Committee on Ecology and Transportation Newsletter

Transportation Research Board Committee ADC30 September 2015

View from the Chair

Alex Levy, Chair Ecology and Transportation Committee

On the Roads to Resilience

By Alex Levy, Senior Ecologist, Arcadis, US

> *Though I do not believe that a plant will spring up where no seed has been, I have great faith in a seed. Convince me that you have a seed there, and I am prepared to expect wonders.*
>
> **Henry David Thoreau**

What you hold in your hands, or are viewing in any of a variety of electronic media, is a timely cross-section of research activities, accomplishments, and practices from the near and far corners of our living world. In the pages that follow are not just ideas from around the world, but a world of ideas from China, South Africa, and North America; and from marine, to temperate, and arid habitats, comes news about the emergence and application of new programmatic policies, research and practices for more-effective and conservation-minded roadside vegetation management, as well as news on terrestrial habitat connectivity, marine ecosystems, and much more. We present these contributions just in time for representatives from around the world gathering at 8th biennial International Conference on Ecology and Transportation (www.icoet.net), where the heralded theme is ***Roads to Resilience: Strengthening Essential Transportation and Ecological Assets across Diverse Landscapes***. Hosted by the North Carolina Department of Transportation, ICOET 2015 is also the location for the mid-year business meeting of TRB Committee on Ecology and Transportation.

Behind-the-scenes, the Committee on Ecology and Transportation is hard at work—collaborating with other TRB standing committees—to contribute to a robust 95th TRB annual meeting in Washington, DC (January 10-14, 2016). We are the lead cosponsor of Pollinators on the Verge: Policies, Practices, and Implications for Conservation in Roadside Habitats, a half-day workshop that will explore the pros and cons of policies and practices to leverage transportation rights-of-way and greenspace for pollinator management. Along with the joint Subcommittee on Animal Vehicle Collisions, we are sponsoring a lectern session ***Animal-Vehicle Collisions: Understanding and Reducing Risk for Driver Safety and Sustainability,*** as well as a cross section of wildlife and habitat connectivity-themed papers in a lectern session of ***Hot Topics and Emerging Themes in Ecology and Transportation.*** Finally, our committee is collaborating in two lectern sessions sponsored by our sister Committee on Environmental Analysis: ***Achieving Measurable Environmental Benefit as a Direct Result of Alternative Project Delivery*** and ***Best Practices with National Transportation Liaisons***. Both of these sessions reflect the changing paradigms in the business of efficiently delivering environmental commitments and quality while advancing transportation projects in the United States.

The intersection of these ideas exemplifies our committee's commitment to improve the environmental quality of our transportation systems. We do this by stimulating research in transportation ecology and communicating the results of recent and ongoing research throughout the

ROADS continued on page 2

■ ROADS continued from page 1

transportation and allied conservation community. From papers to posters, workshops to sessions, news you can use and ideas that inspire; all are contributions from the friends and members of the TRB Committee on Ecology and Transportation. Each of these women and men share their passion in these pages and in their service to our committee where you—too—are invited to publicize, muse, and prepare our community-of-practice and our world to expect wonders.

Strong Data From The Endangered Wildlife Trust's Latest Roadkill Survey Roadkill Survey

(From The Green Mile, newletter of the Wildlife and Roads Project, Endangered Wildlife Trust)

Submitted by Wendy Collinson, Project Executant, Endangered Wildlife Trust, South Africa

Working in the field: identifying a roadkill snake

One of our fake animals – a brightly colored-snake

Brake for wildlife: roadkill in protected areas

Surveys of wild animals killed by passing traffic (roadkill) have produced strong data and several recommendations. This is as a result of recent investigations into the issue of roadkill in the Pilanesberg National Park, South Africa.

The surveys, conducted by the Endangered Wildlife Trust (EWT) between 21 October and 23 November 2014, consisted of on-site investigation of roadkill, as well as questionnaires completed by 302 visitors to the park. Of the 120 roadkill observed by the roadkill research team, 62 were amphibians, 27 were reptiles, 20 were birds, ten were mammals and one was not identifiable.

Vehicle numbers were monitored through the use of traffic counting devices. However, the roadkill research team soon discovered that elephants had taken a liking to the devices and damaged them. Drawing on previous research which has shown that elephants dislike the smell of chili pepper, the team then applied a daily coating of chili pepper and oil onto the counters. The traffic counting devices were then protected from further damage.

One of the most interesting aspects of the project was the role of speed in contributing to roadkill. "More than 95% of respondents to the questionnaire survey believe that speed is the sole cause of roadkill. Our aim was to investigate this opinion in more detail," said the EWT's Wildlife and Roads Project Executant, Wendy Collinson.

