



The North Carolina Department of Transportation in cooperation and with the Tennessee Department of Transportation seeks \$1.8 million from the US Department of Transportation to conduct a targeted corridor feasibility study along 28 miles of Interstate 40 (I-40) in the Pigeon River Gorge (Gorge), referred to as I-40 SAFE PASSAGE. The purpose of I-40 SAFE PASSAGE is to advance our agencies' understanding of the full range of wildlife mitigation opportunities for improving habitat connectivity and reducing Wildlife Vehicle Collisions (WVCs). Utilizing the latest innovations in wildlife crossing design, the study will build on recently completed field research to further determine the feasibility and constructability of wildlife crossings and produce preliminary design plans and cost estimates, that will be essential to implementing priority wildlife crossings and fencing in the Gorge.

An extensive field research project from 2018 to 2021 demonstrated that this stretch of I-40 constitutes a dangerous WVC hotspot with large mammals, with roadkill concentrations of up to 7.3 collisions/mile/year in some sections. In addition to white-tailed deer (*Odocoileus virginianus*), the Gorge also supports an unusually high-density black bear (*Ursus americana*) population (more than 55 percent of the WVCs involved black bears) and a growing elk (*Cervus elaphus*) herd. Furthermore, I-40 bisects a large block of public lands that have been highlighted by numerous studies as a national priority for habitat connectivity for biodiversity and climate resiliency. The highway disrupts the connectivity of Great Smoky Mountains National Park, the most biodiverse national park in the US, to the extensive Pisgah and Cherokee National Forests. Providing wildlife connectivity and permeability across the Gorge would facilitate climate-driven migrations for a range of Southern Appalachian biodiversity, while reducing the extinction risk and improving the recovery options for many at-risk species.

A robust and active coalition of local, state, and federal agencies and conservation nonprofit organizations has been working together since 2017 to tackle wildlife connectivity concerns in the Gorge. Through the work of this coalition, a broad base of public support and private funding has already been secured. Illustrating this support, the Safe Passage Coalition nonprofit members will provide \$295,000 in non-federal match for this project. Once the feasibility study is underway, the coalition will conduct outreach and education efforts to further raise public support for wildlife connectivity improvements in the Gorge. Coalition Member Partners, Wildlands Network and National Parks Conservation Association will also continue their baseline wildlife research and monitoring activities that have been ongoing since 2018.

Installing wildlife crossings and reducing WVCs will provide economic and climate change mitigation benefits. The I-40 corridor is critical for both freight transport (22 percent truck traffic, as part of National Highway Freight System) and tourist traffic (including the most visited national park in the nation), and wildlife collisions in the Gorge have the potential to stall interstate traffic for hours. Project construction would also generate much-needed jobs for rural, economically depressed Haywood and Coker Counties, equitably promoting workforce development and local wealth creation. Considering these factors, the proposed project represents an opportunity to leverage federal investments in wildlife crossings in NC and TN.



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## PROJECT DESCRIPTION

The North Carolina Department of Transportation (NCDOT), in coordination with the Tennessee Department of Transportation (TDOT) seeks \$1.8 million in USDOT funding under the Wildlife Crossings Pilot Program (WCPP) to conduct a targeted corridor feasibility study along 28 miles of Interstate 40 (I-40) within the Pigeon River Gorge (Gorge) on the border of NC and TN, referred to as I-40 SAFE PASSAGE. The purpose of the study is to build upon three years of field research and subsequent analysis conducted along this 28-mile section of I-40 by two partner nonprofit organizations, National Parks Conservation Association (NPCA) and Wildlands Network and focus on identified Wildlife Vehicle Collision (WVC) hotspots and high value wildlife connectivity areas to evaluate the full range of feasible and constructable wildlife crossing improvements and mitigative measures. The Safe Passage Coalition will provide a \$295,000 match.

The research, summarized in Hillard et al. (2022), used a variety of techniques to document patterns in wildlife activity and roadkill rates along this focal section of I-40. The report identifies a set of priority locations for mitigation measures, potentially including new wildlife crossing structures, modified existing structures, and a system of wildlife guide fencing. I-40 SAFE PASSAGE would take recommendations from the field research and investigate the feasibility of different options for wildlife crossing infrastructure at the priority sites. Ultimately, the proposed project will yield preliminary designs, engineering recommendations, and cost estimates that will be essential to moving wildlife mitigation in this critical area to the implementation and construction phase.

Years of anecdotal evidence (see Criteria 1.1) indicates that this section of I-40 is a WVC hotspot, including a very high rate of collisions with black bear (*Ursus americana*), which are abundant in the adjacent mountain forests. Elk (*Cervus elaphus*) were reintroduced into Great Smoky Mountains National Park (GSMNP), with the core population located in the Cataloochee Valley, approximately 4 air miles from I-40 in the Gorge. Elk have subsequently expanded their range to include public and private lands along both sides of I-40 in NC and TN, increasing the risk of WVCs. Like much of NC, white-tailed deer (*Odocoileus virginianus*) are also common in the area, which means that motorists on this stretch of highway face a triple threat from three large mammal species that may end up on the road.

Wildlands Network and NPCA collated vehicle



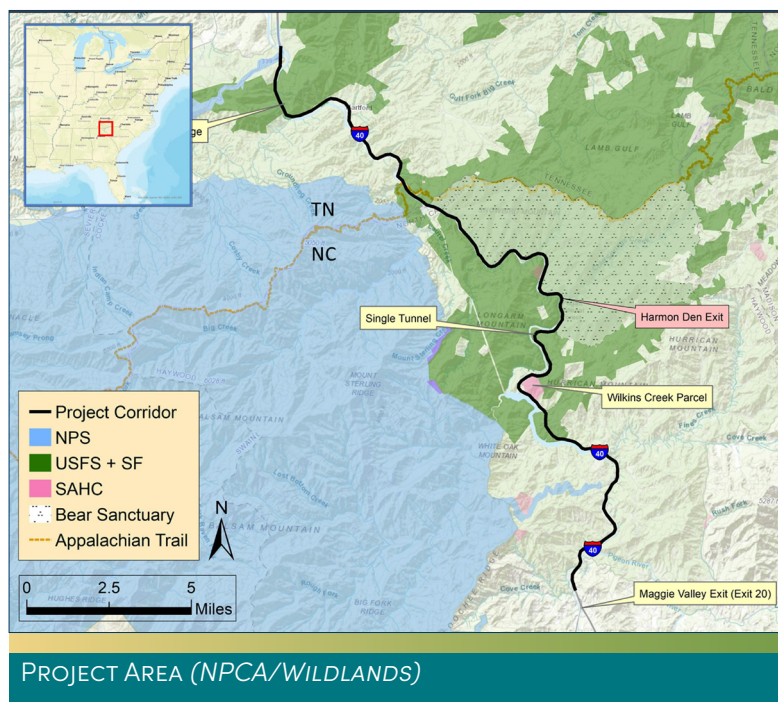
I-40 IN THE PIGEON RIVER GORGE (NCDOT)

