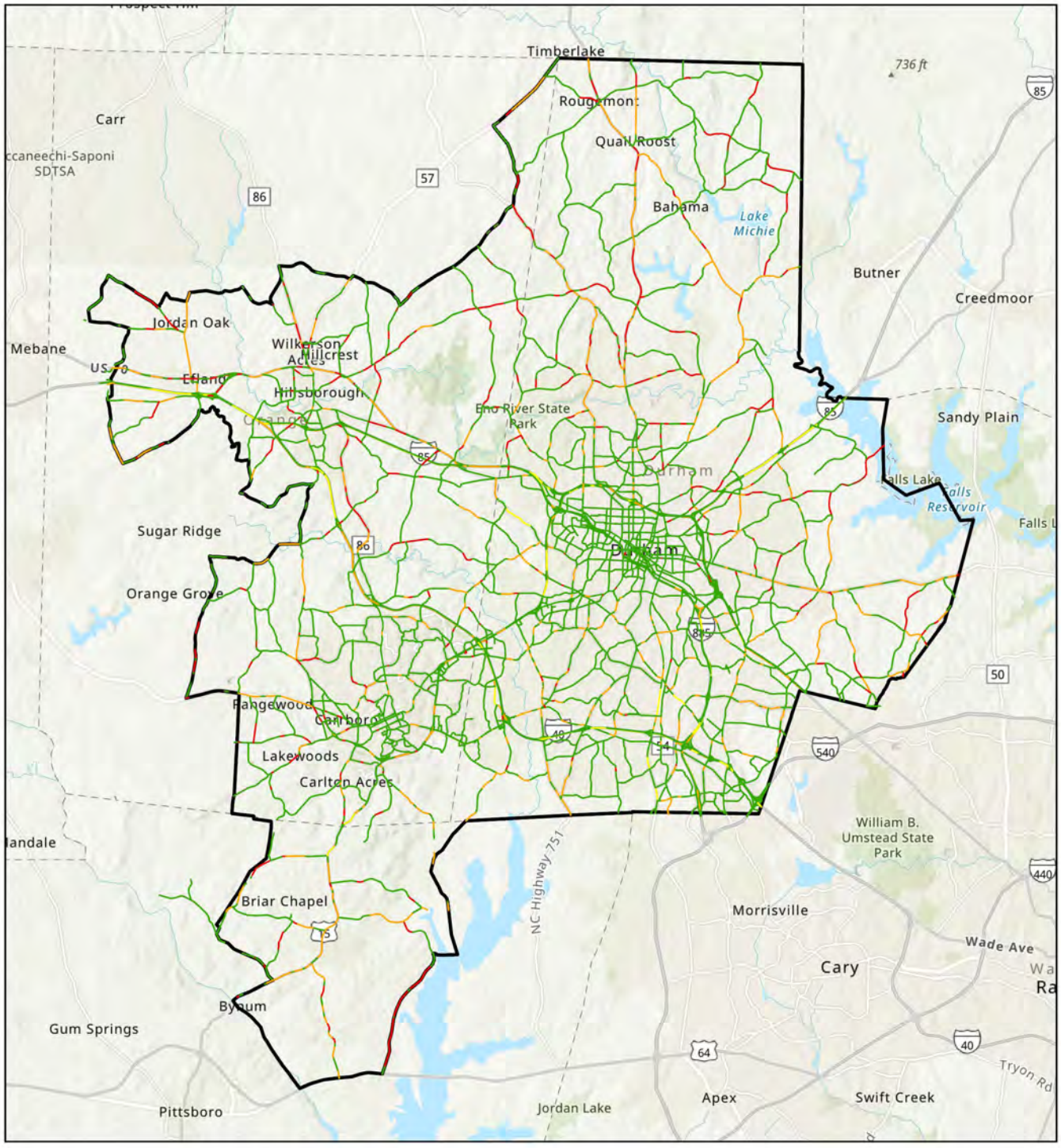
Each point on this layer does not indicate a single reported crash, as some points represent more than one crash event.



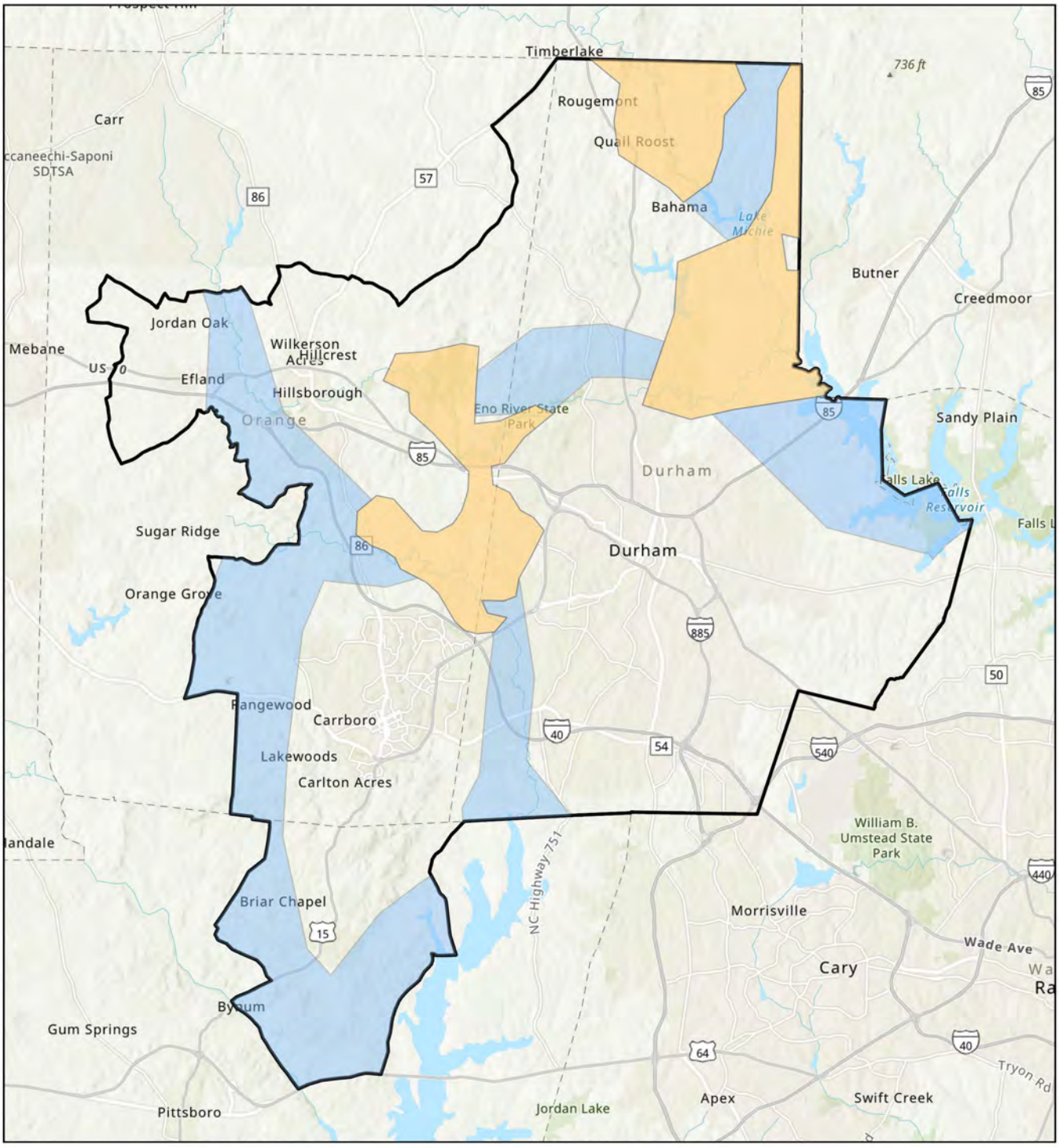
APPENDIX G – MAP OF CURRENT WILDLIFE-VEHICLE CRASH RATE IN THE DCHC MPO PLANNING AREA



