

RIGHT



OF WAY

ROADS NEED OVERHAUL TO DECREASE COLLISIONS

By Frances Figart

*"To cross or not to cross?" For wildlife whose ancestors have traversed our landscapes for centuries in search of food, mates and territory, this is **not** the question. Their instinct is to continue moving across age-old geographical paths. But humans have made this natural migration more and more difficult by fragmenting large sections of wildlife habitat and protected forest, bisecting them with huge roads fraught with heavy, fast-moving vehicles. The resulting rise in collisions with large mammals has become a serious concern not only for conservation, but also for human safety, economics and culture.*



IT'S A GLOBAL ISSUE

that has reached a regional tipping point: there is a documented rise in motor vehicle collisions with wildlife throughout East Tennessee and Western North Carolina. Due to increasing populations—both animal and human—as well as growing tourism in the area, it is expected that this situation will only get worse.

"We see an immediate need to begin to coordinate a multi-disciplinary and multi-jurisdictional exploration of solutions," said Jeffrey Hunter, senior program manager with the National Parks Conservation Association (NPCA), an independent, nonpartisan membership organization devoted exclusively to advocacy on behalf of the National Parks System. "An important goal of our work is to help agencies and partners work proactively together—and with the public—to develop and implement approaches

for infrastructure development that limit or mitigate harmful effects on wildlife."

In early 2017, Hunter began focusing on the problem along a 28-mile section of Interstate 40 in the Pigeon River Gorge that skirts Great Smoky Mountains National Park and along US Highway 19 between Maggie Valley and Cherokee, NC. Last October, he worked with the Federal Highway Administration to organize a wildlife crossing workshop and peer exchange that brought representatives of state departments of transportation together with agency stakeholders such as Defenders of Wildlife, Eastern Band of Cherokee Indians, NC Wildlife Federation, NC Wildlife Resources Commission, NPS, Rocky Mountain Elk Foundation, Southern Appalachian Highlands Conservancy, Tennessee Wildlife Resource Agency, Wildlands Network and the US Forest Service.



Cover page image: Symbolic of the risk–reward situation that bears must face when there is a critical need for them to search for food, security, dispersal or breeding, a female bear looks for the best opportunity to cross as her cubs surround her at the guardrail on I-64 in Virginia near the top of Afton Mountain where the Shenandoah National Park and the Blue Ridge Parkway meet. Image courtesy of Bridget Donaldson, Virginia Transportation Research Council. Above: Dead bear closeup on I-26. Image by Caara Hunter. Right: Dead white-tailed deer, Montana. Image by Marcel Huijser



Left: In the 1970s, the Great Smoky Mountains National Park bear population was estimated to be around 300–400 park wide. Today that number has more than quadrupled with an estimate of 1,500–1,600 individual bears in the park. Right: “Elk prefer a mosaic type of habitat with a mixture of openings and other habitats,” says Kim Delozier of the Rocky Mountain Elk Foundation. “Much of the park is forested so, as elk conduct exploratory movements and find better habitats, we can expect some animals to cross roads in search of greener pastures.” Images by Bill Lea

“THESE ANIMALS ARE NOT REALLY EQUIPPED

to know how to negotiate or avoid an interstate highway.

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and this will lead them to attempt to cross.”*

~Hugh Irwin, landscape conservation planner, The Wilderness Society

“There are high populations of bear in the Smokies and on national forest lands seeking food, mates and new territory. Reintroduced elk are coming out of the Smokies seeking these same things,” says Hugh Irwin, landscape conservation planner with The Wilderness Society and an attendee of the workshop. “These animals are not really equipped to know how to negotiate or avoid an interstate highway. To a

certain extent they will avoid the noise and motion, but they will follow their instincts to find food, mates and new territory, and this will lead them to attempt to cross.”

Irwin describes our region as “a landscape that bear, elk and other wildlife have ranged across for ages. I-40 has been in place for only about 50 years, which is the blink of an eye in terms of this timeframe. In addition, I-40 and

most other highways were not designed with wildlife needs as a primary consideration.”

RIBBONS OF RISK

One of the presenters at the workshop is Mike Pelton, a wildlife biologist and professor emeritus of the University of Tennessee who initiated bear research in the Great Smoky Mountains in 1968, the year I-40 was built. He says there are several reasons why the black bear population in the Southern Appalachians and the Smokies specifically has increased dramatically since the 1970s.