crash data for I-40 in the Gorge from 2001 to 2021, documenting a total of 336 animal vehicle crashes during that window, including official DOT crash reports and 3 years of weekly roadkill surveys conducted by the research team. This number is certainly a gross underestimate, as the roadkill survey field research yielded one-third of the total crash data in just 3 of the 20 years. The steep terrain, high-volume, high-speed truck traffic, and narrow to nonexistent road shoulders make stopping to collect and report roadkill a dangerous task in the Gorge, factors that likely translate into even lower rates of collision documentation than have been reported for other sites around the country. Further, Lee et al. (2021) reported a correction factor of 2.8 that can be applied to road survey data to account for injured animals that have moved out of view from typical survey methods.

Despite these challenges, Hillard et al. (2022) pinpointed several roadkill hotspots that were characterized as having five to nine WVCs within a given 400-meter road segment. Looking at the more intensive data just for the 3 years of roadkill surveys, four road segment hotspots had extremely high collision rates that translate to 7.3 crashes/mile/year and 17 hotspot segments with crash rates of at least 4.9 crashes/mile/year (see Criteria 1.1).

To address the WVC hotspots highlighted previously and the strategic conservation importance, a robust coalition of stakeholder groups emerged in 2017, to work together on this issue. Consisting of a variety of local, state, and federal agencies and conservation nonprofits, the stakeholder coalition holds quarterly meetings, at times with facilitation help provided by FHWA. Nested within the broader stakeholder coalition, a subset of seven conservation nonprofits joined together to form the Safe Passage Fund Coalition, a group dedicated to raising funds (and awareness) for Gorge wildlife road mitigation projects. The member groups of the Fund Coalition are providing the non-federal match for this application, through a mix of private fundraising and in-kind donations of staff time for outreach, education, and research and monitoring (see Criteria 2.1).

I-40 adjacent to the Gorge cuts across what is, for the eastern US, an extremely large complex of public forest land, including the 522,000-acre GSMNP and more than a million total acres contained in Pisgah and Cherokee National Forests. These large core areas are themselves connected to additional public forests to the south (e.g. Nantahala National Forest and the mountain forests of South Carolina, Georgia, and Alabama) and north (e.g. George Washington and Jefferson National Forests and





additional state and federal conservation lands stretching all the way to Maine). I-40 cuts east-west across the spine of these Appalachian public lands, and it does so just to the north of the well-documented biodiversity contained within GSMNP, regarded as the most biodiverse park in the nation (NPS 2023). Therefore, as described in greater detail in Criteria 1.2, addressing the barrier impacts of I-40 in the Gorge can be seen as a national priority for improving terrestrial and aquatic habitat connectivity. This is particularly true through the lens of climate change, as countless species will be attempting to migrate northwards as the climate warms, funneling through the elevational gradients and topography provided by the mountain range. The interstate currently stands in the way of that migration, blocking an essential ecosystem function in this modern world.

Given the strategic importance of the site for biodiversity, any wildlife crossing infrastructure in this stretch of highway will need to be designed well to serve the connectivity needs of a wide range of species, not just the bear, deer, and elk. Hillard et al. (2022) documented a number of smaller animals within the study area, including a high diversity of meso-carnivores, including bobcat (*Lynx rufus*), gray and red fox (*Urocyon cinereoargenteus* and *Vulpes vulpes*, respectively), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), American mink (*Neogale vison*), and the relatively rare long-tailed weasel (*Mustela frenata*) and Eastern spotted skunk (*Spilogale putorius*), and rare reptiles such as the timber rattlesnake (*Crotalus horridus*) and the declining Eastern box turtle (*Terrapene carolina Carolina*).

On the aquatic side, there are a number of tributary creeks that cross under I-40 before joining the Pigeon River, a river whose water quality has been increasing in recent decades due to clean ups and now the outright closure of the upstream paper mill in Canton, NC. Enlarging and improving the culverts for these tributary streams to enhance the passage of terrestrial wildlife will also serve to promote aquatic connectivity, especially if existing obstacles (such as perched culverts) can be corrected to promote the flow of fish and other aquatic species. The tributary creeks contain native brook trout, a species declining across its range due to its need for clean, cold streams with minimal sedimentation. Hellbenders (*Cryptobranchus alleganiensis*), a large aquatic salamander with similar habitat requirements to the trout, could also be eventually restored to this system.

NCDOT is currently replacing several bridges within this section of I-40 (State Transportation Improvement Program (STIP) Project B-6054 A-E). Although the bridge replacements were not motivated by wildlife concerns, they provided an opportunity to improve the bridge designs (or in some cases to maintain existing suitable designs) and promote highway permeability. So far, one bridge, STIP Project B-6054A, has been replaced at the I-40 and Cold Springs Creek Road (NFSR 148) near Harmon Den (Exit 7). The design plans included wildlife benches cut through the rip rap slopes on either side of Cold Springs Creek, a moderately expanded underlying road shoulder, and wildlife (cattle) guard installations on exit ramps that will eventually tie into new wildlife guide fencing. These bridge replacements will add to the opportunities for wildlife to move safely under I-40, but they do not remove the need for this study of additional feasible and constructable wildlife crossings, including research-based siting of standalone



wildlife structures, within the 28-mile Pigeon River Gorge.

TDOT is also planning the replacement of the bridge at the I-40 and Green Corner Road interchange, where the Appalachian Trail runs under I-40. The proposed feasibility study described in this application is a much-needed second phase of investment that will build on the research conducted by the conservation nonprofit groups and yield a set of projects that are ready or nearly ready for capital investment and construction.