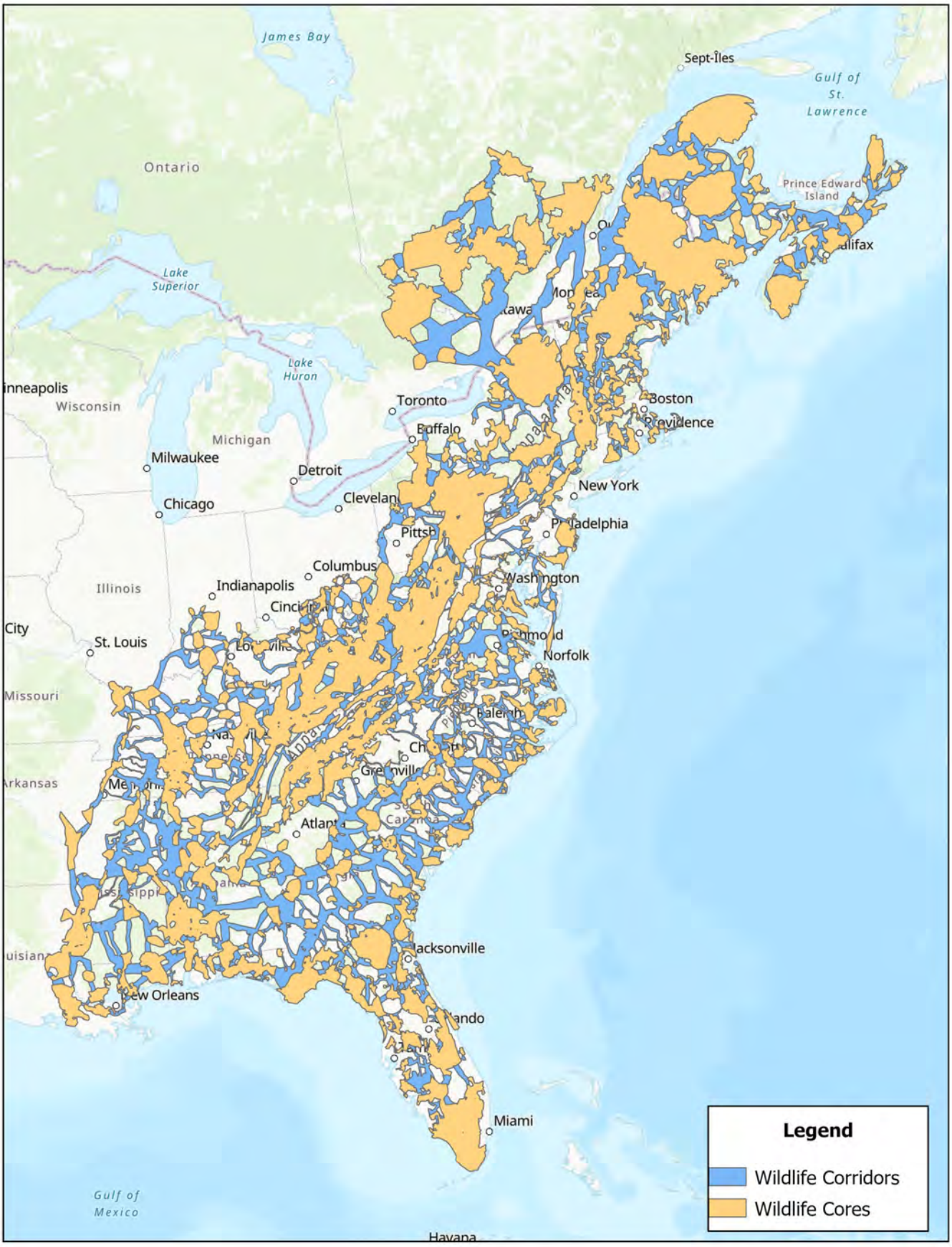
APPENDIX H – MAP OF PROJECTED WILDLIFE-VEHICLE CRASH RATE IN THE DCHC MPO PLANNING AREA



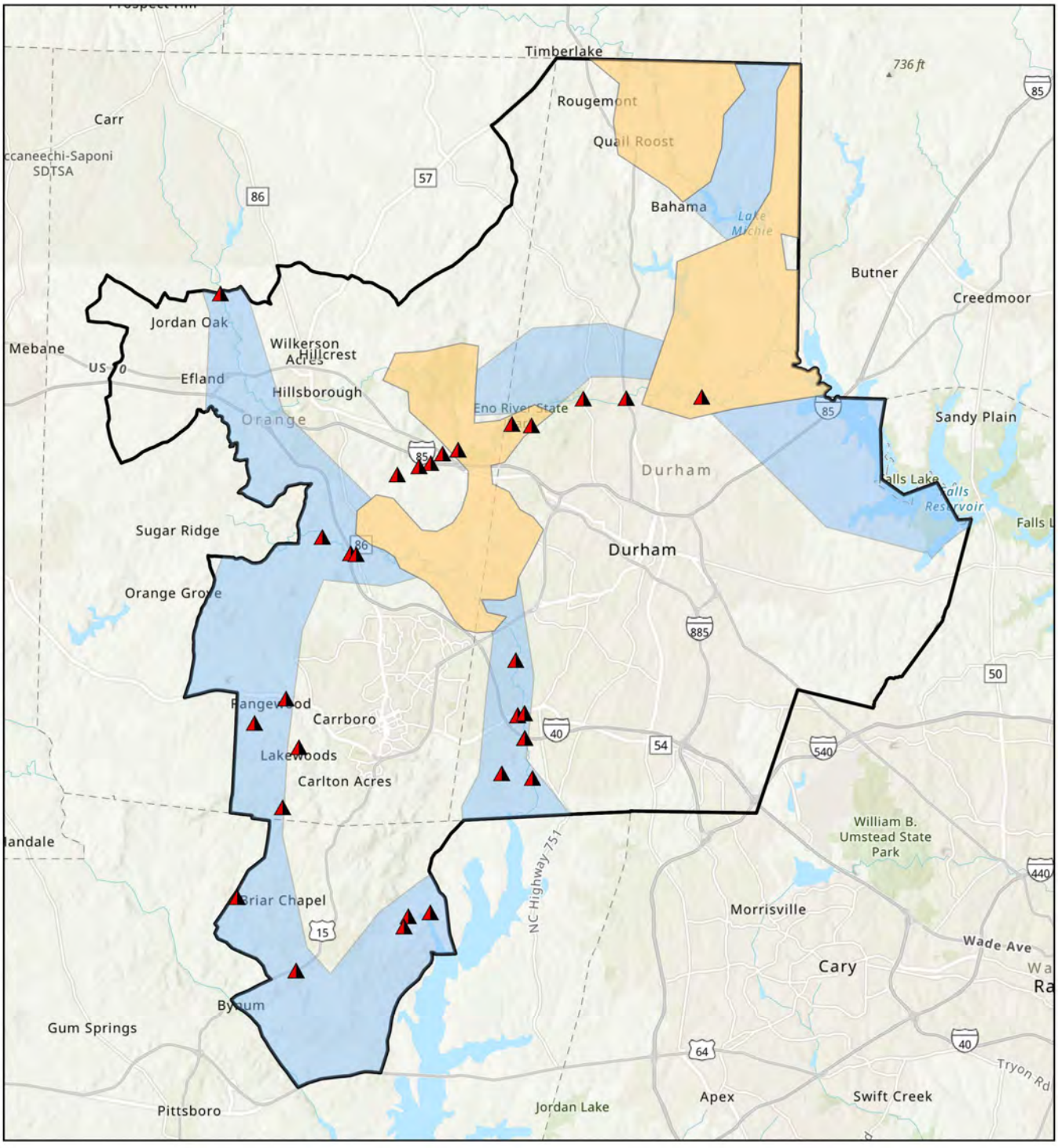
APPENDIX I – MAP OF WILDLIFE CORES AND CORRIDORS IN THE DCHC MPO PLANNING AREA



APPENDIX J – MAP OF WILDLIFE CORES AND CORRIDORS IN THE EASTERN SEABOARD



APPENDIX K – MAP OF WILDLIFE CROSSING PROJECTS IN THE DCHC MPO PLANNING AREA



Wildlife Infrastructure Funding Opportunities within the Infrastructure Investment & Jobs Act