Compliance with park speed limits was found to be reasonably high, with 72% of the 6,981 vehicles monitored driving at, or below, the speed limits. "We postulated that roadkill was likely to occur because drivers were either unaware of their surroundings or travelling too fast to be able to avoid collisions. To investigate these factors we monitored a sample of 201 vehicles and nearly 70% of the drivers were observed to not be looking at the road, but rather scanning the bush for wildlife", said Collinson. "This suggests that many of the roadkill in national parks happen because of the expectation that

■ ROADKILL continued on page 3

■ ROADKILL continued from page 2

animals are to be found in the habitat alongside the road, rather than on the road itself," she added.

The same sample of vehicles was used to investigate the role of speed in determining rates of roadkill. The research team placed three fake animals on the road, and recorded how many times each roadkill was hit (for a total possible hit count of 603 roadkill). We also recorded how fast each vehicle was driving, assigning them to one of three speed categories, namely <20 km/h, 21-40 km/h and >40 km/h. We found no significant difference between hit rates of drivers in each of the speed categories, with approximately 50% of drivers hitting the fake roadkill across the board.

"From our survey, it seems that observation levels of the driver, rather than the speed of the vehicle, is the key factor in the number of roadkill incidents," Collinson commented. "One of our recommendations from the latest roadkill survey is that a driver awareness campaign be launched in parks to make drivers more aware of animals on the roads themselves," Collinson commented. Collinson also said she was concerned about the low awareness levels of roadkill among park visitors. "Of the 284 respondents who had visited a park previously, only 2.8% had noticed roadkill, with 6.3% noticing a roadkill on their current visit," she explained.

Steven Dell, Pilanesberg National Park's Field Ecologist remarked, "despite the use of road signs both at the park gates and within the park, as well as efforts to raise public awareness of roadkill, roadkill still occurs. This project was extremely beneficial to the park as it has assisted in identifying the cause of roadkill and will enable us to focus our future public awareness efforts."

Bridgestone PR Manager, Desirée van Niekerk, said the results of the latest roadkill survey had proved as fascinating as

The Wildlife and Roads Project in action in Pilanesberg National Park

ever. "Bridgestone has been involved with the roadkill project for three years now, and we applaud Wendy and her team's contribution to both road safety and wildlife protection," she said. "We hope these latest findings will soon be used to improve the quality of the experience of park visitors and safeguard the animals in these protected areas," she concluded.

The next stage of the project will shortly commence in Addo Elephant National Park through a joint collaboration between the EWT and Rhodes University.

The EWT's Wildlife and Roads Project in Pilanesberg was supported by Bridgestone SA, Arrow Bulk Logistics, Pilanesberg National Park, Copenhagen Zoo, Mikros Traffic Monitoring and Africa: Live. For further information please contact Wendy Collinson on wendyc@ewt.org.za

Check out EWT's global Road Ecology Facebook page, sharing ideas with their neighbors in other countries: **Facebook:** https://www.facebook.com/groups/roadecology/

Research in Progress:
Important New Study on the Importance of Verges

A verge is defined as the edge, rim or margin. However, on the Continent, a verge is a narrow strip of vegetation bordering a path, sidewalk or highway. Collaborators from a variety of institutions, including the Museum National d'Histoire Naturelle, Université de Montpelier, Université Paris 6 Pierre et Marie Curie, Fondation pour la Recherche sur la Biodiversité and Institut de recherchte en sciences et technologies pour l'environnement et l'agriculture are publishing their literature review of the importance of these habitats and their potential to enhance biodiversity. The authors are creating a database of studies that will be useful to all practitioners. Look for the article (submitted to the journal "Environmental Evidence") or contact the corresponding author Arzhvael Jeusset at arzhvael.jeusset@mnhn.fr. The draft article is entitled "To what extent can linear transport infrastructure verges constitute a habitat and /or a corridor for biodiversity? A systematic review protocol" by Arzhvaël Jeusset, Marianne Vargac, Yves Ybertheau Aurélie Coulon, Nadine Deniaud, Frédérique Flamerie De Lachapelle, Emmanuel Jaslier, Barbara Livoreil, Véronique Roy, Julien Touroult, Sylvie Vanpeene, Isabelle Witte, and Romain Sordello

(Thanks to Andy Fekete, RBA Group, for providing this article)

Vegetation Conservation During Expressway Construction in the Ecologically- Sensitive Area of Jilin Province

By Xinjun Wang[1], Jinsong Li[2], Ti Wang[1], Changjiang Li[2], Shuangcheng Tao[1], Yaping Kong[1], Jiding Chen[1]
[1] China Academy of Transportation Sciences; [2] Jilin Provincial High Class Highway Construction Bureau
Email: xinjunwang@126.com

With the rapid development of highway construction in China, the conflict between the land needed for highway construction and that for natural resources is becoming increasingly evident. Protection of land for plant resources and improvement of the sustainable use of land resource are important scientific issues in road construction.

