Committee on Ecology and Transportation Newsletter

Transportation Research Board Committee ADC30 May 2017

View from the Outgoing Chair

Alex Levy, Senior Ecologist
VHB

Keepers of the Flame

As a native of the burgeoning City of Atlanta, which hosted the 26th Summer Olympiad, I can't think of a more appropriate place to pass-the-torch than as we gather in Salt Lake City, which hosted the 19th winter games. For all who have ever been involved as Friends and Members of the TRB Committee on Ecology and Transportation, the eighth meeting of the International Conference on Ecology and Transportation (ICOET) may come to be known as a milestone of similar significance for our community-of-practice.

You see, while it's one thing to muse on and write about adapting to and embracing the inevitability and excitement of change, it's quite another to be at its vanguard. Our committee, which emerged from an ardent group of environmental and transportation professionals within ICOET near the beginning of this century, is evolving—in every sense of the word—along with the forum from which we emerged and continue to serve.

As chair of ADC30 for the last six years, I have had the privilege of serving as steward of what our founding chair, Tom Linkous, and dozens of women and men have continuously cultivated for over a decade; all voluntarily serving for the advancement of science and our interests in a better, more-sustainable moving world. Having been handed the torch from one ecology and transportation's pioneer, it is my privilege to convey leadership of ADC30 to committee member Dr. Daniel Smith, Research Associate at the University of Central Florida's Science and Planning in Conservation Ecology (SPICE) Lab. This milestone marks a new era for our committee, as we are chaired by a research professional with a track record of working and publishing from the front-lines of conservation, transportation, and land-use planning.

Although I am stepping down as committee chair, I look forward to continuing as an active Friend of the committee; leveraging the experience I've gained with the administration of TRB's programs and the relationships I've begun cultivating with allied committees to the continued benefit of ADC30 and its mission.

Along with the Committee on Ecology and Transportation, ICOET, too, is poised to begin a new chapter in the forum's 20-year history. So I close with a special thanks to James Martin, Eugene Murray and the rest of the past and present staff and leadership at North Carolina State University's Institute for Transportation Research and Education who helped bring both ICOET and our committee into being, and have been fierce stewards of the meeting at which we are gathering.

Dan Smith, Incoming Chair

Daniel J. Smith, PhD, AICP, is a research associate and member of the graduate faculty in the Department of Biology at the University of Central Florida. Dr. Smith has 25+ years of experience in the fields of ecology and environmental planning. His primary focus is studying movement patterns and habitat use of terrestrial vertebrates and integrating conservation, transportation and land-use planning. He is coeditor of the award winning *2015 Handbook of Road Ecology* and received the 2014 land conservation and planning award from the Florida Wildlife Federation for his outstanding contributions to sound use and management of Florida's natural resources.

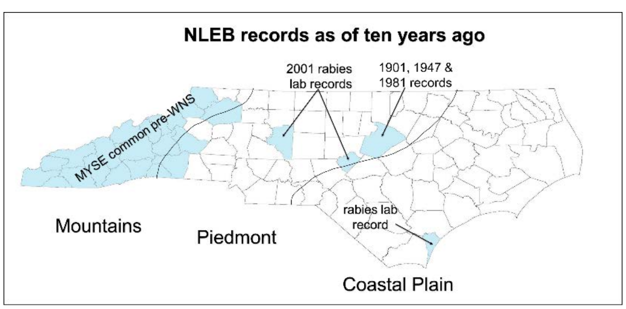
A History of Northern Long-eared Bats in the North Carolina Coastal Plain

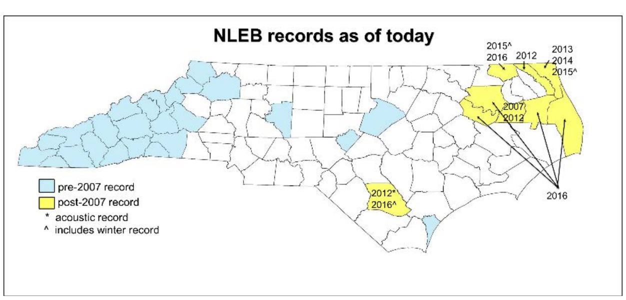
Submitted by: M.E. Frazer;
Three Oaks Engineering, Durham, NC, 27701;
mary.frazer@threeoaksengineering.com