Prepared by Renee Callahan, ARC Solutions, info@arc-solutions.org

Program Name	Amount† (FY22-26)	Eligible applicants					New, Expanded, Existing	Process	Federal Share (%)	Eligible wildlife-related activities
		FLMA	Tribe	State DOT	MPO	Local Gov't				
More information about notice and application timing is available in the companion funding calendar: tinyurl.com/ARC-funding-calendar										
Wildlife Crossings Pilot Program (23 USC 171)	$350M	✓	✓	✓	✓	✓	New	DG Due 9/4/24	Typically 80%; up to 90% for projects on Interstates	Projects to reduce wildlife-vehicle collisions and improve terrestrial/aquatic connectivity, including construction and non-construction projects, involving planning, research, outreach, and feasibility analyses
INFRA (23 USC § 117)	$8B	✓1	✓	✓	✓3	✓	Expanded	DG	INFRA award may be used for up to 60% of project costs	Wildlife crossing projects
Rebuilding American Infrastructure with Sustainability & Equity (49 USC § 6702)	$7.5B		✓	✓	✓	✓	Existing	DG	Typically 80%; except rural, disadvantaged, or persistent poverty areas	Wildlife-related highway and bridge projects eligible under Title 23 USC programs, plus projects to improve aquatic connectivity by replacing or rehabilitating culverts or preventing stormwater runoff
Rural Surface Transportation Grant Program (23 USC § 173)	$2B		✓	✓	✓4	✓	New	DG	Typically 80%, except ADHS, DASP projects	Wildlife-related projects in Rural Areas otherwise eligible under the Surface Transportation Block Grant Program, Tribal Transportation Program, and Highway Safety Improvement Program
National Culvert Removal, Replacement & Restoration Program (49 USC § 6703)	$1B		✓	✓		✓	New	DG Due 9/23/24	Up to 80% for State/Local; up to 100% for Tribes	Projects to replace, remove, or repair culverts or weirs to restore anadromous fish passage, including infrastructure to facilitate fish passage around or over weirs, or weir improvements
Bridge Investment Program (23 USC § 124)	$12.5B	✓	✓	✓	✓3	✓	New	DG All NOFOs are open!	Typically up to 50% for Large Bridges; up to 80% for Small Bridges; up to 90% for Off-System Bridges	Up to 5% annually may go to projects to replace or rehabilitate culverts to improve flood control and habitat connectivity for aquatic species; environmental mitigation is also an eligible expense during bridge construction / reconstruction
Bridge								Due 11/1/24		
Large Bridge								Due 8/1/24		
Planning								Due 10/01/24		
Tribal Transportation Program Safety Fund (23 USC § 202(e))	$120M		✓				Existing	DG Re-opening 10/1/24	Up to 100%	Adding or retrofitting structures or other measures to eliminate or reduce wildlife-vehicle collisions
Nationally Significant Federal Lands & Tribal Projects Program (FAST 1123(c))	$275M	✓	✓	✓2	✓2	✓2	Existing	DG Expected Summer '24	Up to 90% for Federal Lands, 100% for Tribal	Same as Federal Lands Transportation Program, Federal Lands Access Program, and Tribal Transportation Program
PROTECT ‡ (23 USC § 176)	$1.4B	✓1	✓	✓	✓	✓	New	DG Expected Summer '24	Typically 80%, up to 100% for Federal /Tribal	Wildlife infrastructure is not expressly eligible; funding may be used for improved infrastructure resiliency via "protective features" or "natural infrastructure," which may co-benefit aquatic and/or terrestrial connectivity
Roadside Pollinator Program (23 USC § 332)	$10M ($3M in FY23)	✓	✓	✓			New	DG Extended! Due 7/18/24	Up to 100%	Pollinator-friendly activities on roadsides and highway rights-of-way, including planting and seeding native grasses and wildflowers, including milkweed

Suggested citation: Callahan, R. (2024). *Wildlife Infrastructure Funding Opportunities within the Infrastructure Investment & Jobs Act*. Summary prepared on behalf of ARC Solutions, NPCA, Wildlands Network. Bozeman, MT. ***Updated June 25, 2024***

Program Name	Amount (FY22-FY26)†	Eligible recipients					New, Expanded, Existing	Process	Federal Share (%)	Eligible wildlife-related activities
		FLMA	Tribe	State DOT	MPO	Local Gov't				
PROTECT ‡ (23 USC § 176) NC FY24 = $38.9M	$7.3B	✓[1]	✓	✓	✓	✓	New	State FA	Typically 80%, up to 100% for Federal /Tribal	Wildlife infrastructure is not expressly eligible; PROTECT does fund improved infrastructure resiliency via "protective features" such as increasing the size or number of culverts, which may improve aquatic and/or terrestrial connectivity
Bridge Formula Program (IIJA § 11108(a)(2)(A)) NC FY24 = $98.7M	$27.5B		✓	✓		✓	New	State FA	Same as 23 USC § 120; plus up to 100% for OSB	Wildlife mitigation appears to be an eligible expense during bridge reconstruction / construction, given expanded definition of "construction"
Highway Safety Improvement Program (23 USC § 148) NC FY24 = $80.4M	$15.6B	✓	✓	✓	✓	✓	Existing	State FA	Up to 90%, with statutory exceptions	Adding or retrofitting structures or other measures to eliminate or reduce wildlife-vehicle collisions
Surface Transportation Block Grant Program (23 USC § 133) NC FY24 = $334.7M Durham FY24 = $6,985,798	$64.8B (excluding TAP)		✓	✓	✓	✓	Expanded	State FA	Typically 80%, except Interstate projects (90%) & certain states	Construction, addition or retrofitting of wildlife crossings plus projects and strategies to reduce wildlife-vehicle collisions, including project-related planning, design, construction, monitoring, and preventative maintenance
Transportation Alternatives Program (TAP) (23 USC § 133(h)) NC FY24 TA set-aside= $41M Durham FY24 = $880,906	$7.2B		✓	✓[2]	✓	✓	Existing	State FG	Typically 80%, except in certain states	Environmental mitigation to reduce vehicle-caused wildlife mortality or to restore or maintain connectivity among terrestrial or aquatic habitats
Federal Lands Access Program (23 USC § 204) NC per FY = $2.6M	$1.5B		✓	✓		✓	Existing	State FG	Up to 100%	Environmental mitigation to improve public safety and reduce vehicle-caused wildlife mortality while improving or maintaining habitat connectivity
Federal Lands Transportation Program (23 USC § 203)	$2.2B	✓					Expanded	Federal FA	Up to 100%	Environmental mitigation to improve public safety and reduce vehicle-caused wildlife mortality while maintaining habitat connectivity; or to mitigate damage to wildlife, aquatic organism passage, habitat, and ecosystem connectivity including constructing, replacing, maintaining, or removing culverts and bridges
Tribal Transportation Program (TTP) (23 USC § 202)	$3B		✓				Existing	Tribal FA	Up to 100%	Environmental mitigation to improve public safety and reduce vehicle-caused wildlife mortality while maintaining habitat connectivity; or to mitigate damage to wildlife, aquatic organism passage, habitat, and ecosystem connectivity including constructing, replacing, maintaining, or removing culverts and bridges

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LEGEND

1 Applying jointly with one or more States
2 If requested or sponsored by another eligible entity
3 If the MPO has a population of greater than 200,000
4 MPOs may apply for eligible Rural projects within the MPO that are outside of an Urban Area

† Except as noted, FY22-26 total amounts do not reflect additional General Fund appropriations after FY22.
‡ Formula allocation is distributed to States only. MPOs/tribes/local governments are eligible recipients for PROTECT Discretionary Grant funds. FLMAs can apply jointly with a State or group of States.

Green: A Notice of Funding Opportunity (NOFO) is open and applications are being accepted until the deadline. Click on the program name to view an *At-A-Glance* summary of eligibility requirements.
Orange: NOFO is expected in Spring 2024.
Yellow NOFO is expected in Summer 2024.