The Hegang-Dalian Expressway in Jilin Province is located in the Changbai Mountain area, where the forest community is the most important ecological system. As a basic component of the ecosystem, vegetation has supported the stability of the whole area. Abundant vegetation resources are very important for protecting biological diversity, maintaining soil and water, purifying the atmosphere, showing the natural landscape and the sustainable use of biological resources. However, vegetation is inevitably destroyed during expressway construction. Minimizing damage and protecting resources is essential. The following measures as suggested by the China Academy of Transportation Sciences (CATS) and implemented during construction are as follows:

1. Classifiy Vegetation According to Protection Measures

Before road construction, remote sensing images were interpreted, followed by field investigation to understand the vegetation type and distribution along the planned route. This information was used to group vegetation protection measures into four levels. The first is for rare and endangered vegetation, which is preserved in situ or ex-situ conservation; the second is for tall and beautiful trees, which are preserved in situ or transplanted to rest areas and interchange areas for landscaping. The third level is for trees that are not rare or endangered or specimen trees. These are selectively preserved. For example, if the tree does not interfere with subgrade construction, it can be protected in situ. The fourth level is for shrubs and grasses, which have a similar protection level as the third level. However, if shrubs and grasses must be cleared, seeds and stems are collected to facilitate native vegetation restoration.

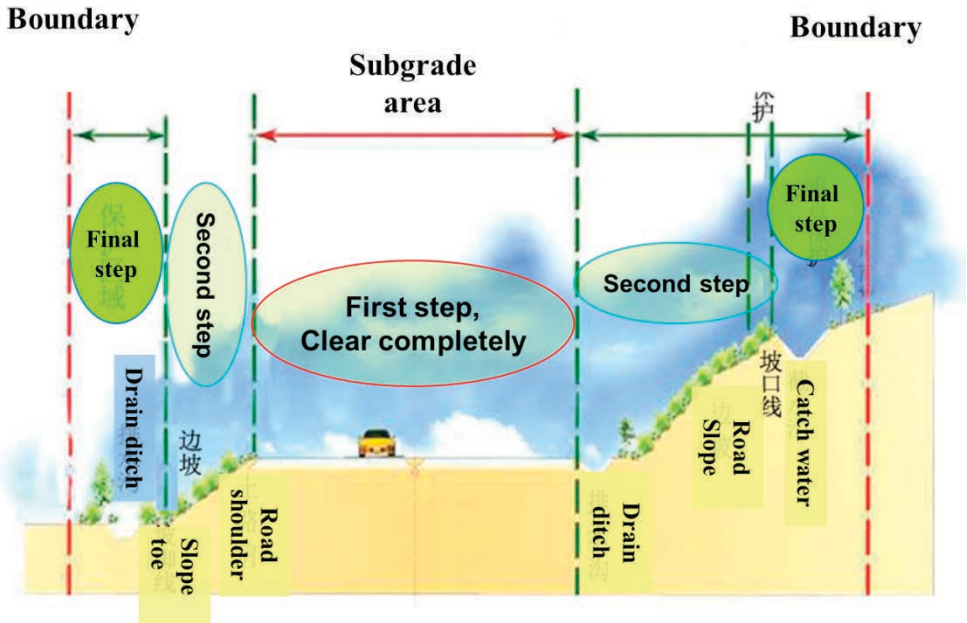

Figure 1. Diagram of site clearing

VEGETATION continued on page 5

VEGETATION continued from page 4

2. Implement Site Clearing Step by Step

At the beginning of site clearing, it is important to define the boundary for protected resources, which is the green dashed line shown in Figure 1. All vegetation should be preserved in situ completely within this area. The first step will then be to remove all the trees, brush, and other vegetation in the subgrade area (Figure1). The second step, based on the geology and terrain characteristics, slope ratio, and drainage requirements, is to determine the extent of the clearing and construction, allowing flexibility to reduce vegetation damage from mechanical construction. As a final step, it is recommended that the ditch or catch basins be constructed manually to ensure the greatest protection for vegetation.

Figure 2. Fencing for a Typical Tree

Figure 3. Transplanting Phellodendron

3. Adopt Various Forms of Protection

Throughout the process, specific protective measures should be taken to protect individual plants from damage from structures such as fences, shielding, retaining walls, etc.

Figure 4. Retaining Wall for Vegetation

Figure 5. Fencing for Korean Pine

4. Results

Through training, providing technical documents, and on-site guidance for construction workers, vegetation protection has achieved very good results. At present, 70 million square meters of native habitat and about 34.5 million trees have been preserved, including 450 rare trees. This will significantly reduce the number of plants needed for vegetation restoration and thus save landscaping costs. Figures 2-9 show examples of the conservation efforts.