The northern long-eared bat (NLEB) has been a potential concern for transportation projects since it was listed as a threatened species by the US Fish and Wildlife Service in May 2015. A decade ago, few records of NLEB existed in eastern North Carolina. The records may have been considered questionable by some as they were mostly historic or obscure in nature. In addition, the presence of NLEB seemed unlikely in the NC coastal plain since it was too far away from caves for NLEB to migrate for winter hibernation.

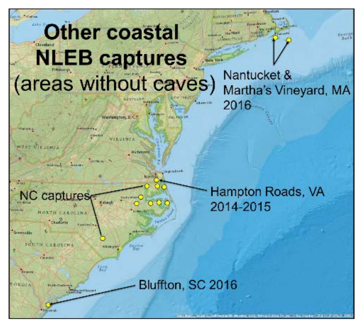
Previous NLEB records included three county records from bats submitted to rabies labs, while a fourth county had historic records dating from 1901–1981 (NC Natural Heritage Program 2016). More recent information, including data from surveys funded by the NC Department of Transportation, has shed new light on NLEB in eastern NC.

The first capture of NLEB in NC's coastal plain did not occur until 2007, despite previous mist-netting in the region (Morris et al. 2009). Subsequent surveys indicate that NLEB are present in the NC coastal plain both in the summer and the winter, although caves and subsurface mines are lacking (Grider et al. 2016). NLEB appear to be roosting in trees through winter, instead of using caves or subsurface mines as expected. During the summer, juveniles have been captured in at least four locations, indicative of maternity colonies. Capture rates are generally low; it may take several nights of netting to catch a NLEB. No signs of White Nose Syndrome (WNS) have been observed.





NLEB captures in the last decade have resulted in eight new county records from the NC coastal plain. Recent NLEB captures have also occurred in the coastal areas of Virginia (Tetra Tech 2015), South Carolina, and Massachusetts, all in areas that are distant from caves. The occurrence of NLEB in an area where their presence had been considered questionable may be a lesson for other coastal plain locations, as well as other regions where there has not been intensive survey work. Population estimates of NLEB and the extent of the species' range in the coastal plain are yet to be determined, but their presence in eastern NC and other locations within the coastal plain of the southeastern US gives hope that some NLEB will be spared from WNS, which has devastated populations of bats that use caves and mines for winter hibernation.



Acknowledgments for data and contributions to this article:
Liz Baldwin, BiodiversityWorks; Dottie Brown, Ecological Solutions; Katherine Caldwell, NC Wildlife Resources Commission; Ed Corey, NC Division of Parks; Zara Dowling, University of Massachusetts-Amherst; Cheryl Gregory, formerly NC Department of Transportation; Jeff Hawkins, Copperhead Consulting; Gary Jordan, US Fish and Wildlife Service; Matina Kalcounis-Ruppell, University of North Carolina-Greensboro; Michael Morse, US Fish and Wildlife Service; Jason Robinson, Biological System Consultants; Heather Wallace, Calyx.

Literature cited:

Grider J.F., Larsen A.L., Homyack J.A., M. C. Kalcounis-Rueppell. 2009. *Myotis septentrionalis* Trouessart (northern long-eared bat) records from the North Carolina Coastal Plain. Southeastern Naturalist 8:355–362.

Morris, A. D., M. J. Vonhof, D. A. Miller, and M. C. Kalcounis-Rueppell. 2009. *Myotis septentrionalis* Trouessart (northern long-eared bat) records from the North Carolina Coastal Plain. Southeastern Naturalist 8:355–362.

Tetra Tech. 2015. Northern Long-eared Bat Survey Report, NSAHR Northwest Annex, Virginia and North Carolina.