As mentioned above, there is already a substantial base of protected public forest on both sides of the highway in a core portion of the Pigeon River Gorge. On the periphery of the Gorge, however, are a moderate number of private lands, some of which are believed to be quite attractive for deer and elk (Hillard et al. 2022). As part of the broader effort to promote connectivity and reduce WVCs in the Gorge, The Southern Appalachian Highlands Conservancy and The Conservation Fund have both been actively pursuing land acquisition at key sites along the interstate and surrounding lands to bolster landscape-wildlife connectivity (with some notable successes already to date). These conservation projects will provide a stable land base upon which further investments in wildlife road crossing infrastructure can be made.

North Carolina has a successful history of investing in wildlife crossings, including culverts on I-26 north of the Gorge, and a set of three underpasses on US 64 in Washington County (see corresponding applications for the WCPP). NCDOT has also incorporated wildlife needs into the design of more than a dozen new bridges and culverts across North Carolina over the past two decades. Designing and then building a system of wildlife crossings and fencing through the Gorge will take these investments to the next level, more on par in terms of scale and impact to major projects that have been implemented in the western US, such as Washington State's wildlife crossings at Snoqualmie Pass on I-90. The technical lessons learned from this major new effort in NC and TN will be applicable for other mountain highways up and down the Appalachians.

I-40 is a critical part of North Carolina's infrastructure as a part of the National Highway Freight System and a North Carolina Strategic Transportation Corridor (Corridor Q). Traffic volume in this area is approximately 28,500 vehicles per day. According to NCDOT's Annual Average Daily Traffic (AADT) data for 2021, 22 percent of the traffic in this area consists of large trucks.

The area is very rural. The large amount of public forest reduces the local population density to a point that is quite low by Eastern US standards.

The 28-mile stretch of I-40 that runs through the Gorge directly intersects with one Federal Opportunity Zone (47029920700) in Tennessee. Another Opportunity Zone (37115010200) is located on the border of NC and TN just a few miles northeast from the Interstate.



**PROJECT INFORMATION**

PROJECT NAME	Wildlife Connectivity Targeted Corridor Feasibility Study on I-40 in the Pigeon River Gorge (I-40 SAFE PASSAGE)
WCPP REQUESTED AMOUNT	\$1,800,000 (YOE)
TOTAL PROJECT COST	\$2,095,000 (YOE)

**ELIGIBILITY CRITERIA**

Who is the Eligible Applicant?	NC Department of Transportation (NCDOT)
Is there an Eligible Partner?	Tennessee Department of Transportation (TDOT)
Indicate the amount, type, and source(s) of the standard 20% non-Federal match under 23 U.S.C. 120(b).	Safe Passage Coalition \$295,000 (YOE)
Eligible Project Type	Construction project, including feasibility study, preliminary designs and cost estimates for construction
Consultation with the State DOT	No consultation because we are the State DOT
State(s) and/or Tribal land in which the project is located	NC
Lead Applicant	NCDOT

**LOCATION INFORMATION**

Location of project area	I-40 from Exit 20 (I-40 and US 276) in NC to just north of Exit 443 (Foothills Parkway/339) in TN
US Census FIPS Code (2019)	Census Tracts 101 and 102 in Haywood County, NC and Census Tract 207 in Cocke County, TN
Geographic Coordinates	35.603529, -83.007291 to 35.841797, -83.181655
Is the project located in an urban area or rural area?	Rural
Is the project located (entirely or partially) in federally designated community development zone?	Opportunity Zone 47029920700
Is the project area located on a federally recognized Indian Tribe land?	No.
Congressional district(s)	NC US District 11; TN US District 1

**PROJECT COSTS**

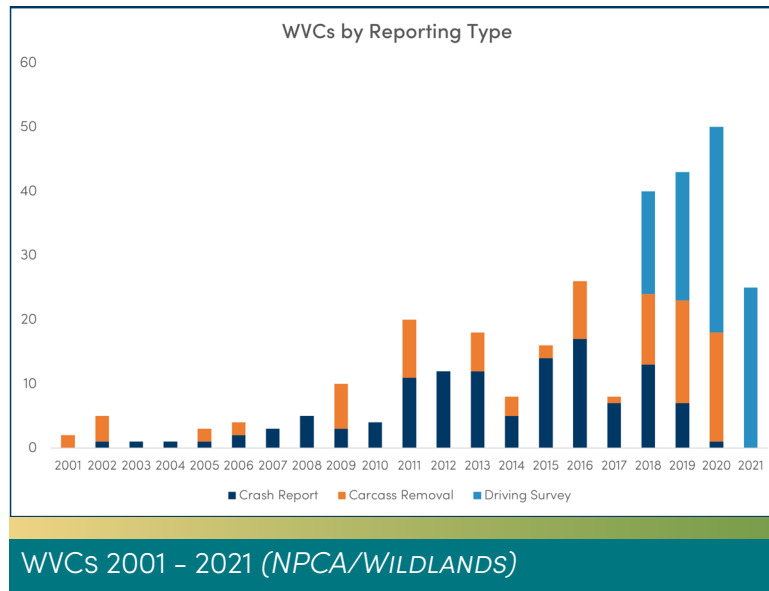
WCPP Requested Amount	\$1,800,000 (YOE)
Estimated Total of Other Federal Funding	\$0
Estimated Non-Federal Funding	Safe Passage Coalition \$295,000 (YOE)
Future Eligible Project Cost	\$2,095,000 (YOE)
Previously Incurred Project Costs	\$0
Total Project Cost	\$2,095,000 (YOE)

# PROJECT MERIT CRITERIA

## CRITERION 1.1: WILDLIFE VEHICLE COLLISIONS

The project contributes to the Wildlife Vehicle Collisions (WVCs) criterion by further evaluating the WVC hotspots identified in the 3-year research study conducted by Wildlands and NPCA in the Gorge from 2018 to 2021, to determine the feasibility and constructability of installing cost-effective mitigative wildlife crossing measures and fencing throughout the study area.