VEGETATION continued on page 6

VEGETATION continued from page 5

Figure 6. Vegetation Conservation Near Bridge Construction

Figure 7. Vegetation Conservation at Interchange Area

Figure 8. Vegetation Conservation Outside a Tunnel

Figure 9. Vegetation Conservation along an Expressway

Kitt Peak Wildlife Underpasses Finished On The Tohono O'odham Nation, Arizona

By Kathleen Kennedy, Program and Development Coordinator, Coalition for Sonoran Desert Protection

The Kitt Peak Wildlife Linkage lies between milepost 130-138 on State Route 86 (SR 86) on the Tohono O'odham Nation in southwest Arizona. This linkage ranks as one of the 28 "highest priority" linkages of the 152 main wildlife linkages in Arizona due to its habitat value for mule deer, mountain lion, bighorn sheep, Sonoran desert tortoise, and other wildlife species. It serves as a landscape-scale corridor between the Baboquivari Mountains to the south and the Camobabi Mountains to the north (Figure 1).

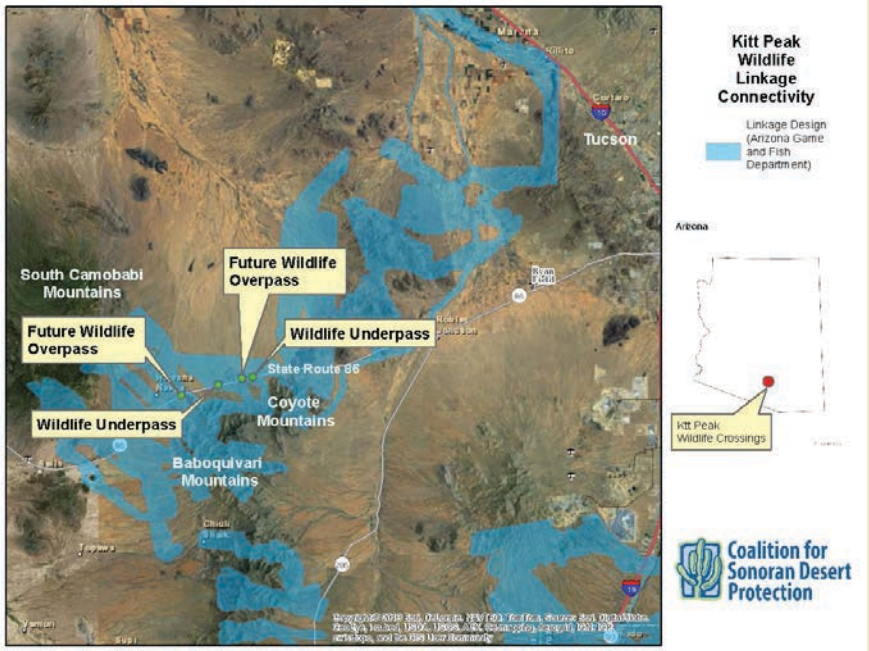

Figure 1. Two large wildlife underpasses were constructed across State Route 86 on the Tohono O'odham Nation in 2013-2014. Two wildlife bridges will be constructed nearby in 2017-2018 to facilitate bighorn sheep movement across the roadway. Historically, this section of road has been a "hot-spot" for wildlife-vehicle collisions; now, wildlife can move safely within this wildlife linkage and motorists have a safer roadway for travel.

Between November 2013 and February 2014, two pre-cast concrete arch wildlife underpasses were constructed on SR 86 (Figures 2,3). These underpasses were funded by Pima County's voter-approved Regional Transportation Authority (RTA) and incorporated into an Arizona Department of Transportation widening project on SR 86. The eastern underpass is 12 feet high, 32 feet wide, and 90 feet in length. The western underpass is 7 feet high, 32 feet wide, and 88 feet in length.

Previously, narrow box culverts served as the only means for wildlife to move under the roadway; these constrained culverts were ineffective for wildlife passage and resulted in many animals trying to cross SR 86 at grade. The new wildlife underpasses have increased wildlife and motorist safety by reducing wildlife-vehicle collisions.

Four motion-activated wildlife cameras were installed in each of the underpasses in September 2014 to monitor and document wildlife use. 8.5 miles of wildlife fencing linking the wildlife underpasses was installed in early 2015 on both sides of SR 86. Videos have documented wildlife crossings, including mountain lion and deer (Figure 4).

Since the Kitt Peak wildlife underpasses and wildlife fencing were finished, wildlife-vehicle collisions have decreased dramatically. Ongoing challenges include persistent use of the underpasses by free-ranging cattle and feral horses, sedimentation from flooding events, and establishing expectations of use by the U.S. Border Patrol.