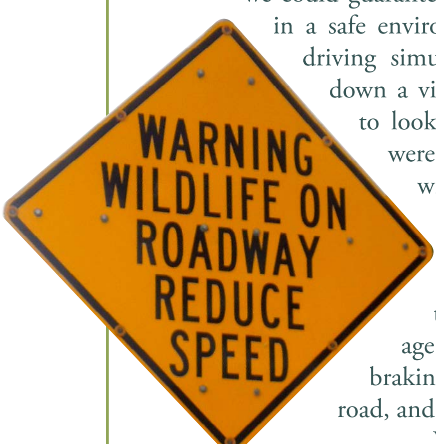
Confirming the Potential of Roadside Animal Detection Systems Using a Driving Simulator

Submitted by: Molly Grace, PhD and Daniel Smith, PhD; University of Central Florida

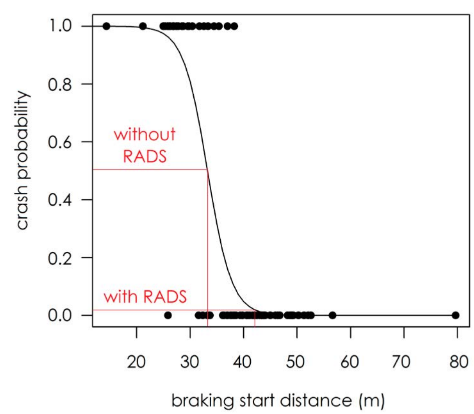
Roadside Animal Detection Systems (RADS) attempt to reduce the frequency of wildlife vehicle collisions by sensing animals near the road and warning drivers with flashing signs. These systems make no effort to keep animals off the road; rather, they depend on drivers changing their behavior to make crashes less likely (i.e., slowing down and being more vigilant). In 2012, a RADS was installed in Big Cypress National Preserve (Florida, USA), a core habitat area for the dwindling population of Florida panthers, the iconic state mammal whose numbers have rebounded from less than 20 individuals to over 200. Vehicle collisions are one of the leading causes of death in this panther population, and the RADS was installed at a hotspot of roadkill.

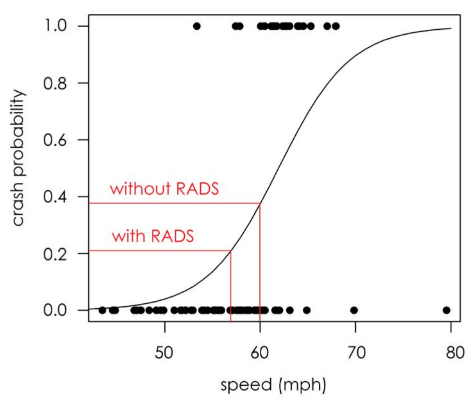
Compared to traditional wildlife crossings (overpasses and underpasses), RADS are usually much less expensive (costs in the thousands rather than millions). However, in practice they are sensitive to environmental conditions and are often plagued with malfunctions; for example, false positives: flashing when no animal has been detected near the road, or false negatives: failing to detect an animal. This calls their usefulness into question. In addition, the events that they are designed to prevent—crashes—are very hard to observe in the field. If we don't know how well RADS prevent crashes, how can we tell if RADS are worth it?

To answer this question, our team at the University of Central Florida Department of Biology, in partnership with the UCF Institute for Simulation and Training, used a driving simulator to assess how a perfectly functioning RADS affects crash risk. The benefit of using a simulator was that we could guarantee a high sample size of crashes in a safe environment. In the highly realistic driving simulator, 90 participants "drove" down a virtual road which was designed to look like Big Cypress. Participants were assigned to treatments either with or without the RADS warning system in place, and had to react to an animal coming out into the road in front of them. We measured their average speed, how early they began braking when the animal entered the road, and whether or not they crashed.