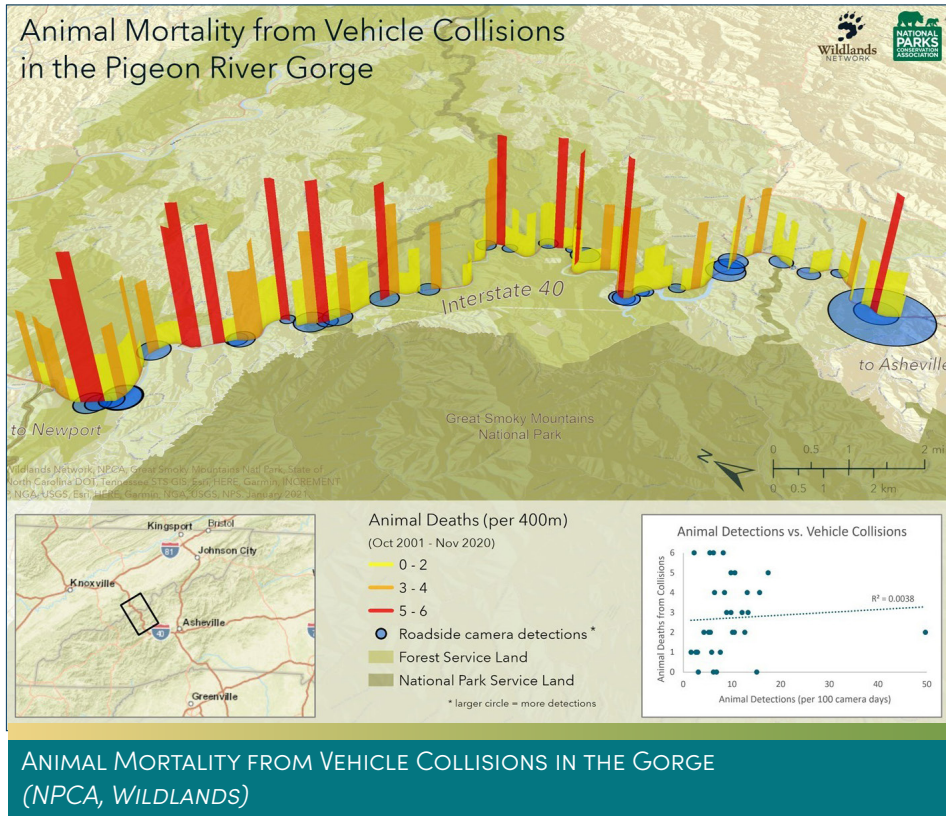
In addition to weekly roadkill surveys, the research also included a large array of roadside cameras that monitored wildlife activity patterns along the highway, as well as cameras that monitored existing structures that might provide crossing opportunities. During the same period, thirteen elk were fitted with GPS collars to track their movements with respect to I-40 and other roads. Results from the project are summarized in Hillard et al. (2022).



For the roadkill and roadside camera studies, the highway was divided into a series of 400-meter segments. Roadside cameras revealed consistently high activity rates for black bear and deer as well as activity centers for elk. The roadkill surveys yielded several WVC hotspots. Looking at the top 17 road segments (out of 115), there were an average of 4.9 crashes/mile/year, a level that is among the highest across North Carolina, (at least when compared to official WVC data; Wildlands Network, unpublished research). NC is known for recording an extremely high rate of deer crashes, close to 20,000 officially reported WVCs each year. The top four segments were even higher, with each recording a rate of 7.3 large mammal carcasses/mile/year, which is well over the thresholds indicated by Huijser et al. (2009) for identifying WVC hotspots where crossing structures would be economically justified. Over 55 percent of the Gorge crashes involved black bear, which is a notable result in NC and TN where deer crashes are



normal. The high frequency of bear-vehicle crashes represents an enhanced safety risk given the larger potential body size of bears versus deer.



The Gorge has long been known as a regional hotspot for bear mortality. A National Park Service (NPS) biologist reported 50 to 75 bears killed on I-40 from the state line to the I-40 and Wiggins Road interchange (Exit 37) (pers. comm.), and an NCDOT Division 14 Supervisor indicated there were 129 bears killed in Haywood County, NC in 2013, mostly along I-40 (Ferguson and NCDOT IMAP crew, pers. comm. 2019). The black bear population in western North Carolina is large (approximately 9,000 bears) and still growing by 5 to 7 percent each year, according to the NC Wildlife Resources Commission (C. Olfenbuttel pers. comm. 2022). Since the completion of the Hillard et al. (2022) study, a new black bear GPS collaring project has been initiated along I-40, and in the first 5 months of study two out of 12 of the collared bears have been killed on the highway (Kristin Botzet pers. comm. 2023).

Hillard et al. (2022) only recorded one elk road mortality on I-40 during their study but given the large size of these elk (up to 900 or more pounds) and the high speed of the interstate, any such crashes are highly dangerous. The GPS collar data indicated there were multiple locations along the highway where elk were approaching or crossing at-grade, with one cow (and her calf) crossing 107



ELK COW & CALF (NPCA & WILDLANDS)



times at 11 different road study segments, in addition to elk occasionally using an existing highway bridge and large box culvert to get under the highway more safely.

Not only does the Pigeon River Gorge possess an unusually high (by Eastern US standards) diversity and density of large mammals, the characteristics of the roadway itself further heightens the safety risk involved with WVCs. Approximately 28,500 vehicles/day cross the corridor and trucks account for 22 percent of the total. I-40 is a crucial east-west freight corridor for the region. One side of the highway in the Gorge typically drops down to the Pigeon River, and the other side is often characterized by steep rock cuts into the adjacent mountains, yielding little room for maneuvering to escape collisions.

Many structures on I-40 are not conducive to wildlife crossing for certain species. Some are perched culverts which impede aquatic passage. Some are too small to attract ungulates or lack ground cover sought by certain species. During the Hillard et al. study, only eight of 19 structures had crossings by one or more large mammal species, and only one had crossings of all three (a box culvert that recorded bear, elk, and deer).

A new system of wildlife-specific fencing that ties together numerous enhanced wildlife crossing structures is clearly needed for I-40 in the Gorge. Such a system could be expected to reduce WVCs with large mammals by as much as 80 to 90 percent (Huijser et al. 2009), saving countless dollars in property damage and preventing costly injuries and human deaths. I-40 SAFE PASSAGE is urgently needed to evaluate and establish future WVC mitigation opportunities.