To further strengthen and re-connect this wildlife linkage, the Tohono O'odham Nation presented a funding proposal to the RTA in September 2014 for two wildlife bridges in the Kitt Peak Wildlife Linkage. The RTA Board approved $6.6 million for the design and construction of these wildlife bridges on September 25, 2014. The two wildlife bridges will be constructed at mileposts 127.5 and 133.5 in 2017-2018.

Another large project currently underway (and funded by Pima County's RTA) is the construction of a wildlife bridge and wildlife underpass on State Route 77 on the northern edge of the greater Tucson metropolitan region. These two wildlife crossings present unique challenges and opportunities since they are located adjacent to numerous residential developments, Catalina State Park, and other private development.

On Tuesday, September 22, we will be giving a presentation at ICOET on both the State Route 86 and State Route 77 wildlife crossing projects. We will be discussing the various successes and challenges of both projects, along with other wildlife crossing projects on the horizon in Pima County, Arizona.

KITT continued on page 8

KITT continued from page 7

Figure 2. One of fifteen pre-cast concrete arches is dropped into place during the construction of one of two wildlife underpasses along State Route 86 in the Kitt Peak Wildlife Linkage in southwest Arizona. Note the small box culvert that the wildlife underpass replaced. Photo courtesy Arizona Department of Transportation.

Figure 3. The finished eastern-most wildlife underpass on State Route 86 on the Tohono O'odham Nation in southwest Arizona. Photo courtesy Coalition for Sonoran Desert Protection.

Figure 4. A mountain lion (left) and a deer (right) pass through one of the Kitt Peak wildlife underpasses on State Route 86 in southwest Arizona. Since the underpasses and wildlife fencing were constructed in 2013-2015, wildlife-vehicle collisions along this stretch of roadway have decreased dramatically. Photos courtesy Tohono O'odham Nation.

New Programmatic Consultation for Indiana Bat and Northern Long-eared Bat

By Anjuliee Mittelman Organizational Performance Division, Volpe, The National Transportation Systems Center and Brian Yanchik, FHWA Resource Center, Environment Team

The Federal Highway Administration (FHWA) and the U.S. Fish and Wildlife Service (USFWS) have been working in coordination to develop a programmatic consultation related to the impacts of transportation projects on two wide-ranging bat species, the Indiana bat and the Northern Long-Eared bat (NLEB). The Indiana bat has been listed as an endangered species since 1966 and can be found across 22 states from the eastern coast of the U.S. extending west into Montana and Wyoming. Indiana bats tend to hibernate in large numbers in only a few caves, making them particularly vulnerable to disruption. Commercialization of caves, loss of summer habitat, pesticide use, and white-nose syndrome have also contributed to population decline. The range of the NLEB, recently listed as threatened in April 2015, overlaps with that of the Indiana bat, allowing for the opportunity for a combined consultation approach.

The intent of the USFWS and FHWA is to streamline the consultation process for highway and the Federal Railroad Administration (FRA) projects and to encourage improved conservation for both bat species. The programmatic calls for and consists of (1) proactive conservation measures necessary for protection of the species; (2) priority regions for mitigation activities; (3) standardized analysis of potential effects, avoidance, and minimization measures for each project; (4) informal programmatic consultation for all States; and (5) plans for future formal consultations. To use the programmatic, State Departments of Transportation (DOTs) must ensure that all submitted projects adhere to the criteria outlined in the Biological Assessment (BA).

Consultation and mitigation approaches for evaluating impacts to Indiana bats vary widely State-by-State and have been rapidly changing in response to the spread of white-nose syndrome across the species' range. The Endangered Species Act (ESA) stipulates that all Federal agencies must work to conserve endangered and threatened species. Section 7 of the Act describes "Interagency Cooperation" and directs all agencies to consult with USFWS when any action may affect a federally-listed species. This range-wide consultation and conservation strategy provides a framework for conducting efficient ESA Section 7 reviews and helps to accelerate the review and permitting process for proposed transportation activities.

Transportation activities, including tree removal, increased noise and light pollution, smoke and heat associated with burning of brush, impacts on water resources, and bridge maintenance or replacement can potentially disturb the roosting, foraging, or swarming of bats. More than 100,000 miles of interstate, State highway, and local roads in many States fall within range of the bats, while rail miles range from approximately 3,000 to 6,000. This programmatic encompasses the ranges of both the Indiana bat and NLEB and will allow Federal agencies to strategically avoid projects in high impact or high risk areas and/or minimize potential impacts.

The hope of FHWA and USFWS is that this programmatic approach will increase transparency and predictability for agencies involved in transportation projects, reduce consultation timeframes, and contribute meaningfully to conservation of both species.