We found that with the RADS, crash probability was greatly reduced, with the underlying mechanisms being reduced driver speed and earlier braking times. We found that the reduction in speed associated with a RADS reduces crash probability from 0.4 to 0.2, while the faster braking times reduces crash probability from 0.5 to 0.1. This reduction in crash probability is linked to very small changes in average speed (3 mph; 4.8 km/h)





We then evaluated the real-life RADS in Big Cypress by measuring its effect on driver speed. We found that drivers reduced their speed by almost the exact amount in the field as they did in the simulator, indicating that crash risk is likely similarly reduced in real life. However, these benefits were limited to people who had not previously seen the RADS—we found that local drivers acclimated to the system, probably due to the high number of false positives. In conclusion, our work shows that RADS have great promise to reduce wildlife-vehicle collisions, but work must be done to improve system function so that drivers do not learn to ignore them. You can read the study here.

Grace, MK, DJ Smith, and RF Noss. 2015. Testing alternative designs for a roadside animal detection system using a driving simulator. Nature Conservation 11: 61–77. doi:10.3897/natureconservation.11.4420

CALL FOR **RESEARCH** PROPOSALS

TERI DATABASE

transportation and environmental research ideas

proposals are due by ~~MAY 8, 2017~~

For more information and to submit your ideas, visit: http://environment.transportation.org/teri_database/

Center for Environmental Excellence

Federal Highway Administration

AASHTO

What is TERI?

The Transportation and Environmental Research Ideas (TERI) database is a central storehouse for tracking and sharing new transportation and environmental research ideas. The Center for Environmental Excellence by AASHTO maintains TERI and keeps all content current. Suggestions for new ideas are welcome from practitioners across the transportation and environmental community.

Examples of Past Research Proposals:

- A Guidebook for Communications between Transportation and Public Health Communities
- Integrating Climate Change and Extreme Weather Into Transportation Asset Management Plans
- Transferability of Post-Construction Stormwater Quality BMP Effectiveness Studies
- Quick Reference Guide for Traffic Modelers for Generating Traffic and Activity Data for Project-Level Air Quality Analyses
- Permeable Shoulders
- Coordination of Section 106 and Long Range Transportation Planning

Photo courtesy of AASHTO America's Transportation Award, Vermont Department of Transportation

Why Submit a Research Idea?

Deadline Now Extended: MAY 22

Submitted by: Kris Gade, PhD; Roadside Resources Specialist, ADOT Environmental Planning; kgade@azdot.gov

Submitting your research proposal through TERI guarantees that the Chairs of each SCOE subcommittee and five AASHTO Standing Committee on the Environment (SCOE) Research Task Force liaisons will consider the idea. If recommended by the Chairs and Research Task Force, the idea may be developed into a research problem statement that can be considered for funding through a variety of sources, including: NCHRP 25-25, Full NCHRP, NCHRP Synthesis, and other quick-turnaround NCHRP Projects (e.g., for Planning, Public Transit, Highways, etc.).

WHAT MAKES FOR A GOOD IDEA?

- ***Idea has a national scope.*** 25-25 research products must apply to most, if not all, State DOTs. Ideas that apply to a broad range of states are more likely to be funded.
- ***Research objective appeals to State DOTs.*** 25-25 is a research body for AASHTO SCOE members—the State DOTs' environmental practitioners. If you are not with a State DOT and are unsure if your idea is appropriate for this program, reach out to a practitioner with a State DOT or ask the Research Task Force members.
- ***Products/outcomes meet intent of 25-25 program.*** The statements that are selected for funding must improve environmental processes in transportation project delivery and enhance environmental stewardship.

Implementation and Evaluation of a Buried Cable Animal Detection System on a Public Road in Virginia

Submitted by: Christian Druta, Senior Research Associate, cdruta@vtti.vt.edu; and Andrew S. (Andy) Alden, MS, PE, Group Leader, aalden@vtti.vt.edu; Eco-Transportation and Alternative Technologies, Virginia Tech Transportation Institute (VTTI)

Background

In order to reduce animal-vehicle collisions (AVCs) in Virginia, the Virginia Department of Transportation (VDOT), in collaboration with the Virginia Tech Transportation Institute (VTTI), proposed the evaluation of an innovative roadside animal detection system (ADS) in naturalistic environmental conditions. This type of underground radar system offers numerous advantages over aboveground animal detection technologies when environmental interferences (e.g., precipitation and vegetation) and site-specific characteristics (e.g., topology, subsidence, and road curvature) are considered.