“Several million acres of public forested lands served as the infrastructure, and maturation of oak trees and concomitant acorn production provided a vital fall food source, along with summer crops of several species of berries,” Pelton says. “Early research by the UT bear program indicated that the sex ratio of the harvest could be skewed toward male bears by delaying the fall hunting season. State wildlife agencies created no-hunt zones on national forests, revised hunting regulations, cracked down on illegal hunting, and increased efforts to educate the public about bears. The USFS cut back on creating access roads in the national forests. Lastly, but certainly not the least reason, is the incredible adaptability of this intelligent species to humans and their intrusive activities.”

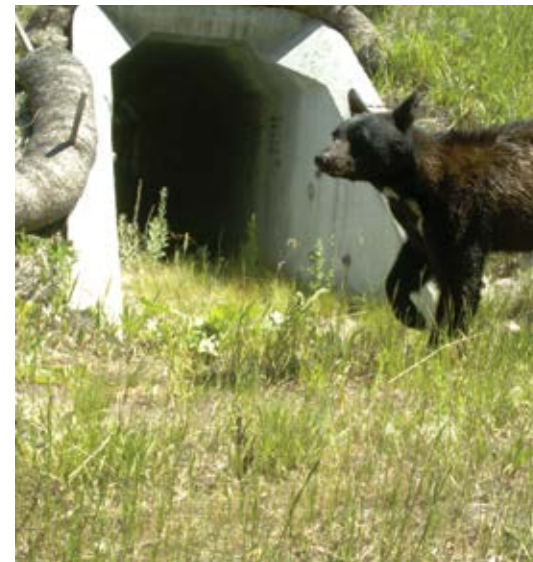
Black bears are consummate omnivores, which allows them to exploit a wide spectrum of food sources. Pelton

describes them as ridge runners and gap crossers. “Many of today’s trails and roads in our region were originally paths for bear and other wildlife. These trails were then used by Native Americans, then settlers, then modern occupants—hiking, biking or motoring,” he says. “As time has passed, these human roads have become serious ribbons of risk for bears and other wildlife. Links in the Southern Appalachian mountain chain—the heart of prime habitat for bears and other wildlife and our public open-space lands—have been broken at significant gaps by our major highways that obviously disrupt the natural movements of bears and other mammals—the I-40 gorge in Tennessee and North Carolina being a prime example.”

When road planners constructed the two tunnels on I-40 between Asheville and Knoxville, they inadvertently created land bridges that are helping some animals to cross. “Monitoring the land bridges has shown that black bear, coyote, bobcat and white-tailed deer are using these structures to cross Interstate 40,” Hunter says. “Thus far we have not seen sign of elk using these structures.”

Pelton points out that most departments of transportation (DOTs) in the eastern United States are late getting into the business of building safe passages across highways for wild animals. Europe, Canada and many of our western states are far ahead.

Hunter is pleased that both North Carolina and Tennessee’s departments of transportation attended the peer



Clockwise from top left: (1) Large mammal underpass, elliptical culvert (12 x 21 feet) courtesy of Montana Department of Transportation, Confederated Salish and Kootenai Tribes, and Western Transportation Institute—Montana State University; (2) wildlife underpass (foreground) and overpass (background) by Marcel Huijser; (3) medium mammal box culvert (4 x 6 feet) courtesy of MDT, CSKT and WTI-MSU; (4) wildlife overpass by Marcel Huijser with aerial support from LightHawk. All images taken along US Hwy 93 North at the Flathead Indian Reservation near Evaro, Montana.

exchange and says it provided an opportunity to “learn best practices and see examples from the visiting international subject matter experts on wildlife crossings and road ecology that will hopefully help us improve the safety and wildlife connectivity where bear, deer and elk travel in and out of the Smokies.”

THE ECONOMIC REALITY

One of those subject matter experts is Marcel Huijser (pronounced ‘Houser’), a senior research ecologist with the Western Transportation Institute at Montana State University in Bozeman who has contributed to road ecology studies for more than two decades. In many of the countries where he works, roads are planned and built with wildlife “permeability”—increased safe crossings—in mind.

Here in the United States, wildlife crossing was not a consideration when most of our roads were built, and as a result there are as many as two million large mammal–vehicle

collisions each year. Huijser says numbers are not exact because crash data and carcass data from reported collisions are minimum estimates. “For example,” he says, “the number of reported wildlife crashes is, on average, only about 30 percent of the number of reported large mammal carcasses, and the latter does not include animals that crawl off the highway corridor and die later nor carcasses that are taken by others before maintenance crews pass by.”