## CRITERION 1.2: TERRESTRIAL & AQUATIC HABITAT CONNECTIVITY

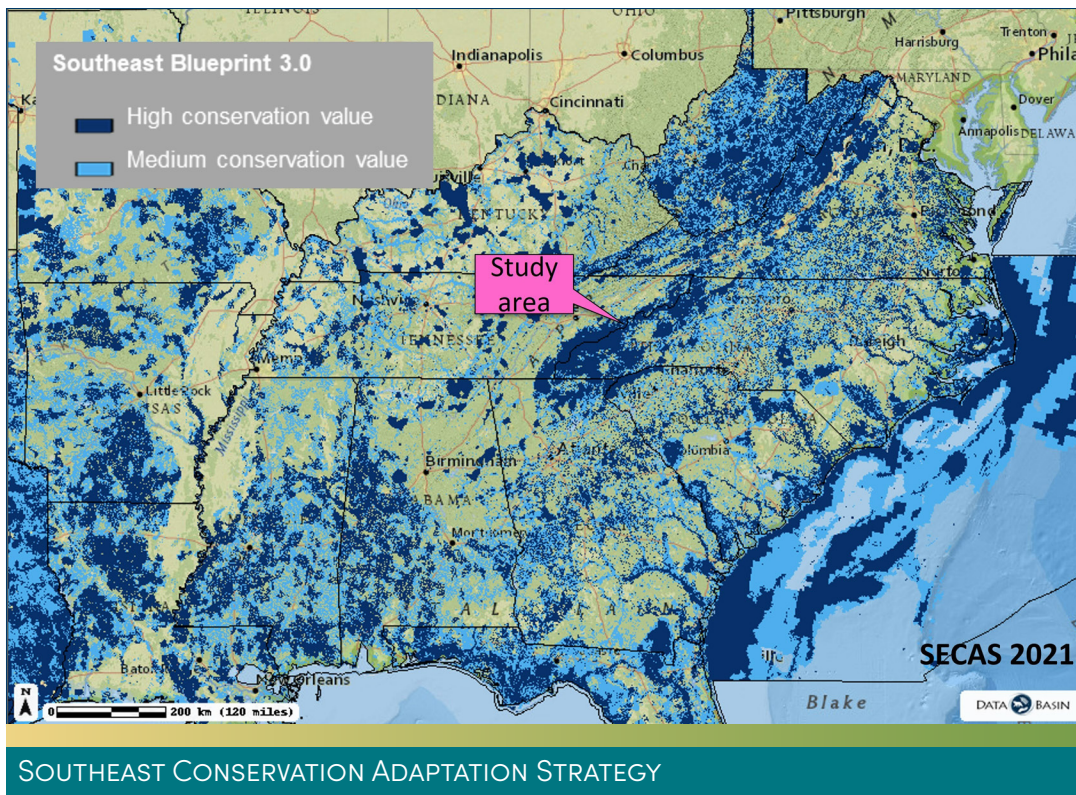
I-40 SAFE PASSAGE contributes to the Terrestrial and Aquatic Habitat Connectivity criterion by evaluating the full range of feasible and constructable wildlife crossing improvements and mitigative measures to reconnect one of the most biodiverse areas in the eastern US. I-40 through the Gorge represents a well-documented and dangerous WVC hotspot. Also, this stretch of highway creates one of the most critical barriers to habitat connectivity for biodiversity in the eastern US. The highway inhibits the internationally recognized biodiversity of 522,000-acre GSMNP from the full reach of the more than one million acres of national forests that stretch to the north. This impedes local connectivity for high numbers of species but also creates a major barrier to the ongoing climate migration pathways that are urgently needed for wildlife to respond to climate change.

Wildlands Network's recent report "Prioritizing Wildlife Road Crossings in North Carolina To Reconnect Wildlife Habitat and Improve Road Safety" identified I-40 through the Gorge as the highest priority site for NC (Sutherland et al. 2022). Wildlands Network surveyed over 160 expert wildlife biologists and conservationists across the state, and out of 179 total wildlife crossing sites considered, the Gorge received the greatest number of votes.

GSMNP is regarded as the most biodiverse National Park in the US (NPS 2023). The

Park’s mix of Southern and high-elevation Northern Appalachian ecosystems served as warm climate refugia for many species during the last glaciation. The Discover Life in America “All Taxa Biological Inventory” project has now recorded over 21,000 species in the national park, including 2,674 species of beetles, 1,940 species of butterflies and moths, 1,817 species of vascular plants, and an incredible 484 species of vertebrate animals. The Park is particularly rich in mammals (70 species) and is a hotspot for amphibians, with 45 total species including 31 species of salamanders. Aquatic diversity in the Park is also extremely high, with 76 species of fish and 123 species of crayfish and other crustaceans documented so far (DLIA 2023, Nichols 2006).

Many conservation plans and designs have highlighted the significance of this nationally significant connection. For example, Wildlands Network’s Eastern Wildway Vision Map and their Blue Ridge Forever connectivity map (Wildlands Network 2016, 2019) and The Wilderness Society’s “Aspirational Network” (Barnett and Belote 2021) and various other US-wide models (e.g., Belote et al. 2022) all confirm the importance of this connection. At the regional level, the Southeast Ecological Framework (Carr et al. 2002) highlighted the Smokies and southern Appalachians as a high priority, as does the more recent Southeast Conservation Adaptation Strategy (SECAS) led by the US Fish and Wildlife Service (SECAS 2021;). Theobald et al. (2012) modeled connectivity patterns across the US and found a major flowline down the NC/TN border through the Smokies.

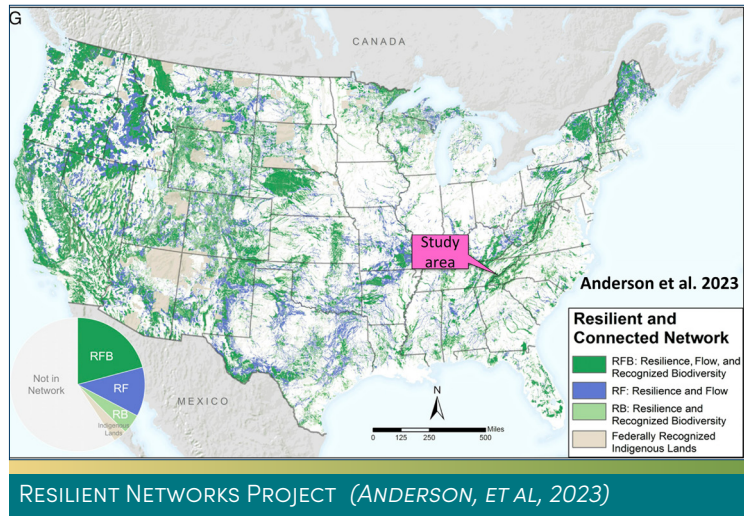


As the climate continues to warm, mitigating the I-40 barrier is essential for enabling species to move northward along the spine of the Appalachians. This movement pathway has been highlighted in numerous studies. The Nature Conservancy’s iterations

of their resilient networks project (Anderson et al 2014, 2016, 2023) have all similarly pointed to this area as being essential for ensuring the survival of biodiversity in the face of climate change. Carroll et al. (2018) also modeled a very concentrated pathway of climate-centered connectivity running through the southern Appalachians.