Pilot Study

The ADS, a buried dual-cable sensor, detects the crossing of large- and medium-sized animals and provides data on their location along the length of the cable. Under a pilot study, the first of its kind on the east coast, the system was installed and tested at a highly suitable site on the Virginia Smart Road, where large wild animals, including deer and bear, are often observed in a roadside environment. Data analyses indicated that if properly installed and calibrated, ADS is capable of detecting animals such as deer and bear, possibly along with smaller animals such as fox and coyotes, with over 95% reliability. ADS also performed well even when covered by three feet of snow. Moreover, the system was tested under various traffic conditions with no vehicle interferences noted during the monitoring period.

Implementation Project Description

The objective of this project is to assess the performance of a similar ADS under real-world conditions following a successful preliminary evaluation under controlled conditions at the Virginia Smart Road. The system is designed to mitigate animal-vehicle collisions by detecting animals along the roadside and communicating with a warning system (typically a changeable message sign) that alerts drivers of nearby wildlife. The ADS will be installed along a road in VDOT's Salem District in a deer-trafficked area and monitored for 12 months (Figure 1). The study will document the installation, calibration, and surveillance of the ADS; the procedures for and results of a performance evaluation; the evaluation of a driver warning system; and recommendations regarding how these features can be used to ensure adequate performance of the ADS for future installations.

The selection of the appropriate road section for ADS installation and evaluation was based on several criteria including easy site accessibility to offer appropriate installation conditions, wide space in the right-of-way, sufficient traffic level, and relatively high animal activity (significant AVCs).

Concurrently, video surveillance cameras and infrared illuminators will be installed at the test site to continuously monitor the area and validate the cable data collection (i.e., cable crossing alarms). Temporary dynamic message signs (DMSs) will be installed once the cable is properly calibrated and exhibiting a high reliability (i.e., 85% and over) over a six-month period. Furthermore, to assess the efficacy of the DMSs, radar data will be employed to analyze vehicle speeds in relation to the animal advisory messages.

Advisory messages will use raw data from the detection system along with other factors (e.g., season, time of day, and weather) to generate more reliable alerts to present to approaching drivers. Depending on the behavior of the deer near the cable, different advisory messages will be displayed by the DMSs to indicate possible crossings or basic speed reduction warnings due to animal activity on the roadside. Additionally, the implemented system may be integrated with the Connected Vehicle framework to provide advance, in-vehicle warnings to motorists approaching the location when animals have been detected in or near the roadway.

Figure 1. Selected site location: Route 8 (Riner Rd.)

Next Generation of Environmental Monitoring & Data Management

Submitted by: Fraser Shilling, Road Ecology Center, Department of Environmental Science and Policy, University of California, Davis CA 95616; fmshilling@ucdavis.edu

There is a wide variety of remote wildlife cameras available today, a growing proportion of which can communicate via cell (primarily) or other wireless (uncommon) protocols so that the photographs taken in the field are available for almost immediate viewing (across the web). Motion-triggered cameras were first used to photograph wildlife in the 1890s (Hance, 2011), but only after the advent of infrared triggers in the 1990s have been used to investigate animal occupancy. Contemporary cameras are digital, include daytime motion-triggering, night-time IR triggering, a range of controllable settings to improve image collection in different environments, and low power-usage. Several models include attachments for external power sources, which allows for attachment of solar panels and batteries, significantly extending the time between maintenance visits. The combination of time-lapse and motion-triggering means that camera traps can be used to capture multiple environmental characteristics, including wildlife movement, and within arrays can provide fine-scale monitoring of conditions adjacent to highways and mitigation structures.

Web-based informatics is a field of research in its own right and refers to the collection and organization of information, often through automated mechanisms, and its transformation into more useful forms for decision making and visualizations through web-portals. From the moment data are captured in web-based informatics, such as photographs of wildlife, they are in a "pipeline" of data movement and transformations. This workflow involves: 1) copying or moving these data from the source (e.g. field camera) to a destination server, 2) extracting the various data both from the image itself and through user interactions, 3) transforming the data from an original file and scaling it for various web-based purposes, 4) summarizing the data across the project and at various scales, and lastly 5) archiving them for future analysis and use. There are many stages of transformation between collection and analysis, and it is during this process that data can used to generate knowledge about conditions and systems. Sensors capture data but not until the data reaches the users do they become useful.