Huijser works with economists to calculate collision-related costs, which include not only those associated with vehicle damage and insurance but also dollars spent on human injury, illness and mortality resulting from collisions, as well as costs related to highway delays and value associated with hunting. All these, he says, add up to roughly \$12 billion annually. The cost of a deer–vehicle collision averages around \$6,000; running into an elk can cost upwards of \$17,000. These costs are mostly based on human safety parameters and do not include values associated with

biological conservation or the economic value of wildlife to a local or regional economy.

Road mitigation measures to increase permeability for both large and small animals can take the form of wildlife overpasses, open-span bridges, large mammal underpasses, medium underpasses, and small pipes for reptiles and amphibians, which comprise the majority of species hit. “We have to be very specific about what we want these crossing structures to achieve,” Huijser says, “because only then can we measure success. We find that the longer the structure is in place, the more the wildlife will use it.”

Some examples where mitigation measures have succeeded in improving human safety and maintaining or improving wildlife connectivity are the Trans-Canada Highway in the Rocky Mountains’ Banff National Park, Snoqualmie Pass on I-90 in Washington State, and the Flathead Indian Reservation in Western Montana where Huijser worked for 13 years. Fencing is often used to keep wildlife off the highway and funnel them to safe-crossing opportunities. Dozens of such corridor projects have led to 80–95 percent collision reduction with large mammals like deer and elk since the mid-’90s.

Huijser cites three main reasons why people care about wildlife and highways: concern for human safety, the desire for wildlife conservation, and economics. Although road mitigation measures are good for human safety and for animals, they cost money. Creating wildlife corridors on an existing road can run into the hundreds of thousands of dollars per mile, a single wildlife overpass can cost up to \$10 million, and an underpass may require around half a million to build.

But Huijser says we can’t afford not to. “Implementing effective mitigation measures substantially reduces costs associated with wildlife–vehicle collisions by 80–100 percent. Bottom line: even if people don’t care about human safety or wildlife conservation, it can still make economic sense. And if you consider the biological conservation

aspect, the value expands to take in benefits to local tourism economies.”

A CULTURAL PERSPECTIVE

A fourth reason for caring about wildlife collisions is related to culture. “On tribal lands, we have several areas where high-speed traffic meets known elk crossings,” says Caleb R. Hickman, supervisory fish and wildlife biologist with the Eastern Band of Cherokee Indians (EBCI). “The top of Soco Mountain on Highway 19, where tribal land and the Blue Ridge Parkway meet, has already had several elk–vehicle collisions and several elk mortalities.” Other problematic areas include the section of Highway 19 between Bryson City and downtown Cherokee, Highways 74 and 441, and the Blue Ridge Parkway crossing the sovereign contiguous land base called the Qualla Boundary.

“We counted up to 60 elk this fall on tribal lands, and elk like to move great distances,” Hickman says. “Right now, over 40 elk are known to walk across Highway 19, and another 12 across the Blue Ridge Parkway, where the mountains create tight, windy roads with blind curves. These smaller highways are particularly dangerous to elk and people. Because of this growing concern, our program looks to place collars on ten elk in the next two years to understand their behavior.”

The EBCI wants to keep elk off of highways but also out of residential areas. “We would prefer to navigate animals to our tribal reserve. As you get to the borders of the tribal boundary, vehicle speed limits increase, so passage between key management areas would be ideal.”

Tribal wildlife biologists would also like to work with state and federal agencies to obtain useful data to determine impacts on their resources. Hickman hopes the EBCI’s data might inform DOTs about crucial areas for slowing down traffic and help fish and wildlife managers develop methods to attract wildlife away from dangerous intersections. “We wish to manage

land with partners to attract these large animals into the more remote wild places during their long-distance movements,” he says. The tribe hopes this work will help them prepare for that time in the not-too-distant future when elk populations expand and start to cross Highway 441.

While the basic idea of a wildlife corridor is something the tribe supports, they see the I-40 corridor as just one of many potential barriers to safe crossing. Hickman’s main concern is that corridors be built with respect for the tribe’s land, people, and natural and cultural resources. Government and agency interactions require careful communication in order to accomplish this, he says.

D.O.T.s NEED DATA

Departments of transportation are obvious lynchpin partners in any successful effort to help make roads more permeable. To date, the majority of planning and implementation of highway permeability measures in North Carolina has occurred in the eastern half of the state.

“This is mostly due to the number of opportunities that have presented themselves over the last 20 years in the east versus the west,” says Travis Wilson, Eastern Region Highway project coordinator with NC Wildlife Resources Commission (NCWRC) and the agency’s liaison to NCDOT. “With that said, the first wildlife crossing installed in NC was located on I-26 in Western NC. As a late addition to the project design, that crossing was limited in scope and ultimately resulted in a structure with flaws that limit its effectiveness.” Since then, multiple wildlife crossings have been incorporated into the design of more than a half-dozen transportation projects from Durham to Dare County.