Most compelling in a visual sense is the now famous Migrations in Motion map produced by The Nature Conservancy. Based on modeling the climactic needs of individual species, this animated map illustrates predicted movement routes of around 3,000 mammal, bird, and amphibian taxa under current climate change projections (Lawyer et al. 2013, McGuire et al. 2016), many of which are projected to track through the spine of the Southern Appalachians, which act as a funnel for gathering migrating species before sending them northwards. In short, the Appalachians are considered an essential, central climate migration route for species on the east coast, and I-40 cuts across this essential connectivity corridor just north of the hyper-diverse GSMNP.

The Gorge and the I-40 corridor also serve as a barrier to aquatic connectivity. In the Gorge, 27 perennial creeks and branches flow under I-40 through culverts not designed for wildlife. Most of these streams are not functionally connected for upstream aquatic movement due to perched culverts or other issues. Efforts to improve terrestrial habitat connectivity by enlarging, modernizing, and adding climate/flood resilience to many of these creek culverts will reap numerous benefits for aquatic species, including populations of brook trout and other native species. A few streams with extant brook trout, including small wild populations with apparent native ancestry, occur within the Gorge (Kazyak 2021) and flow into the Pigeon River.



BEAR AT I-40 CULVERT (NPCA, WILDLANDS)



BOBCAT AT I-40 CULVERT (NPCA, WILDLANDS)



## CRITERION 2.1: LEVERAGING INVESTMENTS

The project contributes to the Leveraging Investments criterion by building on current and previous work to reduce WVCs. The recognized high importance of mitigating WVC and improving habitat connectivity along I-40 in the Gorge has led to the emergence of a strong coalition of conservation nonprofits that have committed themselves to helping raise funds to pay for wildlife crossing infrastructure in the Gorge. The “Safe Passage Coalition” ([www.smokiessafepassage.org](http://www.smokiessafepassage.org)) consists of seven nonprofits, including NPCA, Wildlands Network, Defenders of Wildlife, The Wilderness Society, Great Smoky Mountains Association, North Carolina Wildlife Federation, and The Conservation Fund. So far, the groups have raised well over \$120,000 to leverage investments in wildlife crossings and fencing for this section of I-40. Some money has been spent on on-going outreach and communications activities, but the Coalition steering committee voted to commit \$100,000 as part of the non-federal matching funds for this WCPP application as well as \$195,000 in in-kind services such as continued monitoring and outreach.

Looking beyond the proposed feasibility study, once a set of warranted, feasible, high priority projects have been identified, the Safe Passage Coalition plans to launch a capital campaign to raise additional non-federal funds for construction. Drawing inspiration from the successful campaign conducted to build the Wallis Annenberg Wildlife Crossing (“LA Cougar Project”) in California, this new fundraising effort will benefit greatly from the feasibility study and preliminary design deliverables of this project, and from the wildlife-friendly and conservation-minded local communities centered around Asheville, NC and Knoxville, TN.

## CRITERION 2.2: Economic Development & Visitation Opportunities

I-40 SAFE PASSAGE contributes to the Economic Development and Visitation Opportunities criterion through its connection to GSMNP and other adjacent National Forests and outdoor recreational opportunities. GSMNP is the most visited national park in the US. While much of the tourist industry development for the Park is focused on nearby gateway communities such as Gatlinburg, TN, there is substantial tourist traffic on I-40 through the Gorge to both GSMNP and the adjacent (and similarly popular) Pisgah and Cherokee National Forests. Furthermore, the heavily used and internationally renowned Appalachian National Scenic Trail runs through the length of the national park, then crosses I-40 in the Gorge in TN and proceeds into the national forests. The Pigeon River itself has also become the center of a vibrant white-water rafting industry, with the rafts visible from I-40 as the river parallels the interstate.

This tourist activity, which can only be expected to increase over time, can be leveraged and improved by the positive implementation of wildlife road crossing structures in the Gorge. Wildlife crossing projects, if communicated well to the public at local, regional, and national scales, will generate even more visitation interest.

Sustainable economic improvements are vital for the local communities surrounding the Gorge in both NC and TN. Haywood County, NC has a population of 62,089 (2020),



a median household income of \$33,922, and 11.5 percent of its population living below the poverty line. Furthermore, the largest employer in Haywood County, the Canton Paper Mill, permanently closed in Spring 2023. While this closure is expected to benefit river water quality over time, the economic impacts on the community will be severe. Cocke County, TN is even smaller and less well off, with a population of 35,999 (2020), median household income of \$25,553, and with 22.5 percent of the population living below the poverty line. The 2019 US Census Tract 47029920700 in Cocke County, TN is listed as a Historically Disadvantaged Community. It is in the highest 83rd percentile for low income, 89th percentile for projected flood risk, 92nd percentile in terms of expected agricultural loss rate, 98th percentile in terms of transportation barriers, 91st percentile in terms of unemployment, and over 23 percent of the population have less than a high school diploma.

The economic activity generated by building a large system of wildlife crossings and fencing in the Gorge will be a meaningful contribution to the area, as will the positive attention and goodwill generated by the win-win aspects of the projects and the generally positive media coverage that wildlife preservation activities garner.

### ***Criterion 2.3: Innovation***

This project contributes to the Innovation criterion through the opportunity to explore and evaluate innovative technologies and solutions and implementation options for wildlife road crossings in the Gorge (see for example, McGuire et al. (2021), and these innovations will be pursued to the extent practicable. The nonprofit organizations involved in the Safe Passage Coalition supporting this proposal, particularly Wildlands Network and NPCA, are closely aligned long-term partners with the group ARC Solutions, a nonprofit that specializes in bringing new technologies and designs into wildlife crossing installation around the world.