Process:
Discretionary Grant (DG) - distributed at the national level; Formula Allocation (FA); Formula Grant (FG)

Eligible Applicants: Federal Land Management Agency (FLMA); Department of Transportation (DOT); Metropolitan Planning Organization (MPO); Local Government (Gov't)

Sources: Infrastructure Investment & Jobs Act; FHWA Bipartisan Infrastructure Law; FHWA Funding; FHWA HSIP; White House Guidebook; USDOT Upcoming NOFOs, FHWA Competitive Grant Funding Matrix

This guidance chart was prepared by Renee Callahan on behalf of ARC Solutions, National Parks Conservation Association, and Wildlands Network.
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ARC Solutions is a not-for-profit partnership whose mission is to identify and promote leading-edge solutions to improve human safety, wildlife mobility and long-term landscape connectivity.
ARC is fiscally sponsored by *Social and Environmental Entrepreneurs*. Contact: Renee Callahan (rcallahan@arc-solutions.org).
National Parks Conservation Association is a non-profit organization whose mission is to protect and enhance America's National Park System for present and future generations. Contact: Bart Melton (bmelton@npca.org).
Wildlands Network is a non-profit organization whose mission is to reconnect, restore and rewild North America so that life—in all its diversity—can thrive. Contact: Erin Sito (e.sito@wildlandsnetwork.org).

ARC NATIONAL PARKS CONSERVATION ASSOCIATION Wildlands NETWORK

DCHC MPO WILDLIFE CROSSING PLANNING STUDY SURVEY

The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization's Wildlife Crossings Planning Study is an MPO-led initiative with a goal of improving roadway safety by eliminating wildlife-vehicle crashes. This study and plan will recommend transportation improvements in the MPO planning area that prioritize safety, eliminate crash-related impacts, and help protect the natural environment.

Summary of Wildlife-Vehicle Crashes

Roads are a serious conflict point between wildlife and vehicles. North Carolina had over 20,000 reported wildlife-vehicle crashes in 2022 alone, which resulted in a crash cost estimate of $486 million dollars (NCDOT). However, the actual number of crashes is believed to be at least five times higher based on underreporting.

Wildlife-vehicle crashes are a significant safety issue in the MPO's planning area. Out of the 100 counties in North Carolina, the MPO's counties rank in the top third of highest reported crashes (Chatham ranks 21, Orange ranks 30, and Durham ranks 35). Between 2020-2022, these three counties had a combined crash cost estimate of almost $75 million dollars. DCHC MPO's plan recommends projects to eliminate wildlife-vehicle crashes in its planning area and their associated costs.

1. Prior to learning about the MPO's wildlife crossing study, how familiar were you with wildlife crossing countermeasures and wildlife-vehicle crash impacts?

☐ Very familiar ☐ Somewhat familiar ☐ Not familiar

2. Please indicate what materials you reviewed, and/or events attended before taking this survey. Check all that apply:

☐ MPO Draft Wildlife Crossings Plan
☐ DCHC MPO public engagement virtual event
☐ DCHC MPO public engagement in-person event
☐ DCHC MPO Wildlife Crossing Study project website
☐ Other _____

3. Please share the reasons why you feel incorporating wildlife crossing solutions within our transportation network is important or not important. Check all that apply:

☐ Wildlife well-being and connectivity
☐ Costs associated with wildlife-vehicle crashes (medical, repair, etc.)
☐ Reduction in vehicle crashes
☐ I do not feel that incorporating wildlife crossings solutions within our transportation network is important.
☐ Other _____

4. Your experience with roadway safety and wildlife-vehicle crashes are important. Please consider sharing your experience(s) with us.

_____

_____

5. Do you have additional feedback or comments about the draft plan?

_____

_____

OPTIONAL QUESTIONS

1. What is your household zip code? _____

2. Which race/ethnicity best describes you? (Please choose one)

☐ Asian or Pacific Islander ☐ Black or African American ☐ Hispanic or Latino ☐ Multiracial or Biracial

☐ Native American or Alaskan ☐ White or Caucasian ☐ Other _____

3. What is your gender identity?

☐ Female ☐ Male ☐ Non-binary/non-confirming ☐ Transgender ☐ Prefer not to say

4. I speak, read, and write English well.

☐ Yes ☐ No

5. What is your age group?

☐ 17 years or younger ☐ 18-24 ☐ 25-64 ☐ 65+

6. Is your total household income equal to or above $49,160 per year?

☐ Yes ☐ No

7. Five (5) or more people live in my household.

☐ Yes ☐ No

8. I am or am considered to be disabled.

☐ Yes ☐ No

9. My household has zero cars.

☐ Yes ☐ No

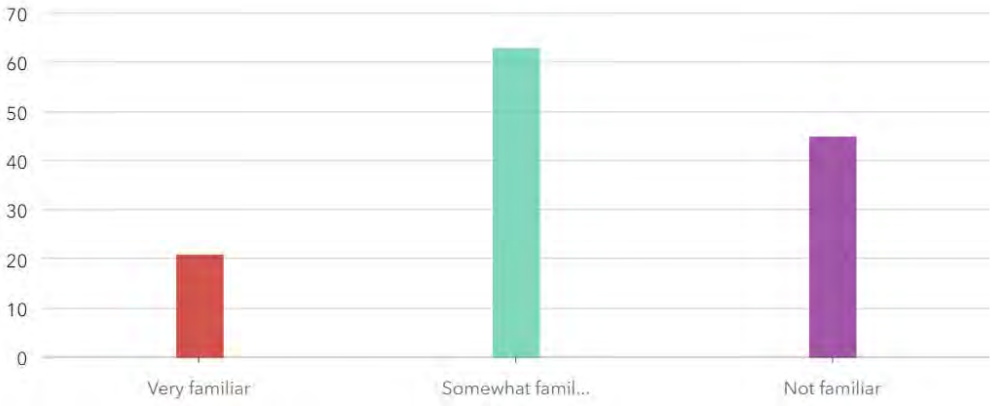
10. Would you like to receive our e-newsletter?

Please share your email if you would like to be added to the MPO's contact list

_____

APPENDIX N - WILDLIFE CROSSING PUBLIC ENGAGEMENT RESULTS

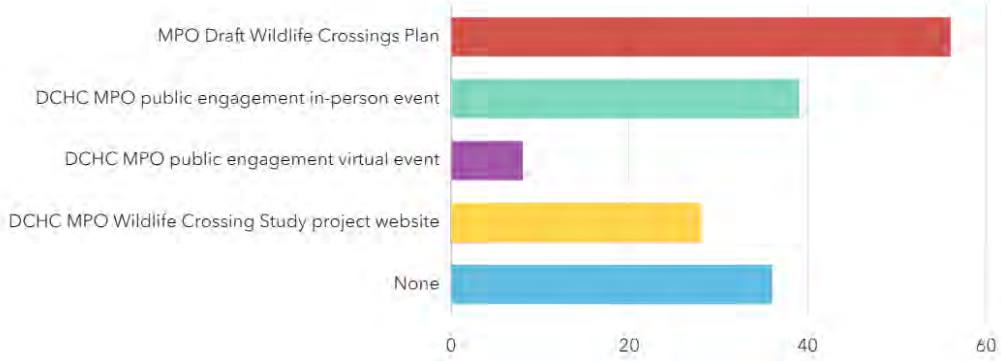
1. Prior to learning about the MPO's wildlife crossing study, how familiar were you with wildlife crossing countermeasures and wildlife-vehicle crash impacts?