The Pigeon River Gorge section of I-40 is known to have the highest vehicle–bear collisions in the state. Just since May of 2018, vehicles have killed at least 35 bears in the gorge, but the number could be as much as a third higher. According to

NATIONAL PARKS CONSERVATION ASSOCIATION CENTENNIAL

A century ago, visionaries with a passion for America's national parks saw the need for a strong, independent voice speaking out on their behalf. With the strength of 1.3 million members and supporters, the National Parks Conservation Association is that voice. On May 19, 2019, the nonprofit will celebrate 100 years of working to protect places of unparalleled natural wonder, historical significance and cultural value.

Founded by the first director of the NPS, Stephen Mather, NPCA was championed early on by New York journalist and activist Robert Sterling Yard. In 1920, he encapsulated his vision for how the organization would claim its power, words that have just as much meaning today as they did then: "Unconnected with the Government and absolutely independent of political or other

adverse influences, it has become the fearless and outspoken defender of the people's parks and the wild life within them against the constant, and just now the very dangerous, assaults of commercial interests."

NPCAs Don Barger, senior regional director, Southeast Region, was named one of the 100 most influential people in the history of Great Smoky Mountains National Park. "Today, some of our most important projects in this region include fighting the threat of oil and gas development to our Atlantic coastal parks, preservation of the Ocmulgee River corridor in Georgia including its Native American history, and the wildlife corridors connectivity project in East Tennessee and Western North Carolina," he says. "The future of our parks is in the hands of those who love them and of those who will come to love them."



Kim Delozier of the Rocky Mountain Elk Foundation and Jeff Hunter of NPCA confer during the early planning stage of the connectivity project focused along a 28-mile section of Interstate 40 in the Pigeon River Gorge that skirts Great Smoky Mountains National Park and along US Highway 19 between Maggie Valley and Cherokee, NC. Image by Caara Hunter. NPCA is spearheading the collaboration of at least two-dozen stakeholders, conservation agencies and department of transportation representatives to address the issue of road permeability.



Matt Richards, ecology section manager for TDOT's Environmental Division, there were 19 bear crashes from 2014 to 2018 just between mile marker 440 and the TN-NC state line. All but four occurred in October, November and December—when bears are on the move in search of food and getting ready to den—and all happened between 7:30 p.m. and 4 a.m.

Richards says the biggest challenge to adding structures to existing roadways is cost, and they "may be considered unneeded based on the success of other more inexpensive deterrents such as fencing." Another challenge is the steep

terrain of the gorge, which limits construction access. He says if there were "incentives from regulatory agencies to use wildlife-crossing mitigation to offset other project impacts such as streams and wetlands," this would help DOTs move toward greater permeability for wildlife.

One of the more important aspects in planning is the protection of the wildlife corridor, according to NCWRC's Wilson. "Wildlife crossing structures are added cost to transportation projects, so it is imperative to protect that investment by placing the structure where you have already identified and protected that corridor," he says. "Local land trusts

and environmental stakeholders often have the contacts and resources to effectively work to protect those areas in advance of a project." The NPCAs Hunter says thankfully both the Southern Appalachian Highlands Conservancy and The Conservation Fund are engaged with the initiative.

The Wildlife Resources Commission has been involved in road mitigation research for wildlife for more than two decades. That work has led to the identification and installation of wildlife underpasses on new highways that benefit a whole suite of species—including reptiles, amphibians, birds and small mammals—not just black bears or deer. Colleen Olfenbuttel, black bear and furbearer biologist with the NCWRC, says that "while installing underpasses on existing highways is expensive and challenging, the commission can identify opportunities when a road is in the process of being improved."

At the wildlife-crossing workshop, "we discussed the need to work collaboratively to right-size the project with the need," says Wanda Austin, project development engineer for the NCDOT Division of Highways. "We also discussed how all agencies need to work on reporting and monitoring strategies. Each agency has its own method to capture data on strikes. Unfortunately, some strikes are not reported, or the reporting is not detailed enough to give decision makers information needed about the type of strike."

Austin adds that if the true cost of a collision—including vehicle repair, insurance claims, road user costs, emergency response and other factors—could be captured, then the perceived benefit of the project would be higher. "DOTs need data," she says, "and this is part of the data that is currently missing from the analysis of wildlife-crossing projects."