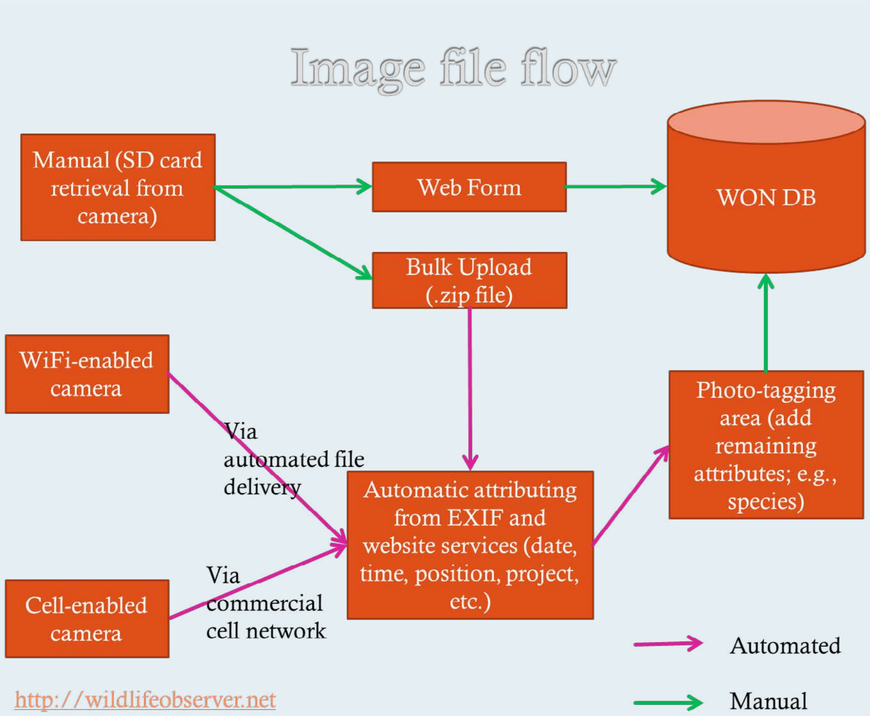


Figure 1. Steps in photographic data transfer from field camera traps to the wildlife observer network database-server ("WON-DB)" through manual and automated pathways.

To advance the frontier of remote camera systems to monitor wildlife near highways, we tested and deployed communicating cameras at pilot sites in UT, MT, SD, CO, WA, ME, and CA (Caltrans Districts 2, 3 and 4). These are commercial cameras that email their pictures to a specified email address through cell-communication technology. We also developed a novel and affordable wi-fi camera based system, which can reduce data transfer costs. A service was developed to include bulk upload of pictures indirectly (through field-users) and directly from cameras to a web-informatics system (http://wildlifeobserver.net). Four main procedures were developed to facilitate image upload to the website from remote cameras, varying

MONITORING continued on page 7

MONITORING continued from page 6

Figure 2. Mule deer crossing a new structure over CO-9. (Left); Mule deer crossing under US 89 during a small flash-flood event. (Right)

in the amount and type of manual intervention during the upload process (Figure 1). The first was a form-based upload which captures all relevant data by completing the form and uploading a photograph. The second was a novel bulk upload tool whereby a user can organize thousands of images, upload the zipped images to the web-system, and tag images according to the species and activity shown in the image. The third procedure was for images originating from cell-communicating cameras, where the image can be automatically ingested by the website, with later identification of the animal by a biologist. The fourth procedure was for files transferred directly from a camera to a server via a network router across a Wi-Fi network, again with later identification of the animal by a biologist.

There are a number of situations for which this combined communicating camera and web-informatics approach could be useful. For example:

1. Some wildlife presence at transportation infrastructure can override all maintenance and construction activities due to the species' listing or classification. If the cameras can be placed in strategic areas where these animals are resting, nesting, occurring, then when the animals have left the area, transportation activities can resume.