Answers	Count	Percentage
Very familiar	21	16.28%
Somewhat familiar	63	48.84%
Not familiar	45	34.88%

Answered: 129 Skipped: 0

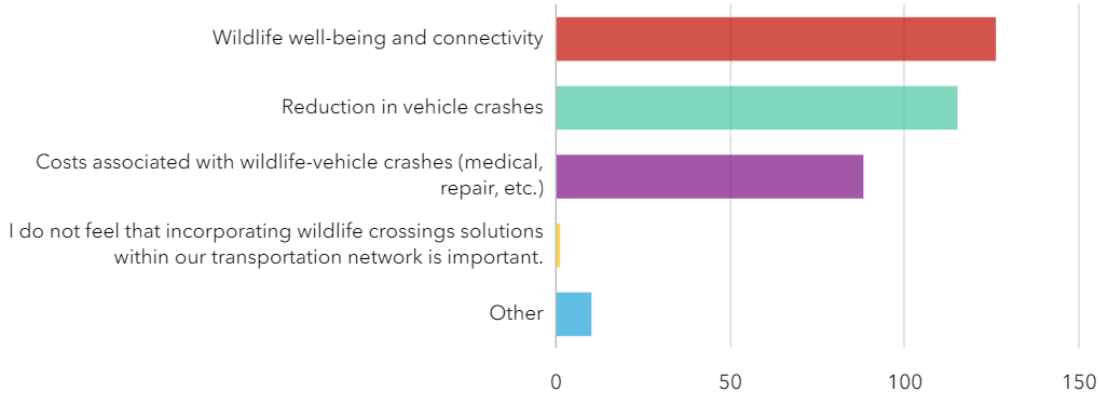
2. Please indicate what materials you reviewed, and/or events attended before taking this survey. Check all that apply:



Answers	Count	Percentage
MPO Draft Wildlife Crossings Plan	56	43.41%
DCHC MPO public engagement in-person event	39	30.23%
DCHC MPO public engagement virtual event	8	6.2%
DCHC MPO Wildlife Crossing Study project website	28	21.71%
None	36	27.91%

Answered: 128 Skipped: 1

3. Please share the reasons why you feel incorporating wildlife crossing solutions within our transportation network is important or not important. Check all that apply:



Answers	Count	Percentage
Wildlife well-being and connectivity	126	97.67%
Reduction in vehicle crashes	115	89.15%
Costs associated with wildlife-vehicle crashes (medical, repair, etc.)	88	68.22%
I do not feel that incorporating wildlife crossings solutions within our transportation network is important.	1	0.78%
Other	10	7.75%

Answered: 129 Skipped: 0

Additional reasons submitted as part of this question:

- Driver safety
- Healthy environment for humans and all organisms requires systems thinking and action. Thriving wildlife is an ecosystem service that provides significant economic benefits.
- Traffic is more congested, and people are speeding and weaving in and out of traffic. There isn't a safe way for wildlife to cross.
- STOP CLEAR CUTTING!!! STOP REWARDING PEOPLE FOR KILLING FORESTS!!! STOP DEVELOPERS!!!! GIVE TAX BREAKS TO PEOPLE WHO SAVE TREES AND FORESTS!!!!
- Loss of biodiversity through decline in wildlife populations
- some of these crossings could also be used by people to get across to trails that cross busy roads
- Prioritizing life is essential.
- Need to internalize high costs of wildlife collisions into construction to minimize them up front.

4. **Your experience with roadway safety and wildlife-vehicle crashes are important. Please consider sharing your experience(s) with us.**
Public comments provided during the planning process are reflected as originally provided. All names or identifiers have been removed to protect the privacy of individuals.

We live in northern Orange County and have had near misses with deer, etc. often.
We have run into deer, as have man people I know. Last year I helped rescue a turtle that had been hit crossing 54 at the Waterfowl Impoundment and put it back in the woods.
We drive cautiously to avoid deer casualties, especially around dawn and dusk. Despite our best efforts, a deer that lagged behind the herd hit our van, wandered off hurt. It cost us a four-figure amount to fix the damage. No winners in this story - thanks for your work to keep everyone safe!
Vehicle wreck 2023, deer.
South ellerbee Creek goes through a culvert under Washington Street right next to I-85. There's no easy terrestrial crossing of Washington unless you go right along the exit for North Duke Street. There are extensive wetlands on either side. I've seen several large animals cross at this point and because the road is so wide people drive much faster than the 35 mph speed limit there. It's also a blind Hill and curve.
Small birds, groundhogs, raccoons and opossums, etc. are something I see commonly hit and are likely unreported. There is a bridge with an underpass near me (NC 54) that is small, blocked, and unused. Much small roadkill nearby. It is meant to connect the northeast creek.
Several years ago we were driving eastbound on I-85 west of Greensboro in heavy traffic at night. This was the section that is several lanes wide. Traffic was very heavy. Some car ahead of us had hit a young deer, which was in the road and we couldn't avoid it. We drove over it, which was frightening. We were lucky that there was only cosmetic damage to the car. We live in the Raleigh area, and regularly see dead wildlife (racoons, squirrels, cats, etc.) in the road. I would like to see more natural crossings to reduce deaths and injuries to animals, and I would also like to see local governments remove dead animals from the road and shoulders.
Our family has been involved in a few wildlife-vehicle crashes. It is devastating. We are huge animal/wildlife lovers and are anguished at the unnecessary and traumatic loss of life (from turtles, snakes, to raccoons, opossums and deer, etc.). It's a horrific way to die and leaves many young animals orphaned and also at risk of death. In one crash, we also sustained a 'totaled' vehicle, requiring purchase of another car.
One car crash at night due to a deer jumping in front of the car - car had to be replaced

My husband hit a deer on Hillandale Road in Durham and his nearly new car was totaled.
My husband and a deer collided a few years ago on Umstead Road in north Durham. The deer was killed; my husband was fine; the truck was damaged. Any good ideas to minimize these accidents are worth pursuing.
My family members have hit animals in the past, both locally and living in other states. It is emotionally jarring even without vehicle damage or human injury. However one of our cars was totaled after hitting a deer on an interstate in Wisconsin. My family member was lucky to survive. Most of the wildlife do not survive collisions, and I'm all for making safer passages for them. We lived near Barbee Chapel Rd at Spring Meadow Dr (near the Orange Cty/Durham Cty line), and soooo many animals died on that curve in Barbee Chapel. It's near the Farrington Rd. project. Maybe some speed traps would help there!
My brother and husband have both hit deer. I may have hit raccoons. I saw squirrels and a cat get hit. My cat was hit when I was a kid. It hurts to think about. Every life is precious (human and animal). Please do everything you can.
Living in N Durham, I've had several near misses with deer on main roads, and I have witnessed many deceased squirrels, opossums, and family pets sadly along the way
Killed a deer in 1986 after I-40 was extended in CH.
I've had several near misses and one traumatic instance of hitting a raccoon while drive. While the raccoon did not cause damage to the car, it took a very unpleasant experience that I hope to never repeat. I also have significant concern with hitting larger animals that could cause harm to my vehicle or myself, in addition to the animal.
I've been in near-crashes many times! A big concern for my family.
It's heartbreaking to see the aftermath of wildlife-vehicle crashes!
It's always distressing to see a wild animal needlessly injured or killed by a vehicle.
It makes me very sad to see deceased wildlife and feel it deserves more attention. Thanks for doing this!
It has hurt my heart to see animals such as turtles, deer, and others wounded by vehicles. I once witnessed a grieving squirrel crying for hours beside a dead squirrel that I assume was its mate.
In Carrboro and Chapel Hill we are impacted primarily by the significant deer population. I encounter deer in the roadway while driving and biking daily, often several times a day. I and family members have been impacted by vehicle strikes. They are traumatic and costly.
I've had many near-misses. This is important!

