



Wildlife Crossing

Web-Connected Cameras Offer Improved Monitoring for Highways

Exploratory Advanced Research . . . Next Generation Transportation Solutions



The ability to detect and monitor wildlife movement and crossings and other ecological processes near highways is important to transportation agencies' environmental stewardship and decision-making activities. Few agencies have been able to systematically perform such monitoring because long-term monitoring is difficult to fund and staff and may present safety risks. Remote cameras present the opportunity to surmount these difficulties, but images collected by static cameras may not be viewed until weeks or months later, which can result in lost data from equipment failure or poor siting. These problems would become obvious much earlier with a continuous data feed, but wireless streaming cameras have not typically been used to monitor wildlife activity near highways.

Creating Web-connected wireless camera systems for wildlife monitoring is the goal of the Exploratory Advanced Research (EAR) Program project "Remote, Wireless Camera Systems for Environmental Monitoring of Transportation Corridors." The Road Ecology Center at the University of California, Davis, is conducting this research, which is funded by the Federal Highway Administration (FHWA).

Wildlife Traffic Cameras

This project is the first demonstration of an affordable, accessible remote camera system that continuously streams data through structured Web systems that State agencies can use to study wildlife movement around transportation corridors. At present, remote wildlife camera systems (known as *camera traps*) are typically checked manually by transportation agency staff, who download the data collected. This is costly for agencies and can be dangerous for workers. Researchers have developed a model system that any transportation agency can use in areas with wired, wireless, or cellular system connectivity, including using the system in conjunction with existing traffic camera infrastructure and adding wildlife monitoring to the data stream.

The model system features a Web interface that enables easier transmission and sharing of data across agencies and potentially with the general public as well. Researchers are investigating the use of image analysis software to automate the identification of common wildlife species captured in pictures from the remote cameras, because no such system is currently available for wildlife image analysis. Automated identification would help standardize data collection across transportation agencies and provide significant time savings to agencies.

Technology and System Development

In the project's first phase, researchers examined the options available for camera traps to detect and photograph wildlife and analyzed how they could be assembled to form a "plug-and-play" wildlife-monitoring system using either wired Internet connections, Wi-Fi,™ or cellular technology. Working in partnership with the California Department of Transportation and other State transportation agencies, researchers are now further developing and refining a camera system to meet the needs of States, along with an online database (wildlifeobserver.net) that agencies can use to collect, manage, analyze, and share the wildlife image files collected.



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The online system is set up to receive image files uploaded either by transportation agency staff or directly by remote, wireless cameras. The system then automatically creates database records for image files based on information already attached to the file, such as the date and time an image was captured. Users just need to identify the animal and add any further desired characteristics or data (e.g., gender, age, specific activity observed, and direction traveled).

Field Testing

Staff from transportation agencies in California, Colorado, South Dakota, and Utah are cooperating in field testing the camera and database systems to evaluate both their effectiveness in capturing and managing wildlife images and their ease of use. Using this feedback, the researchers will develop training materials and conduct a Webinar and onsite training with State transportation agency staff. The researchers will then present to FHWA recommended camera and database systems, along with documentation describing how to acquire, set up, and use them.

Importance to FHWA

The technology developed for this project will contribute to the implementation of *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*, a report and toolkit developed by FHWA and seven other Federal agencies. Eco-Logical presents the partner agencies' vision for an infrastructure development process that promotes ecosystem-based environmental mitigation through integrating plans and data across agencies. Implementation of Eco-Logical has been slowed, however, by issues related to data collection and analysis. This project's innovations in technology will help agencies more easily and cost-effectively acquire the needed wildlife movement data.

EXPLORATORY ADVANCED RESEARCH



What Is the Exploratory Advanced Research Program?

FHWA's Exploratory Advanced Research (EAR) Program focuses on longer term, higher risk research with a high payoff potential. The program addresses underlying gaps faced by applied highway research programs, anticipates emerging issues with national implications, and reflects broad transportation industry goals and objectives. To learn more about the EAR Program, visit the EAR Web site at www.fhwa.dot.gov/advancedresearch. The site features information on research solicitations, updates on ongoing research, links to published materials, summaries of past EAR Program events, and details on upcoming events.

Next Steps

The next steps for the project researchers include developing short training videos on the system and writing articles describing both the informatics and camera sampling process for publication in peer-reviewed journals. The researchers will also improve the associated data portion of the Web system so that the ecological context of camera placements can more easily be visualized and will demonstrate standardized methods for understanding the capacities of individual camera models and how this affects sampling by the cameras.

Learn More

For more information on this project, contact Deidre Remley in the FHWA Office of Project Development and Environmental Review, 202-366-0524 (email: deidre.remley@dot.gov).

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A deer uses a wildlife crossing that the California Department of Transportation constructed under State Route 50.

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A bobcat travels through a wildlife crossing built by the California Department of Transportation under Interstate 80 in the Sierra Nevada mountains.

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