GORGE CONNECTIVITY STUDY

Several initiatives are in place to help collect the data that DOTs need before various types of mitigation efforts can be considered for incorporation into existing highways. Dr. Liz Hillard, a wildlife scientist with the nonprofit Wildlands Network, and Steve Goodman, NPCA's Volgenau wildlife research fellow—a name Hunter says honors the Volgenau Foundation, which generously donated significant funding to both NPCA and Wildlands Network for this project—are collaborating on research to evaluate how roadways outside the park influence the connectivity of bear, deer and elk habitat.

"We are conducting road mortality surveys and procuring mortality data from state agencies (TDOT, NCDOT and NCWRC) along I-40 in the Pigeon River Gorge to determine wildlife mortality hotspots," says Hillard. "In addition, we are putting GPS collars on elk in partnership with both the park and the state to assess roadway movement patterns and elk road-crossing behavior. Understanding where animals are getting hit and where elk are crossing roadways will allow us to identify locations where mitigation strategies can be focused."

Goodman says the primary goal of their work, referred

to as the Pigeon River Gorge Wildlife Connectivity Project, "is to improve wildlife's ability to cross this portion of I-40 to improve public safety. Our 28-mile project corridor runs from Exit 20 (Maggie Valley) in North Carolina to the Foothills Parkway (Exit 443) in Tennessee. Our target species are black bear, elk and white-tailed deer, but we will also, opportunistically, collect data on other (smaller) species."

Goodman and Hilliard are creating a master database of black bear, elk and white-tailed deer mortality along the study corridor. "Mortality has potentially been underreported in the past," Goodman says. "We will combine records from crash data reports, carcass removal activities and our weekly driving surveys into a centralized database that will allow us to compare sections of highway over time."

Hilliard says due to annual and seasonal variation in animal movements, multiple years of research are necessary to determine patterns and processes influencing road mortality and elk roadway behavior. Therefore she and Goodman expect to be collecting data for the next two to three years.

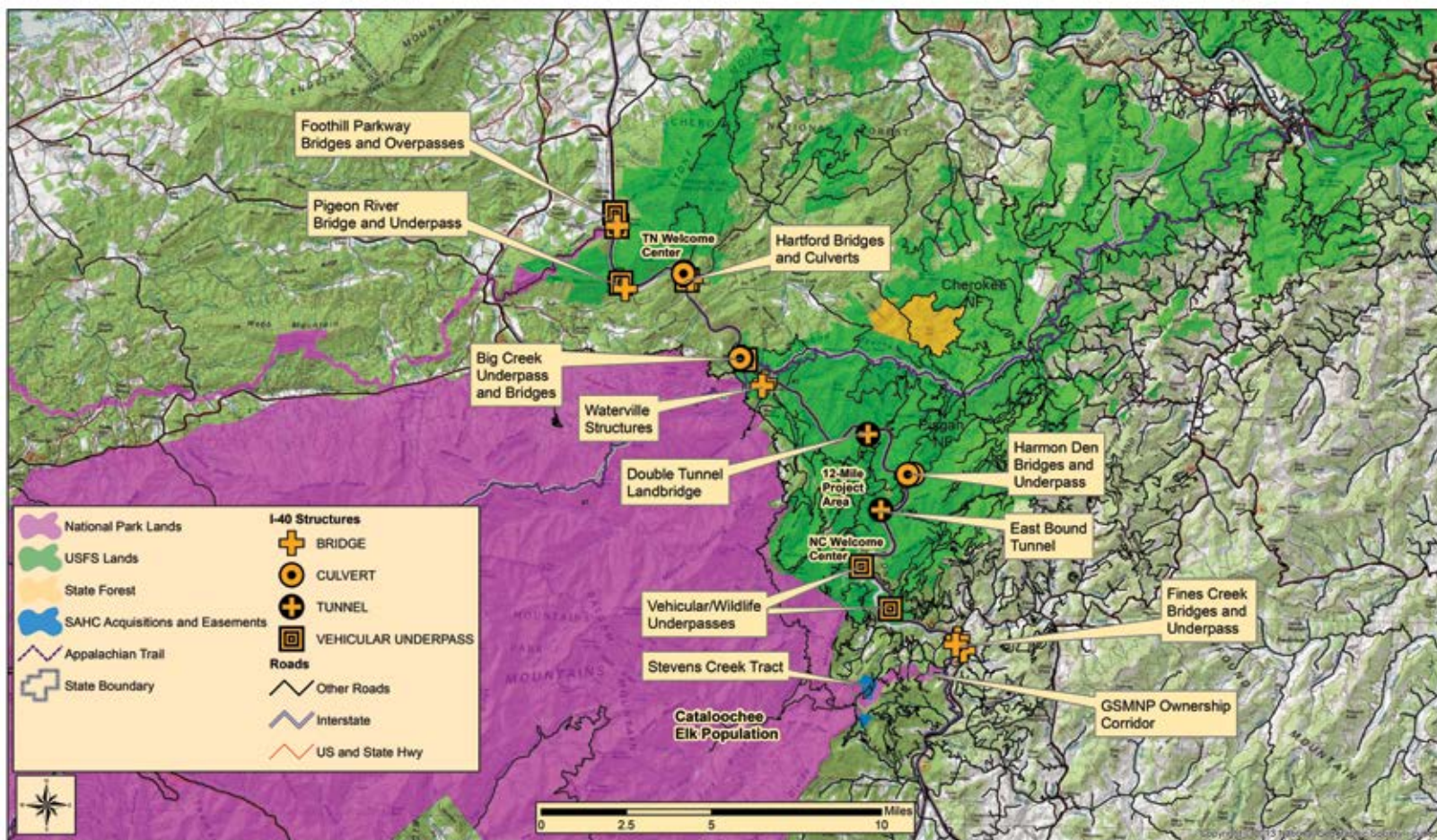
"The frequency of elk-vehicle collisions is likely to increase through time as road networks continue to expand, the elk population continues to grow, and traffic volume increases," she says. "This research will provide information to guide mitigation strategies to increase human safety, reduce elk-vehicle collisions, and increase the connectivity of public lands as elk disperse."