I think this is great and long overdue. I live on a road in Carrboro where the speed limit is 20mph. Yet vehicle speed plus heavy traffic means I see dead animals on my street every day and many single-vehicle accidents. I personally witnessed a one-month old fawn be hit and killed by a driver in the middle of a clear sunny afternoon. Even roads with traffic 35mph and under are hazardous, but the proposals in the plan are a great start.
I TELL EVERYONE THAT PEOPLE HAVE TO WATCH OUT FOR ANIMALS. DO NOT DRIVE LIKE YOU ARE THE ONLY ENTITY IN THIS WORLD. DO NOT TAIL GATE. GO SLOWER AT NIGHT. STOP FOR TURTLES AND HELP THEM ACROSS. STOP BEING SELFISH ABOMINATIONS UPON THIS PLANET.
I stop to move turtles or help injured animals, it is so sad to see our state's wildlife injured on the road.
I see endless numbers of animals/wildlife killed on the roads. Heartbreaking.
I live in south Durham near the USACOE wildlife impoundment areas near New Hope Creek and Third Fork Creek. I see the evidence of wildlife-vehicle crashes often and it's very hard to see.
I live in a rural area of Orange County teeming with wildlife. When I drive, I'm white-knuckled watching for deer that waiting to jump out in front of my car and kill me. I wish that the sensors on my car would register them, but they seem to be oblivious to deer coming from the sides of the road. I also walk a lot on country roads, and am saddened to see so many dead animals that have been struck by cars. I especially hate that some people run over them (especially herps) on purpose. I record wildlife fatalities through iNaturalist for projects such as Wildlife Crossings, GLOBAL Roadkill Observations and Dead Herps.
I live beside a creek. My road crosses over it. I cannot begin to count the number of dead animals I've seen over the 35 years I've lived here. Everything from deer, of course, to possums, raccoons, skunks, barred owls (!), black vultures, box turtles, mud turtles, snapping turtles, black snakes, water snakes myriad frogs and toad -- it is heart-breaking.
I have not personally experienced any serious wildlife-vehicle crashes in North Carolina, but I have witnessed many roadkill deer, racoons, possums, turtles, and other animals. It's heart-wrenching to see and think about the wildlife killed by cars, and I can only imagine how harrowing it must be to be a driver who hits an animal.
I have never hit a deer but I see dead deer every day and it makes me very sad.
I have hit and killed a fawn, and have nearly hit deer many times. My husband has also hit a deer causing major damage to his car and killing the deer. We want to avoid the dangers and costs posed by wildlife crashes and we also want to preserve the lives of local wildlife as much as possible. We strongly support efforts aimed at providing safe movement and migration routes for wildlife and have hoped for measures that promote these things for many years.

I have had the unfortunate experience of hitting a deer that suddenly ran across the road in front of my vehicle. It caused damage to my vehicle, but I was more distressed at killing the deer. I am also one of the people you see pulling off the road (when safe to do so) to help turtles cross the road. However, I have seen cars intentionally run over turtles and snakes crossing a road when they could have easily and safely avoided running them over. Our wildlife camera captured images of a Bobcat until someone provided a photo of a dead Bobcat by the side of US 15-501 less than a mile away from the Haw River. I always wondered if that explained why the Bobcat images suddenly disappeared.
I have had 2 significant vehicle deer encounters, as well as many, many near hits. I would like to see the wildlife crossing plan implemented throughout the DCHC area. Thank you.
I have experienced multiple wildlife collisions while driving, and it is always a sad, scary, and gruesome experience, for me and especially for any children riding in the car. I also work in wildlife rehabilitation, and have seen the aftermath of so many wildlife collisions. Turtles, opossums, deer, squirrels, and raptors are frequent victims. I applaud the work that you are doing, and hope that we can reduce collisions with all of these species and build a more harmonious future for the triangle.
I have been lucky that a deer only grazed our car, but I am crushed that it may have been wounded. As Durham allows more deforestation and construction to foster growth, every road nearby is littered with dead animals fleeing the area.
I have been in a crash where a deer was hit and killed and another incident where a pheasant was killed. It is an unhappy experience and the sooner we protect these sharers of the land and environment the happier I.will be. Too long coming. Glad you are finding recovery act funds to do it
I hate seeing squashed turtles.
I had 2 collisions with deer near Githens middle school and consider myself to be a careful driver who drives infrequently. What are the odds of that?! Both were somewhat traumatic as they involved death of animals and costs were incurred in both to repair my vehicles (thousands of dollars). Fortunately, I was able to pull over and no other cars were involved. In Finland, I noticed many interventions to allow for continuous pathways for animals. Honestly, I am bewildered that this idea is not part of the infrastructure and also bewildered that the light rail plan failed. Less cars seems safer and cleaner for all of us.
I am often anxious driving because I worry about hitting animals, especially at dawn and dusk. Investing more in wildlife crossings would address some of my concerns.
I always stop to move turtles off the road and do so in the safest way possible. One time a guy in a huge pickup swerved around me and smashed the turtle on purpose before I could get to it.

Husband had car accident with deer. Avoid crushing turtles and help them on their way (same direction they are heading) where possible but sadly can't help if the turtle is on a busy road
Driving home to Carrboro from Pittsboro in fall 2009, a large buck came running out of a treed area near an apartment complex and crashed into my Scion. The deer was badly injured but after a while limped into the woods and responding officers had to follow it to dispatch it. Repairing the car required leaving it at a body shop for a week. My husband and I were lucky not to be hurt, but it was very sad to see the buck suffering. I was very happy when the wildlife passage was created in 15-501 for New Hope Creek. Before then, it was horrifying to see all the animals killed trying to cross the highway there. Also near Southpoint, built through a floodplain.o
As a teenager in the car with family, we struck a deer crossing road at dusk.
A deer totaled our car, and herself. It isn't a safety issue but I am so pleased that this plan is being considered to allow smaller wildlife a safe crossing. I've seem too many people intentionally swerve to kill turtles.
A deer ran into the side of my car several years ago on Cole Mill Road at I-85. It caused $2,500 in damage. I recognize the need for wildlife crossings. However, the deer in particular are everywhere in Durham. I'm not sure how you can narrow down a few locations for crossings.
• A white-tail deer suddenly jumped on hood of car at night. • Fawns hidden among the tall grasses on the shoulder suddenly jumped into the road. • My toddler and I were stopped in one lane while someone was moving a large snapping turtle off the road. [Pond was located on one side of the road and forested area on the other side.] Both lanes of traffic were stopped in the removal process. In my rear view mirror, I saw a car going very fast over a slight hill behind my stopped car. To avoid rear-ending my car, he had to swerve off the road and onto the shoulder. He flew passed my car. We all could have been seriously harmed–even the person with the turtle.

5. Do you have additional feedback or comments about the draft plan?

Public comments provided during the planning process are reflected as originally provided. All names or identifiers have been removed to protect the privacy of individuals.

When I'm driving and see a lot of animal bodies on the side of the road, it sets me on edge. Even though I haven't hit anything large, the fear is there, and knowing I was driving along a route that was minimizing vehicle strikes would definitely put me more at ease.
With the growth in our area, wildlife collisions are only going to increase as animals attempt to traverse a changing landscape. We need to provide connective corridors between large natural areas for our own human health (natural eco-system services, mental health (walking trails, wildlife viewing, etc), and for wildlife benefit - keeping common species common and protecting the food web.
We need to respect existing wildlife corridors and not pave them.

Signs of wildlife crossing is very important and helpful. Well lit areas need to be implemented.
Wildlife more prone to vehicle impacts when hunted (skittish) and would prioritize those areas
Wildlife and their mobility corridors need protection which ultimately protects citizens and minimizes crashes.
We used to live in Colorado where these changes were already implemented and they work. I've also seen these same plans used in Canada and they have worked there for decades. Let's do this here. I-85 in particular this is an issue. I feel like it's just a matter of time before my vehicle is impacted by wildlife and I want myself and the wildlife to be safe. My brother hit an elk in Wyoming and the damage is unbelievable and awful.
We have all been involved in wildlife vehicle collisions. It would be wonderful to avoid this for both humans and animals alike.
There are so many places on our roads where wildlife routinely tries to cross- providing safe alternative paths is absolutely necessary for conservation purposes as well as traveler safety.
The more we protect our wildlife, the more we protect ourselves. Drivers who avoid hitting wildlife are likely to hurt themselves and others, which is why it's so important to remove these interactions as much as possible.
Stories are sad and scary when one hits a deer on interstates after someone else hit it first in the dark.
So many smashed KILLED box turtles and other water turtles. on all our roads...even rural roads. When you have a wetlands on one side of a road and then another wet area on the other, then you see multiple dead turtles especially small ones spring and summer. More under road crossings are needed and sloped ditches leading to these passage ways. Roadside ditch depth and slope are important to avoid trapping turtles and to be able to "guide" them to a under road culvert or other. Please Check with A Turtle for Every Log and the Turtle Rescue Team at NCSU Vet school to get their ideas on location, type etc. of safe passage ways that keep turtles off the roads.
So many deer dangerously crossing the roads in our area. Lots of roadkill including turtles, snakes, opossums, gray foxes etc.
Professional environmental scientist' I understand the importance of this work.
Please have wildlife crossings! It's so important for living peacefully with nature. It's also much safer for us and our families!
People drive too fast and are distracted. People don't always see or look for road hazards, including wildlife