For more information, please visit: https://www.fws.gov/MIDWEST/Endangered/section7/fhwa/index.html

Photos courtesy of Normandeau Associaties.

A Roadkill Mitigation Success Story

(From The Green Mile, newsletter of the Wildlife and Roads Project, Endangered Wildlife Trust)

Submitted by Wendy Collinson, Project Executant, Endangered Wildlife Trust, South Africa

The Greater Mapungubwe Transfrontier Conservation Area (GMTFCA) in the Limpopo Province was declared a World Heritage Site in 2003 and is recognised as an important area for conservation and cultural heritage.

In 2013, with support from Bridgestone SA and De Beers Group Services, the EWT conducted intensive surveys of wildlife killed on the roads traversing the GMTFCA. The results of this work showed that roads were having a significant impact on wildlife in the GMTFCA. Over a 120-day period, 1121 roadkill carcasses were detected, as well as a major roadkill hotspot identified.

The presence of a roadkill hotspot presented the EWT and De Beers Group Services with an important opportunity to assess the effectiveness of roadside fencing in directing wildlife to cross the road through existing culverts.

As roadkill has been found to be highest during the spring and summer months, we elected to repeat the route driven in 2013, a 100 km paved and 20 km unpaved transect, for 40 days during January and February of 2015. We found that average daily traffic volumes had increased from 200 to 600 vehicles per day and that roadkill numbers had increased from 368 to 717 over the sampling period. Comprising a total of 97 different vertebrate species, birds were the most impacted species, followed by reptiles (187), mammals (149), and amphibians (62).

In order to assess the effectiveness of the mitigation measure, we drove for 20 days with no mitigation in place, before installing the roadside fencing for the latter 20 days along a 12 km roadkill hotspot section of the 100 km paved road.

The roadside fencing is only effective for small mammals, reptiles and amphibians, since birds and larger species will not be deterred by low fencing. Despite this, and the fact that roadkill numbers remained high for the unmitigated sections, we found one roadkill (Scrub Hare) at the end of one of the roadside fences.

Data are still being analysed and a full report will be available shortly.

We now need to assess the benefits of installing more permanent structures on the roadside that will enable us to conduct long-term monitoring of the impacts on roadkill.

Working in the field: identifying a roadkill shrew

Assembling the fence

Under-road culvert with drift fencing

The EWT's Wildlife and Roads Project in the GMTFCA was supported by De Beers Group Services, Bridgestone SA, Mikros Traffic Monitoring and Mopane Bush Lodge. For further information please contact Wendy Collinson on wendyc@ewt.org.za

Roadside Activity and Behavior of White-Tailed Deer and other Wildlife near Unfenced Underpasses

Bridget Donaldson, Senior Research Scientist
Virginia Department of Transportation
Virginia Center for Transportation Innovation and Research

The U.S. road system includes more than 582,000 bridges longer than 20 feet, 480,000 of which are over waterways. Many of these structures, and millions of smaller structures, serve as passageways for wildlife beneath the road. Because most of these structures were constructed for drainage or other purposes unrelated to wildlife use, they are often spaced miles apart and have no fencing. Research has shown that the addition of fencing to connect a series of newly constructed wildlife underpasses decreases collisions with wildlife, but research is needed to establish how retrofitting an individual existing underpass with fencing affects animal-vehicle collisions (AVCs) and the use of the structure. If this low-cost form of mitigation increases habitat connectivity and reduces AVCs, this could have a substantial impact on drivers and wildlife, particularly if implemented on a large scale. In order to provide evidence-based fencing recommendations, additional information is needed with regard to wildlife activity and behavior at unfenced underpasses and adjoining sections of interstate.

VDOT's research division, the Virginia Center for Transportation Innovation and Research, installed 38 trail cameras to capture white-tailed deer and black bear activity and behavior along an interstate roadside adjacent to two unfenced isolated underpasses. Cameras were installed at a box culvert (10 by 12 by 189 ft) and beneath a large bridge underpass (307 ft wide) and along the adjoining 0.5-mile interstate roadside on both sides of the underpasses. Sites were monitored with cameras for 2 years (Figure 1)

The findings indicate that the threat that deer pose to driver safety is apparent even on roads near suitable underpasses if those underpasses have no fencing. Despite frequent use of the underpasses by deer (1,187 per year), there was high deer activity along the adjacent roadside (1,181 per year) (Figure 2). Although deer activity was higher along the roadside next to the less frequently used culvert than next to the bridge underpass, there was an equal number of deer-vehicle collisions (DVCs) at each site. Highway

Figure 1. Black bear and deer along the interstate near unfenced underpasses

DEER continued on page 12

DEER continued from page 11

crossing attempts were a low proportion of deer behavior (n=100 crossing attempts), but at each site resulted in 7.5 DVCs per year on the 1-mi highway segments adjacent to the unfenced underpass. Black bears used the bridge underpass 18 times and visited the highway roadside 20 times; there were no bear deaths from vehicles at these sites during the monitoring period.