2. These cameras could in turn be connected to driver warning systems. Ongoing research on effective driver warning systems has met with mixed results and cameras combined with wildlife-recognition could fill an important gap.

3. Wildlife mitigation infrastructure could be monitored with these cameras to evaluate when a species of interest is near the road, and the results of the animals' activities would be known within seconds to minutes. This may be important for listed species, such as Canada lynx, or for highly migratory species, such as herds of mule deer, moving in pulses.

4. Remote cameras could be set up in flash flood areas near highways to alert DOTs, highway patrol, and other authorities when flood water is about to make a road impassable, or dangerous. Flooding along I-15 in Utah, Arizona, and Nevada caused a cascade of destroyed roads, injured people, and massive destruction.

5. A remote camera system could be used to detect changes in sea level or areas where rivers empty into larger bodies of water along coastal roads. The system could be programmed to send pictures to a central location several times a day for personnel to review for short term urgent conditions that may affect infrastructure.

We found that the technology is available commercially to develop and use remote, wirelessly communicating cameras/instruments for wildlife and other environmental monitoring associated with highways (Figure 2). These communicating cameras combined with web-informatics allows DOTs and their partners to rapidly collect and share data about wildlife movement and occurrence and potentially other important events (e.g., flash flooding in the desert southwest).

If you are interested in the approach described here and for more information, please visit our web-system (http://wildlifeobserver.net). To get started with your own project with cameras and web-informatics, you can find help materials (written and video, http://wildlifeobserver.net/help), materials from the 2 webinars (http://wildlifeobserver.net/resources), a selection of images from different projects (http://wildlifeobserver.net/gallery) and a partial list of partner organizations (http://wildlifeobserver.net/partners). This work was supported by the Federal Highway Administration under Agreement # DTFH61-13-C-00010 to the University of California, Davis. Thanks to Deirdre Remley (FHWA), David Waetjen (UCD), Patricia Cramer, and Kathryn Harrold for their help and support.

Steering Transportation Toward Sustainability

Submitted by: Eliza Murphy
m.eliza.murphy@gmail.com

An exciting shift is about to take place at the International Conference on Ecology and Transportation (ICOET) as Fraser Shilling, Co-Director of the Road Ecology Center (University of California, Davis), takes over organization of the biannual event.

Shilling, an ecologist at UC Davis, envisions a metamorphosis for the event that brings scientists, engineers, and transportation planners together, beginning with establishing road ecology as a "stand alone science."

"We are our own discipline. We have our own sets of hypothesis, methods, and practices specific to the field," he said. **"We study the unique interactions between road systems and nature."**

The crux of the field hinges on asking the fundamental question: **"Can we make an ecologically sustainable transportation system or not? It's a big unknown,"** he said.

Shilling identified two considerable obstacles confronting road ecology. **"Insufficient understanding in the transportation community of the impacts of transportation on nature, and vastly insufficient funds to study and remedy the impacts."**

After the upcoming ICOET conference, Shilling will partner with the UC Davis' Institute of Transportation Studies, the National Center for Sustainable Transportation and the John Muir Institute of the Environment to organize future conferences.

A scientist dedicated to sustainable interactions between society and nature, he said,

"I hope to take ICOET in new directions and to invigorate the field of road ecology to help it transform transportation."

We'll see you at ICOET 2017!

***Salt Palace Convention Center**, Salt Lake City, Utah*

Host of the Mid-year Meetings of the **TRB Committees** on ***Environmental Analysis in Transportation*** (ADC10) and ***Ecology and Transportation*** (ADC30)

Join us for the ninth biennial ICOET conference, co-hosted by the Utah and Wyoming Departments of Transportation, with support from the US DOT Federal Highway Administration.

ICOET is the foremost interdisciplinary, interagency supported conference addressing the broad range of **ecological issues related to transportation systems** in all modes. Experts in transportation development, related scientific study, policy issues, and administrative processes gather at ICOET to share **current research, quality applications, and best practices** that can enhance both the project development process and the ecological sustainability of all transportation modes.