I-40 SAFE PASSAGE has targeted innovative technologies. For example, Fiber Reinforced Polymer (FRP) overpasses are a new option for wildlife bridge construction that have the potential to reduce costs while improving durability, and the Gorge may be a good candidate for having some of the first FRP wildlife bridges installed in the US.

Some of the unique and challenging characteristics of the Gorge will demand innovation. For example, the relative lack of detour opportunities, combined with the high commercial and tourist traffic on the highway, place a considerable premium on minimizing the amount of time that the interstate can be closed for wildlife crossing installation, if at all. Therefore, it will be important for the I-40 SAFE PASSAGE feasibility studies to consider new and innovative techniques for rapidly installing pre-cast structures (such as those that won the ARC Solutions design competition). It will also be important to investigate the use of new technologies for expanding and replacing existing culverts under the interstate while minimizing disruptions to the flow of traffic.

The rocky terrain of the Gorge also poses challenges that will inspire innovation, particularly with fencing, as it is extremely expensive to dig in the base of wildlife fencing into bedrock to prevent wildlife from slipping underneath. NCDOT is already



investigating new options for such situations where the fencing may be directly tied to the rocky substrate. Also, in many places in the Gorge, it may be possible to utilize the steep cliff-like rock cuts as “natural” fencing, to minimize the amount of new fencing required and to focus the new fencing on the locations where less severe terrain lends itself to greater wildlife movements. As part of this proposal, we will also directly investigate options for improving the flow of wildlife through existing structures under I-40, as creative retrofits (where feasible and appropriate) will almost certainly be cheaper than installing new or replacement structures.

### ***Criterion 2.4: Education & Outreach***

This project contributes to the Education and Outreach criterion by our commitment to our vision, “We strive to find collaborative solutions for safe wildlife passage across Interstate 40 and other area roadways through active participation from regional and community stakeholders. The intended results will be increased public awareness, improved connectivity for wildlife, reduced wildlife–vehicle collisions, and safer driving conditions.” Our project will not be considered complete until the results are shared through our website, local outreach, and publications. The considerable education and outreach capacity already incorporated into this project by our nonprofit partners is one of the clear strengths of this proposal. The Safe Passage Coalition is committed to raising funds for wildlife improvements to the highway, as well as raising awareness and public support for the effort. Over the past several years, positive media attention and public support has been generated in both NC and TN for Gorge wildlife road improvements. A list of multiple of newspaper stories, magazine articles, TV news clips, short films, etc. can be found at [Safe Passage Press](#). One of the Safe Passage Coalition leaders, Frances Figart of Great Smoky Mountains Association, even published a well-received children’s book about the effort, “A Search for Safe Passage”, which won the Publication of the Year award from the Public Lands Alliance.

The nonprofit groups’ plan to continue the outreach and education work, in concert with NCDOT and TDOT and other state and federal agency partners, as a core part of the current WCPP proposal. The new outreach plan will work to ensure that the public in both states is aware of the feasibility study and other continuing research efforts.

In addition to media outreach, 927 people receive a monthly e-newsletter with Gorge project updates and this list will be expanded as the project continues to unfold and gain momentum. The Safe Passage Coalition also maintains a website that will be used to provide project updates and stories from the field.

As described above, it should also be possible to substantially increase the amount of signage and educational materials that are placed at strategic locations in and near the Gorge. This will eventually include bold new educational displays within view (or at least nearby) of new crossing structures that will be built. But while the feasibility study is underway, we will also explore opportunities for education and outreach at a variety of locations, including the NC and TN Visitor Centers on I-40, trailheads for the Appalachian Trail and other popular hiking destinations such as Max Patch, rafting company headquarters, the Western NC Nature Center in Asheville, and other similar

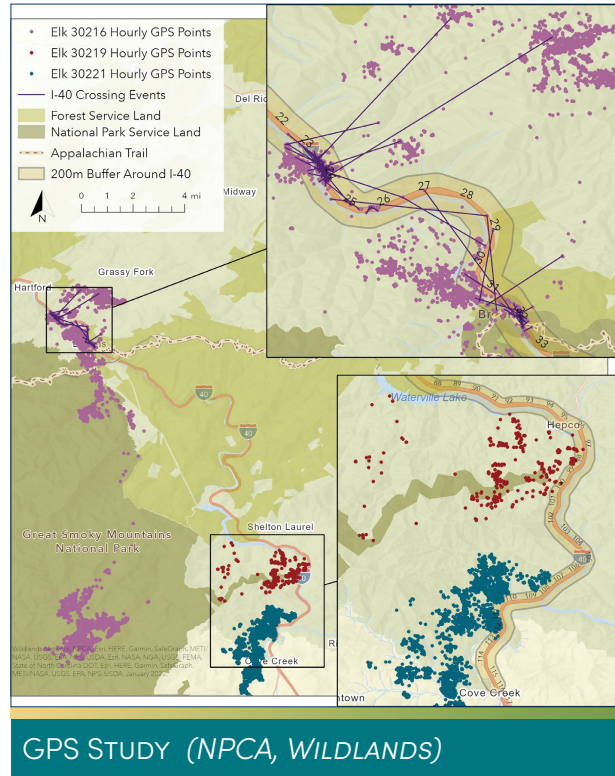
opportunities.

### Criterion 2.5: Monitoring & Research

The project contributes to the Monitoring and Research criterion by building on the privately funded research work of Wildlands Network and NPCA. This research has developed a substantial and scientifically rigorous baseline of information about the wildlife situation along I-40 in the Gorge. This includes 3 years of weekly roadkill surveys, camera monitoring of roadside habitats and existing bridges and culverts and tracking elk with GPS collars.

This work will continue during the development of I-40 SAFE PASSAGE. NPCA and Wildlands Network have pledged to continue a subset of their research work in the Gorge, including weekly roadkill surveys and camera monitoring at select structures,

such as the newly replaced bridge at the I-40 and Cold Springs Creek Road interchange to Harmon Den (Exit 7) in NC, where benches were installed under the bridge to improve wildlife passage under the interstate. The groups are also working with university partners to facilitate ongoing and new studies, such as the black bear GPS study currently underway, analyses of existing data on meso-carnivores in the Gorge, as well



GPS STUDY (NPCA, WILDLANDS)



I-40 & COLD SPRINGS CREEK INTERCHANGE (EXIT 7, HARMON DEN)  
(NCDOT)

as proposed new investigations of reptile and amphibian use of bridges and culverts, and of genetic impacts of the interstate barrier on various wildlife species. Previous and current data will provide an exceptional baseline of information to use in evaluating the effectiveness of new crossings and fencing that will be eventually installed in the Gorge.