According to Goodman, the results from the project will

Nick Melton, GSMNP elk technician; Molly Byrne, GSMNP intern; Steve Goodman, NPCA Volgenau wildlife research fellow (background); Joe Yarkovich, GSMNP wildlife biologist; and Dr. Liz Hillard, wildlife scientist with Wildlands Network (foreground), collaborate to place a tracking collar on an elk. Image by Keith Martin



Existing and Potential Wildlife Corridors Across I-40 in Pigeon River Gorge



Map created by Hugh Irwin, landscape conservation planner, The Wilderness Society

provide valuable insight into the highway's effect on wildlife, both in terms of wildlife-vehicle collisions and also in terms of how the highway may be serving as a barrier to wildlife movement. "Reducing mortality and lessening the road barrier effect will increase the safe flow of animals—including those moving to and from the Smokies—for seasonal breeding and foraging opportunities."

PARTNERSHIP AND PROMOTION

Another agency involved with this effort is the North Carolina Wildlife Federation (NCWF), which works with NPCA, NCWRC, conservation groups, land trusts and the public to support land acquisition, improve habitat for elk, and increase connectivity of habitat to reduce the risk for elk-vehicle collisions.

"NCWF has partnered with NPCA and Wildlands Network to collect GPS data on elk to better understand their movements with the intent to identify where elk are crossing roadways and where implementation of crossing structures would be most beneficial," says Dr. Liz Rutledge, wildlife specialist and certified wildlife biologist with NCWF. "The data will provide insight into elk behavior and how they utilize the landscape during various times of the year. Ultimately, we hope this data will help biologists and

partners work together to reduce elk mortalities on roadways, thus increasing overall elk population numbers."

An active supporter of proactive transportation planning and the modification of current roadways, NCWF provides input on project strategies, brings new stakeholders to the table to ensure all perspectives are represented, and continues to work on future educational and tourism opportunities to highlight the uniqueness of charismatic species and help the public understand the importance of protecting them.

"As with many landscape scale projects, inclusion of all stakeholders and conflict resolution will need to occur to achieve the overarching goal of connecting large tracts of land to provide corridors for wildlife," Rutledge says. "This will require a collaborative effort on behalf of numerous stakeholders, including NCWF, state and federal agencies, conservation groups, the DOTs and local landowners."

FUTURE RIGHT OF WAY

At the end of 2018, the World Wildlife Federation released a report on a long-term study indicating that, in just the last 45 years, human activity and decision-making has caused the marked decline of 60 percent of global wildlife species. In addition, the Center for Biological Diversity has determined that our planet is now in the midst of its sixth

mass extinction of plants and animals.

Our local issue relates to these findings directly. We are part of the problem.

Great Smoky Mountains National Park, Pisgah National Forest and Cherokee National Forest surround the Pigeon River Gorge's I-40 corridor and are some of the largest remaining contiguous federal public landmasses in the eastern part of the country. Connecting large landscapes such as these is one of the highest priorities for wildlife conservation in the US.