A statistically significant relationship was found between roadside deer activity and DVCs, and this relationship was strongest in October and November. Deer were predominantly unresponsive to the roadside; behavior typically included feeding and walking. Walking represented 48.4% of the unresponsive behaviors and was also statistically correlated with DVCs.

The attempted at-grade highway crossings by deer and the high frequency of DVCs at the evaluated highway sections indicate that many deer choose to cross the accessible interstate rather than use a nearby underpass, particularly when the underpass is smaller than what deer typically prefer. Fencing installation along the roadside adjacent to the underpasses is expected to reduce roadside deer activity and associated DVCs, while guiding deer to a safe means of accessing habitat across the highway. The addition of fencing may also increase use of the underpasses by bear and other wildlife.

Researchers are working with VDOT to install fencing and jump-out structures at the evaluated study sites. The ends of the fencing will be tied into transitional areas (e.g., steep terrain or areas with a change in habitat or land use) to decrease accident probability near fence ends. To determine the effectiveness of the VDOT fencing installations, the baseline data collected in this study will be used to compare the data from a post-fencing camera monitoring study. If fencing is found to reduce DVCs, other underpasses in Virginia will be identified as candidates.

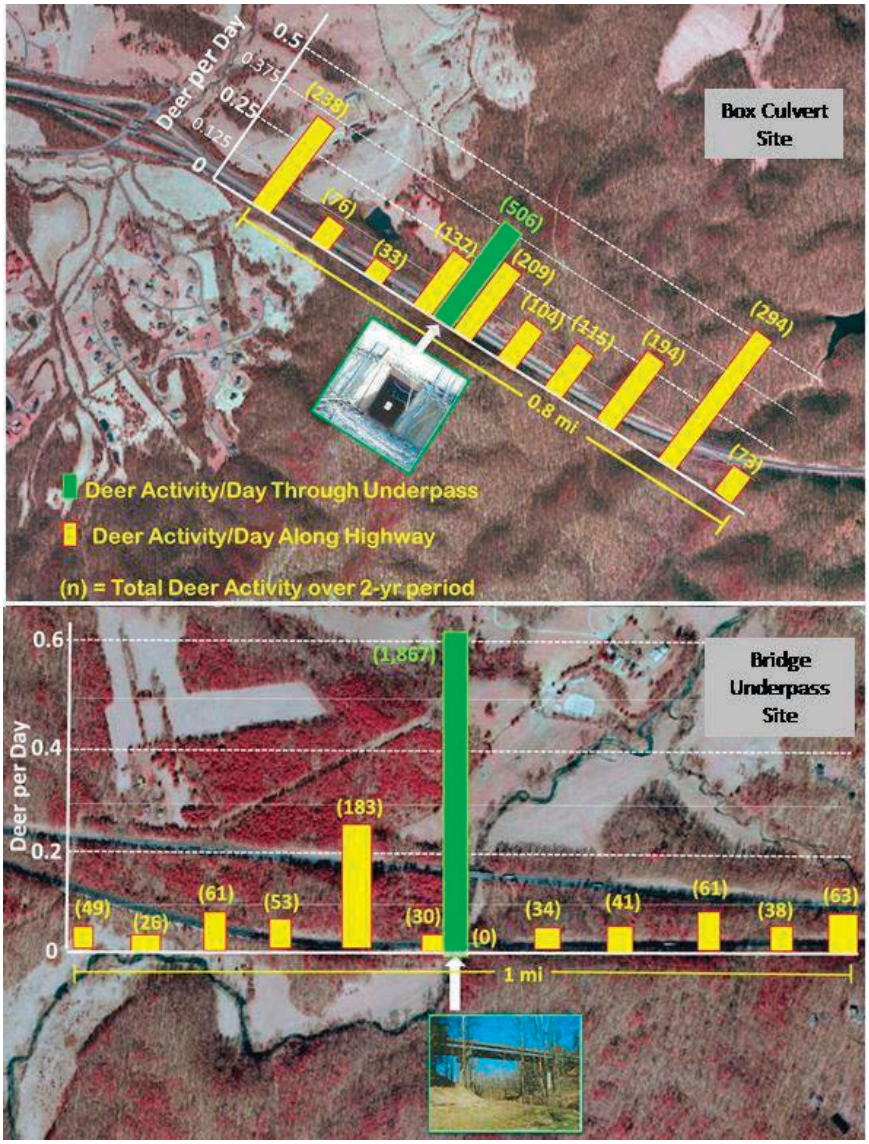

Figure 2. Deer activity through the box culvert (top) and beneath the bridge underpass (bottom) and along the adjoining sections of interstate. Bars are positioned at camera locations.