## Criterion 2.6: Survival of Species

The project contributes to the Survival of Species criterion by preserving critical habitat for species that are currently declining or threatened by climate change. The Gorge is home to numerous species that are declining elsewhere, such as the timber rattlesnake, eastern box turtle, long-tailed weasel, Eastern spotted skunk, and a wide range of terrestrial salamanders and neotropical migrant songbirds. Some of these species, particularly the timber rattlesnake, which was petitioned for federal listing in 1992 and is a state species of special concern in NC, could potentially be a future candidate for federal endangered species protection if they continue to decline elsewhere. Eastern spotted skunks and long-tailed (and least) weasels are uncommon and of increasing concern to wildlife biologists in the southeast, and both species were detected at several study locations by Hillard et al. (2022) during camera surveys along I-40. I-40 SAFE PASSAGE will mitigate WVC concerns for these species.

Culvert improvements or replacements have the potential to benefit many additional reptile and amphibian species including the spring salamander (*Gyrinophilus porphyriticus*), Eastern newt (*Notophthalmus viridescens*), longtail salamander (*Eurycea longicauda*), eastern box turtle, spotted salamander (*Ambystoma maculatum*), wood frog (*Lithobates sylvaticus*), and Blue Ridge two-lined salamander (*Eurycea wilderae*).

## PROJECT READINESS

### Technical Assessment

#### ADMINISTRATION

NCDOT will administer funds received through the WCPP. TDOT will review deliverables and provide input, as appropriate.

#### PROJECT PROGRAMMING

I-40 SAFE PASSAGE is not programmed in the NC or TN Transportation Improvement Program, Land of Sky Rural Planning Organization (RPO) or East Tennessee South RPO Long-Range Transportation Plans, or either State's Long Range Transportation Plan.

#### PROJECT PUBLIC INVOLVEMENT

NCDOT acknowledges the importance of its obligation to provide robust public involvement throughout the decision-making process and project implementation across the state. These efforts, as directed by NCDOT, are critical to the success of our projects. Following the NCDOT Statewide Public Involvement Plan and in coordination with TDOT and the Safe Passage Coalition, a comprehensive I-40 SAFE PASSAGE Public Involvement Plan (PIP) will be developed. The PIP will identify opportunities to educate



the public on the purpose and need for the project as well as education on wildlife in the region and wildlife corridors and crossings. Public engagement opportunities may include meetings, stand-alone kiosks at rest areas and visitor centers, and participation at area events.

A comprehensive public involvement effort has taken place in the area in support of wildlife crossing upgrades in Tennessee and North Carolina. The Safe Passage Coalition has committed itself not just to raising funds for wildlife improvements to the highway, but also to raising awareness and public support for the effort. Media content developed by the Coalition can be found at [Safe Passage Press](#).

## PROJECT SCHEDULE

Upon funding award for I-40 SAFE PASSAGE, NCDOT is prepared to move quickly toward implementation. Since NCDOT has decided to leverage investments and focus on the WVC hotspots and high value wildlife connectivity areas identified by Hillard et al. (2022), defining the scope of the feasibility study has already been accomplished. NCDOT will begin project work within 3 months of funding availability and anticipates the feasibility study completion within one year from contract NTP.

I-40 SAFE PASSAGE will take place within existing NCDOT rights of way. Every effort will be made to avoid and minimize impacts. If impacts are determined during final design, NCDOT will work with the US Army Corps of Engineers and NC Division of Water Resources to permit these areas. Additionally, at several location coordination will be necessary with the US Forest Service.

Further, the potential federal listing of tricolored bat (*Perimyotis subflavus*) under the Endangered Species Act, which is anticipated to occur in late 2023, will not affect the project schedule. NCDOT is developing a programmatic consultation for the species in coordination with the FHWA, the US Army Corps of Engineers, and the US Fish and Wildlife Service.

## *Environmental Review and Permitting Risk*

I-40 SAFE PASSAGE development will maintain a focus on ensuring that all recommended projects developed in the feasibility study will be designed with permitting and environmental impacts in mind. The project team will work closely with regulators and stakeholders to ensure that permitting requirements, stakeholder outreach, and rapid implementation are at the forefront of each recommendation. NCDOT has designated liaisons within all necessary regulatory agencies who are assigned to work specifically on NCDOT projects. Potential regulatory and permitting concerns will be addressed through early coordination in the site selection process and designated liaisons within the regulatory agencies will ensure streamlined coordination.



## ADMINISTRATIVE PRIORITIES

### *Safety*

Our proposed feasibility study for the Gorge corridor of I-40 is 100 percent aligned with the National Roadway Safety Strategy, given the strong emphasis in our project for reducing the number of dangerous, potentially lethal crashes between vehicles and large-bodied wildlife. See Criteria 1.1. A properly designed system of wildlife crossings and fencing can be expected to reduce WVCs by as much as 90 percent, making this one of the more effective and efficient highway safety interventions available.

### *Climate Change and Sustainability*

Designing and subsequently installing a system of wildlife road crossings in the Gorge would promote the climate resilience of the entire Southern Appalachian Ecosystem. See Criteria 1.2 for why this area is so important to climate-driven migrations for numerous wildlife species. By reducing major crashes involving large mammals, the project will also serve to reduce the relatively large amounts of greenhouse gases that are released anytime the busy I-40 corridor slows down to an hours-long crawl of idling trucks and passenger vehicles.

### *Equity*

The proposed work on the Gorge will promote urban-rural equity by marking a substantial investment in highway safety in two very rural, poverty-stricken counties (Haywood County, NC at 11.5 percent and Cocke County, TN at 22.5 percent). See Criteria 2.2. By reducing crashes, the crossing projects will promote the livelihood and prosperity of rural residents who can least afford the property damage and health care implications of a high-speed collision with a bear, deer, or elk.

### *Workforce Development, Job Quality, and Wealth Creation*

Completion of the proposed feasibility studies and then the eventual construction of a system of wildlife road crossing structures will require large amounts of skilled labor. The resulting workforce of high-quality jobs will certainly promote wealth creation in the western NC and eastern TN labor markets.