"Statistics regarding documented wildlife roadkills, vehicle damage, human injuries and fatalities have been available for decades in eastern states," says biologist Mike Pelton. "With ever-increasing traffic volumes and increasing numbers of larger mammals—deer, bear and elk, not to mention smaller creatures—it is time for more immediate action by DOTs."

Why spend money on a road crossing when we may save only a few individual animals? Kim Delozier of the Rocky Mountain Elk Foundation believes it's simply *the right thing to do*—for several reasons. "Obviously, when you are dealing with thousands of animals, population management is the general focus. However, animal welfare has risen to a level where wildlife managers now must be more conscious about how *individual* wild animals are treated," he says, adding that greater care of individual animals from wildlife managers gains credibility and support from the public. "We have impacted wildlife habitat and their movements with our roads, parking lots and subdivisions. So why would we not do the best job we can to reduce *our* presence in *their* home?"

Black bears have become an icon of Western North Carolina and East Tennessee with a diverse group of stakeholders (e.g., photographers, wildlife watchers, hunters, tourists, businesses) interested in seeing the black bear population continue to thrive. "Vehicle collisions were the primary cause of bear mortality in our recent urban/suburban black bear study in Asheville," says Olfenbittel of the NCWRC. "Because bears are considered an umbrella

FLORIDA CASE STUDY

The nonprofit Defenders of Wildlife has been working for decades to address the impacts of roads on the recovery of the Florida black bear and Florida panther.

"We know that transportation infrastructure can fragment important habitat, interrupt animal movements and cause direct mortality," says Ben Prater, field conservation director of the Southeast Program. "Through our work in Florida we also know that these impacts can be reduced and in many cases mitigated with careful planning and a commitment to considering the needs of wildlife."

With stakeholders and partners working together, Defenders of Wildlife has demonstrated success and learned many lessons along the way. Prater says "applying this knowledge in areas like Western North Carolina and East Tennessee will be essential to protecting and connecting habitat for elk, black bear and numerous other species on the landscape."



Florida panther. Image courtesy of US Fish and Wildlife Service

"WE HAVE IMPACTED WILDLIFE HABITAT

and their movements with our roads, parking lots and subdivisions.

So why would we not do the best job we can to reduce our presence in their home?"

~ Kim Delozier, Rocky Mountain Elk Foundation

Eastern Wildway Draft Vision Map 2017 v1.0

CORES, CORRIDORS AND CONNECTIVITY

Since the 1970s, conservation biologists have observed an accelerating rate of species extinction. Today our species loss, termed the "sixth extinction," is occurring at an alarming rate, unprecedented during the past half-billion years. The latest estimates suggest that 30 to 50 percent of all species are possibly heading toward extinction by midcentury.

In 1991, some of these same scientists and other visionaries catalyzed the establishment of the Wildlands Network with the mission to *reconnect, restore and rewild* North America. The network is made up of districts called 'wildways.' The Eastern Wildway stretches from the wilderness of Quebec, the Adirondacks and the Shenandoah Valley to the Great Smoky Mountains and Everglades National Park—and includes the Appalachian Trail.

"Conservation biology identifies three key management concepts to reverse this loss of species and genetic diversity: *cores, corridors and connectivity*," says Christine Laporte, senior network specialist for the Eastern Wildway. "Wildlands recognized nearly 30 years ago that landscapes need to be connected by corridors and today we mesh this concept with an understanding that human society's footprint is expanding. National parks and other protected areas serve as the 'cores,' or building blocks, for *networks of wild lands* across the continent. Wildlife crossings are an important and effective method for achieving connectivity between these cores along species' movement corridors."

Wildlands Network uses field data and research to inform appropriate planning for wildlife crossings, such as its elk research along Interstate 40 in the Pigeon River Gorge corridor. "As our climate changes, many species—including humans—need to be able to move to optimal habitats," says Laporte. "With tools like wildlife crossings, we can do so in ways that reduce road collisions and without disrupting natural patterns of movement."



This map was prepared by Wildlands Network in 2017 using various conservation science data sets and satellite images. It represents a potential network of core habitat areas for biodiversity, interconnected by a system of corridors, at the scale of eastern North America. Implementing the Wildway will take years of land protection and restoration efforts, with conservationists working with private landowners on a voluntary basis. Core area boundaries are drawn broadly to include restoration areas around existing concentrations of natural habitat. Corridors follow available habitat pathways and modeled habitat connectivity priorities and in many cases would need restoration of habitat and mitigation of road barriers to achieve functionality. For questions about the map, contact Dr. Ron Sutherland, chief scientist at Ron@wildlandsnetwork.org. To learn about partnership opportunities, contact Christine Laporte at Christine@wildlandsnetwork.org.