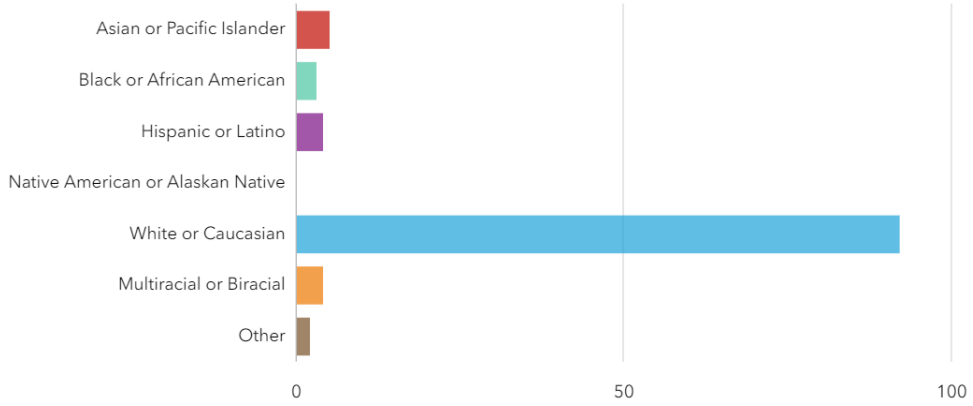
Offering a cost effective way for wildlife to cross public roadways (including and especially intestate bi-ways) is both a safe and humanitarian way to improve the lives of humans and wildlife. This survey is a first step and speaking for Western North Carolina residents this discussion is much needed and overdue. (Review I40 & I26 wildlife vehicle crash statistics)
No personal accidents. But see then results very often
Need for all safe drivers and respect on all roads to eliminate any dangers.
n/a
I've been so happy about the 15-501/New Hope Creek overpass ever since it happened, and [name withheld] told me about it. I have practically been holding my breath to see other sites be improved with the same purpose. It is crucially important to make these corridor connections for the wildlife. Knock on wood, I've not yet had a collision in my 36 years living in NC. I used to live on Phils Creek near Old Greensboro Highway, and now am just west of the Cane Creek Reservoir on Mebane Oaks Road, on what we call Caterpillar Creek. I've taught environmental classes at UNC and Elon U, and have included information about corridors with examples from other places of some beautiful crossings in my lectures.
I'm all about protecting wildlife. Roads/bridges and other human-made forms of moving vehicles has a devastating effect on wildlife, not just death. We as a human species who cares about creatures other than ourselves owe it to wildlife to create safe passage where we've blocked that over decades. Not just for large four-leggeds, but also smaller wildlife such as salamanders, frogs, toads and so forth. Wild Virginia has take the lead on this topic and done some fantastic work. Follow their lead (and I'm not from VA, just really impressed with their devotion and respect for the well being of wildlife. Here in NC, not so much. Sad.
If we can leave more areas wooded when developing new sites, I bet it would reduce crossings too. It makes me so sad to watch NC bulldoze our richly biodiverse sreas. It also helps to have lights facing down for migratory burds (even better- off in migration season).
I'm a fan of P-22, the beloved LA resident cougar who died in a vehicle crash. LA and other localities are building wildlife crossings like bridges, to protect wildlife from cars. If California can do it, so can N Carolina: let's follow their lead, and learn from their experience.
I think that this plan is a good start. It is thorough, well written and well researched. It appears that many stakeholders have been contacted. I especially like the maps, wildlife table and the list of references that are also noted in the text.
I think it's important that these upgraded crossings can be multiuse - I've seen people running across the Guess Rd/Eno river (continuation of trails), and at the Oxford Rd/Eno crossing (from Pennys Bend to Mountains to sea trail). An added benefit!
I have thankfully not been involved in a major wildlife crash.

I am thrilled to see this effort in Durham, Orange and Chatham Counties. As a regular cyclist and motorist, it is clear to me how many animal collisions (large and small) regularly occur. It is my hope that these projects are implemented to increase the safety of humans and wildlife.

6. What is your household zip code?

Zip Code	Responses	Zip Code	Responses
27516	15	28732	2
27713	11	27243	1
27517	10	27295	1
27510	8	27503	1
27705	8	27519	1
27312	6	27526	1
27707	6	27572	1
27701	5	27587	1
27704	5	27609	1
27278	5	27612	1
27523	3	28203	1
27302	2	28214	1
27514	2	28376	1
27703	2	28739	1
27712	2	30307	1

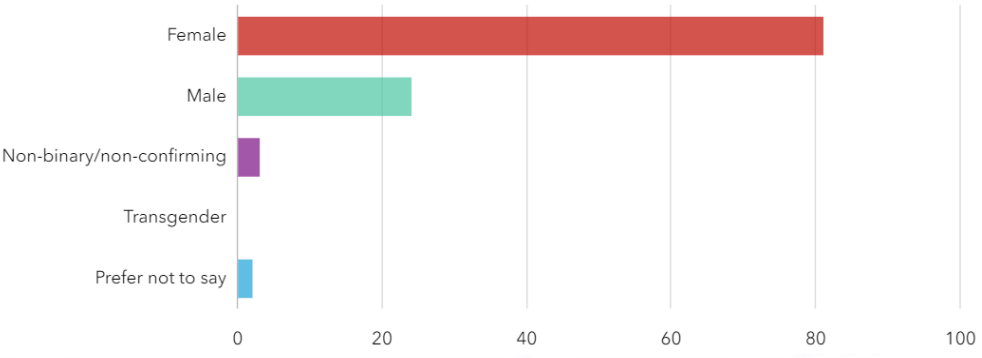
7. Which race/ethnicity best describes you? (Please choose one)



Answers	Count	Percentage
Asian or Pacific Islander	5	3.88%
Black or African American	3	2.33%
Hispanic or Latino	4	3.1%
Native American or Alaskan Native	0	0%
White or Caucasian	92	71.32%
Multiracial or Biracial	4	3.1%
Other	2	1.55%

Answered: 110 Skipped: 19

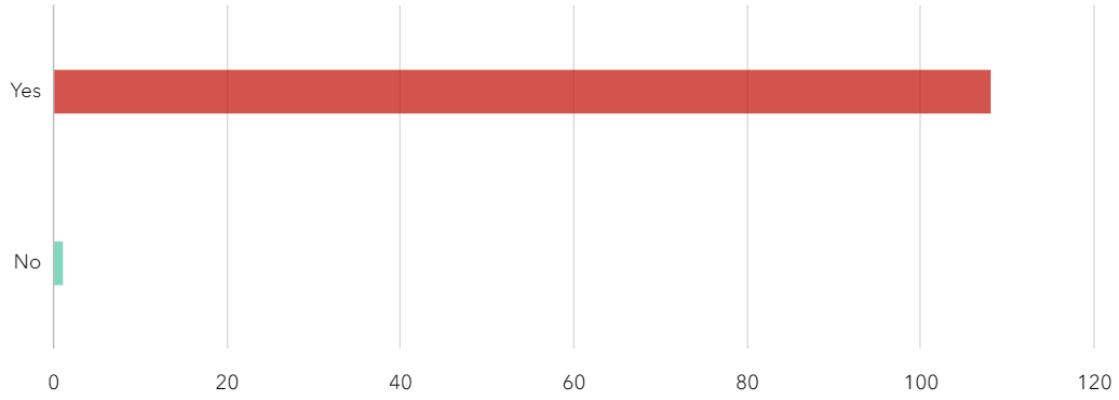
8. What is your gender identity?