Trends and Issues in the Marine Transportation and the Environment

By Marcia Bowen, Normandeau Associates

The Marine Environment Committee (AW030) decided that their research needs could be best summarized in a white paper format. A group of dedicated volunteers put their heads together to create a working document that they hope to submit for publication. These issues, some very relevant to Ecology and Transportation, are summarized here.

The potential for **new transportation routes** in the Arctic and through Nicaragua along with an expanded Panama Canal pose potential environmental risks. Arctic routes reduce ship travel distance by as much as 5,200 miles and transit time by an estimated 30%. Although the routes are open only for a period of weeks, they potentially offer a commercially viable alternative to the Suez and Panama Canals, with lower fuel use and reduced emissions. There is considerable debate about whether these routes offer a safe and reliable transit. Research is needed to tracking current vessel use, and to understand how vessel emissions will behave in the arctic environment, both in terms of air quality and deposition on sea ice. Research is also needed to understand how increased shipping could affect water quality and migratory patterns of native wildlife.

The proposed Nicaraguan Canal is less of a certainty. Construction will pass through a number of undisturbed areas including several biosphere reserves, coastal wetlands and migratory pathways. The Canal could change the salinity regime in Lake Nicaragua, the largest lake in Central America and an important water source. The proposed Nicaraguan and Panama Canal expansions will both allow substantially larger vessels to transit, with increased air emissions along the routes and ports. Research is needed on all of the potential environmental impacts associated with these new routes, especially air emissions.

Non-native species, many of which are transported in ballast water, continue to affect the diversity and resilience of coastal and marine ecosystems. Research topics include investigation of new technologies for ballast water management and the role of international and federal agencies in managing threats from invasive species.

Marine transportation continues to be a threat to **water quality.** Oil and chemical spills, while a small percentage of ocean oil levels, tend to be large and highly visible. Vessel discharges and emissions also contribute to water quality impairment. In particular, vessel emissions increase atmospheric CO2, contributing to ocean acidification. Research topics include quantification of the effects of marine transportation on water quality, including ocean acidification and global warming; new controls and practices employed by the cruise ship industry to reduce discharges; and what role regulations might play in controlling shipping discharges.

Dredging is essential to maintain the marine transportation network and to improve ports in readiness for the larger, post-Panamax vessels. More research is needed to understand the effects of suspended sediments on marine ecosystems, especially in terms of organism passage. This in turn, will help fine tune dredging "windows" so that they protect species while potentially expanding the time periods that dredging can occur. Alternative disposal options for dredged materials need to be investigated, with a focus on beneficial reuse.

Air emissions from cargo ships stem largely from the predominance of diesel engines. Use of alternative fuels (such as natural gas and LNG) as well as development of low emission engines will help reduce emissions. Research is needed to understand the marine transportation-based emission sources, technologies to reduce emissions and improve fuel economy. Expansion of LNG in particular poses its own risks in terms of production and transport as well as the cost of new LNG-fueled vessels.

Watch this space for details on the publication.

Call for Posters

Spotlight Theme: Research Convergence for a Multimodal Future

95th

Transportation Research Board Annual Meeting

January 10-14, 2016 Washington, DC

TRB Committee on

Ecology & Transportation

ADC30

The Transportation Research Board (TRB) Committee on Ecology and Transportation welcomes submissions of your work as part of an environmental poster session at TRB's 2016 annual meeting in Washington, DC this January.

Themes should emphasize

- best practices
- regulatory streamlining
- approaches to resource assessment
- effects analysis and documentation
- integrating natural resource and transportation planning
- regulatory permitting and compliance
- successful mitigation and enhancement
- environmental stewardship
- lessons learned
- or any other ecological aspects of transportation program delivery or project development

Abstracts must be no more than 500 words, and should contain the following:

(1) full title
(2) primary/secondary presenter name(s) with complete contact information (mailing address, phone, e-mail)
(3) a concise statement of the project or study objective
(4) notable practices, approaches or lessons learned
(5) current or anticipated results or outcomes
(6) significance and implications of the results or outcomes; and, if applicable
(7) recommendations for future research

Poster session abstracts must be submitted electronically no later than **Monday, September 28, 2015** to: alex.levy@arcadis-us.com, Draft Mock-ups in PDF-format are encouraged but not required until December 4, 2015. The committee will notify applicants of acceptance by October 16th along with any additional details. Each presentation will be equipped with a table and a 4'h x 8'w panel for display. Electrical connections will be available, although an internet connection will not.

See you in Raleigh!

TRB

TRANSPORTATION RESEARCH BOARD

Editor: Marcia Bowen, Design: Linda Cable
Normandeau Associates, Inc.