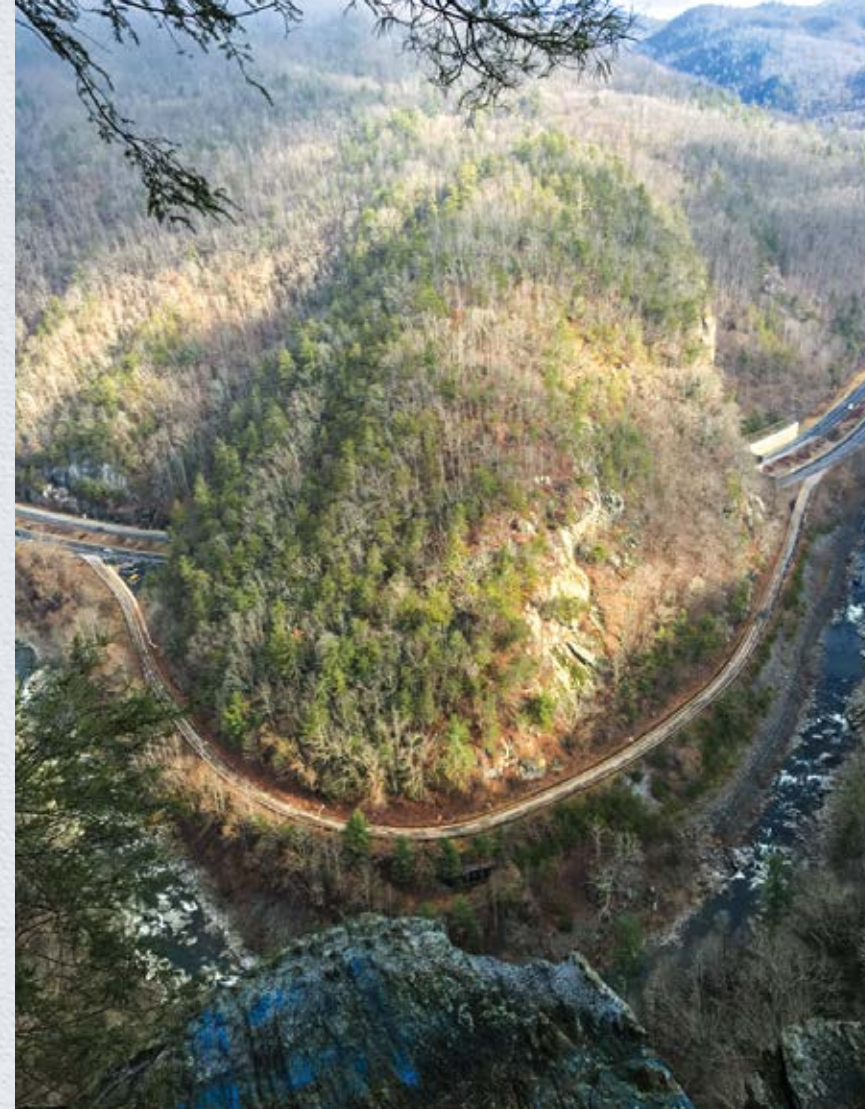
species, conserving travel corridors for bears will benefit many other species."

Research ecologist Marcel Huijser says we need to be thinking about "which of our native species will be able to adapt to a changing climate. We also need to think in terms of wildlife passages that allow for northward movement and movement up and around the mountains."

Hugh Irwin of The Wilderness Society agrees that climate change is making the need to address wildlife movement for adaptation even more critical. "The time is ripe for this oversight in design to be remedied," he says. "I-40 and

other highways should be retrofitted to address the needs for wildlife crossing."

If you want to help, ask your congressional representatives to support the Wildlife Corridors Conservation Act, introduced in 2018 by Sen. Tom Udall (D-NM) and Rep. Don Beyer (D-VA), and expected to be reintroduced soon. "It will establish a National Wildlife Corridors System on federal public lands and provide funding for states and tribes to protect wildlife corridors on non-federal lands," says Susan Holmes, policy director, Wildlands Network. "It has support from 150 national and regional groups, scientists like E.O. Wilson and outdoor recreation companies like Patagonia." ❖



When road planners constructed the two tunnels on I-40 between Asheville and Knoxville, they inadvertently created land bridges that are helping bear, bobcat, coyote, deer and other animals to cross safely. Images (which include a melanistic coyote) courtesy of NPCA