The ICOET program includes podium presentations, posters, field trips, and exhibits on topics of interest to **researchers, biologists, engineers, planners, project managers, administrators, and policy makers.** Hundreds of professionals—representing government, Tribal, academic, nongovernmental, and private industry organizations—from the United States and more than 20 countries regularly attend ICOET.

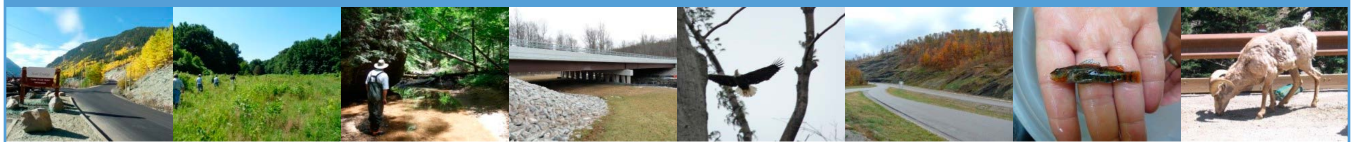
We look forward to seeing you at the conference!
http://www.icoet.net/ICOET_2017/index.asp

For the latest conference program agenda visit:
http://www.icoet.net/ICOET_2017/documents/ICOET17_Program_Agenda_20170322.pdf

Join us for the TRB Committee on ***Ecology and Transportation*** (ADC30) mid-year meeting at ICOET on
Sunday, May 14, 5-7 PM MDT, Room 259

2018 Transportation Research Board—CALL FOR PAPERS

Committee on Ecology and Transportation (ADC30)



The TRB Committee on Ecology and Transportation is seeking research papers to be evaluated for presentation* at the TRB 97th Annual Meeting, January 7-11, 2018, in Washington, D.C. The spotlight theme of Annual Meeting will be:

Costs and Opportunities for Ecologically Sustainable Transportation

Topics of interest include, but are not limited to:

- Measuring our progress and looking forward: Critical achievements and future challenges in transportation and ecology.
- Geospatial modeling and decision making tools: What's new, what's needed, and how are they being used?
- Climate change adaptation: Strategies for addressing impacts of transportation adaptation on natural systems and vice-versa.
- Leveraging technology: Innovations that improve the understanding of interactions between natural and transportation systems.
- Cross-cutting strategies: Looking to other fields and practices for applications in transportation and ecology.
- Understanding and avoiding transportation impacts on wildlife and fisheries connectivity and improving movement through mitigation structures.
- Measuring and using the transportation-effect zone in assessment, planning, and decision-making.

* Papers received will also be considered for publication in the *Transportation Research Record: Journal of the Transportation Research Board.*

Submission and Review Schedule

June 1	TRB paper submission website opens
August 1	Paper submittal deadline for the 2018 annual meeting
October 30	Authors are notified of peer review results
November 15	Revisions due for papers accepted for presentation
March 15	Final revisions due for publication consideration

Please visit the 2018 meeting website updates, as well as information on formatting submittals and the peer-review process.

2018 TRB Annual Meeting Website
http://www.trb.org/AnnualMeeting/AnnualMeeting.aspx

TRB General Submission Guidelines and Schedule
http://www.trb.org/GetInvolvedwithTRB/GetInvolvedSubmitaPaper.aspx

Committee on Ecology and Transportation
http://ecologyandtransportation.weebly.com/

For Additional Information Contact

Alex Levy, Committee Outgoing Chair, alevy@vhb.com
Dan Smith, Committee Incoming Chair, daniel.smith@ucf.edu

Photos (Left to Right): Guanella Pass Road, CO; Exel stream and wetland mitigation, KY; "3 Forks" Daniel Boone National Forest, KY; Mulligan Road wildlife crossing, VA; Bald Eagle, KY; US 119 over Pine Mountain, KY; Rainbow Darter, KY; Bighorn Sheep, CO (Photo Credit: Ian Chidister)

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TRANSPORTATION RESEARCH BOARD

Stantec

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