Answers	Count	Percentage
Female	81	62.79%
Male	24	18.6%
Non-binary/non-confirming	3	2.33%
Transgender	0	0%
Prefer not to say	2	1.55%

Answered: 110 Skipped: 19

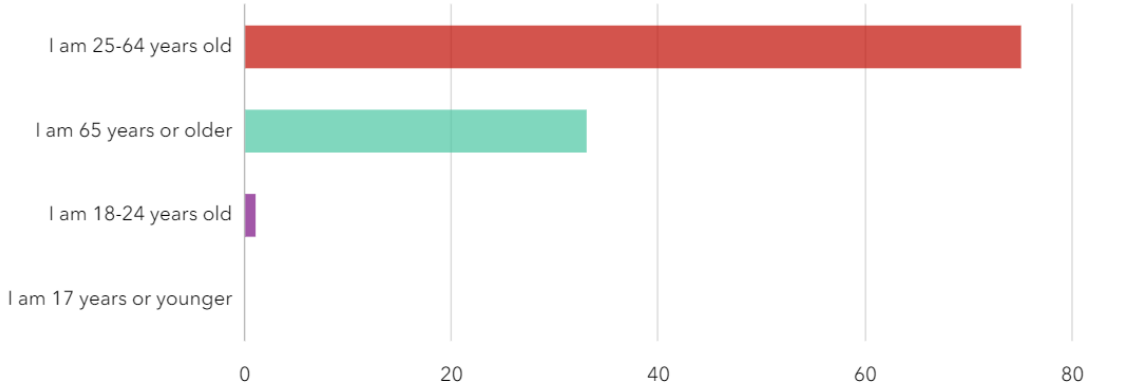
9. I speak, read, and write English well.



Answers	Count	Percentage
Yes	108	83.72%
No	1	0.78%

Answered: 109 Skipped: 20

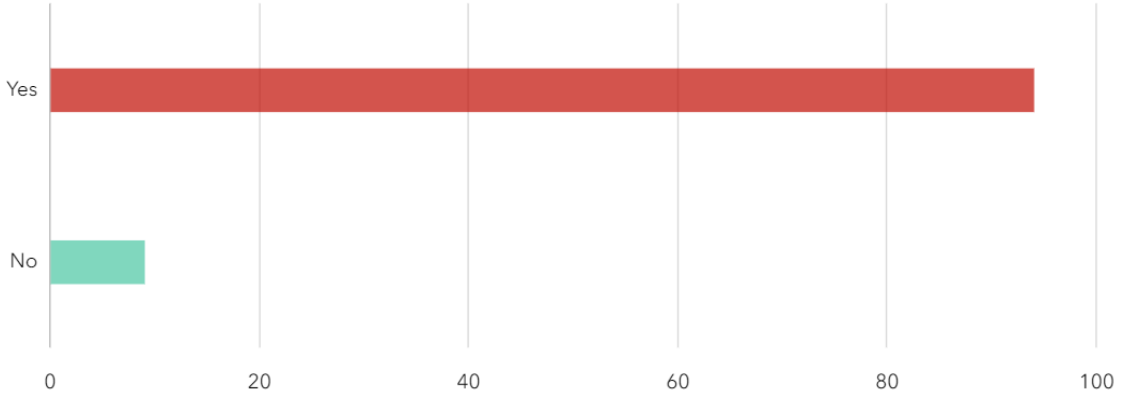
10. What is your age group?



Answers	Count	Percentage
I am 25-64 years old	75	58.14%
I am 65 years or older	33	25.58%
I am 18-24 years old	1	0.78%
I am 17 years or younger	0	0%

Answered: 109 Skipped: 20

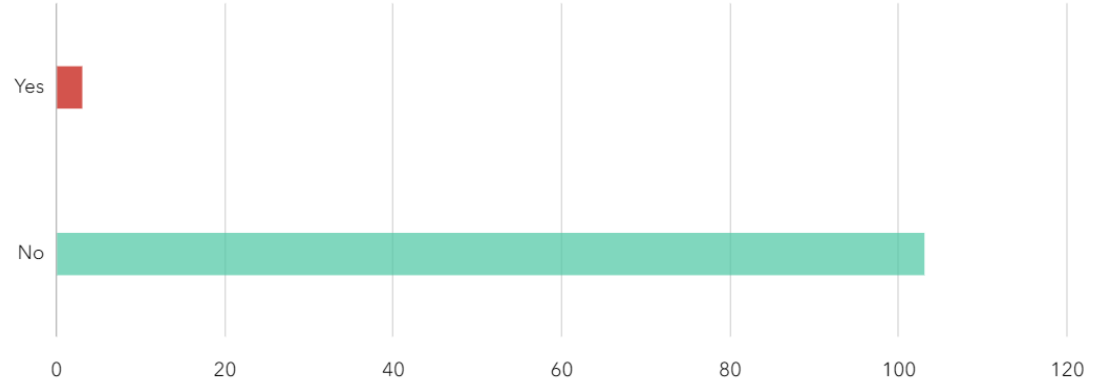
11. Is your total household income equal to or above $49,160 per year?



Answers	Count	Percentage
Yes	94	72.87%
No	9	6.98%

Answered: 103 Skipped: 26

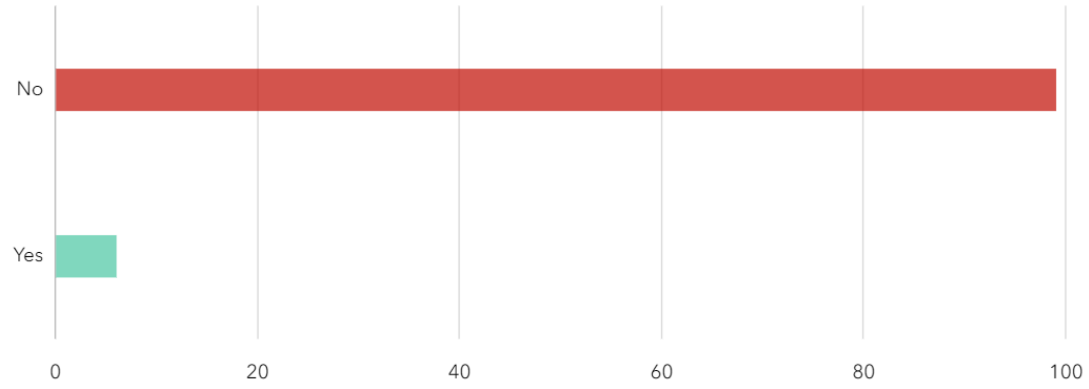
12. Five (5) or more people live in my household



Answers	Count	Percentage
Yes	3	2.33%
No	103	79.84%

Answered: 106 Skipped: 23

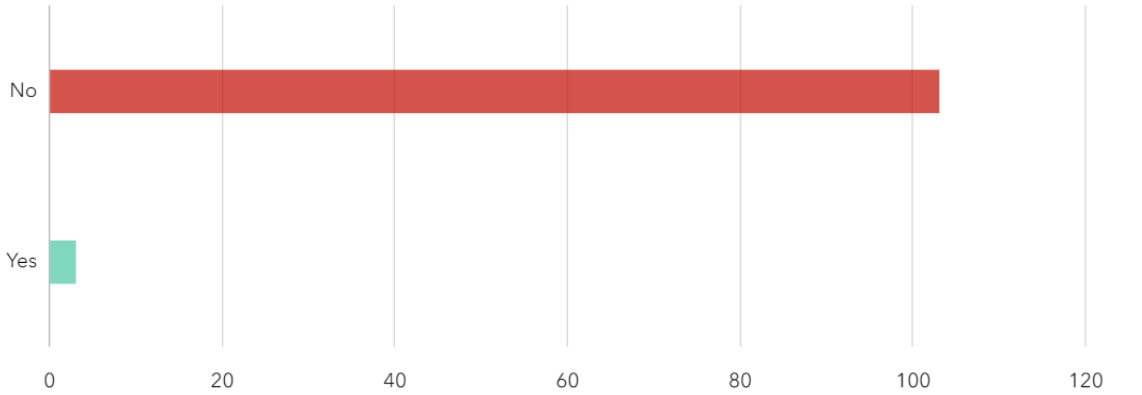
13. I am or am considered to be disabled.



Answers	Count	Percentage
No	99	76.74%
Yes	6	4.65%

Answered: 105 Skipped: 24

14. My household has zero cars.



Answers	Count	Percentage
No	103	79.84%
Yes	3	2.33%

Answered: 106 Skipped: 23

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