



Research

Construction Complete: TRANSCEND Embarks into the Future

What was once 230 acres of land containing decommissioned runways and taxiways at the Lewistown, MT airport has been bustling with activity over the last several years, but not from airplanes. In 2003, the Airport Board and Fergus County Commissioners asked the Western Transportation Institute (WTI) to look at the decommissioned portion of the airport and determine whether it could be used for transportation research and testing.

WTI conducted requirements analysis, identified research priorities, and developed partnerships and an implementation plan for establishing a state of the art research center. Today, the site is known as TRANSCEND, an advanced research facility focused on solving rural transportation challenges.



Aerial photo showing test tracks of TRANSCEND facility prior to construction and installation of snowmaking equipment, workshop, sub grade stabilization test strip and RADS test bed.

Included on the 230 acres are 4 miles of paved test track and a nationally recognized Roadside Animal Detection System (RADS) Test Bed that has been operating since 2006. Construction was just completed on a reservoir, pipeline, and structures to support the new snow-making equipment used for creating winter test environments. Data acquisition and communication infrastructure are in place and are designed to support future Vehicle Infrastructure Integration (VII) research. There is also a heated shop building for instrumenting vehicles, conducting experiments, or maintaining equipment.

Located in Lewistown, in the very center of the state of Montana, TRANSCEND is a giant research sandbox, a place where researchers can study multi-disciplinary transportation challenges in a full-scale environment without interfering with or affecting the traveling public. Research. Development. Testing. All in one location, backed by the expertise and commitment of WTI researchers from all focus areas, TRANSCEND provides an **"open road to discovery"** in a natural cold-region research environment.



Photo credit: WTI/MSU

Eli Cuelho, Research Engineer, has been with WTI since 1998 and serves as TRANSCEND's Project Manager. "As the only full-scale transportation research center in the northwest, TRANSCEND is positioned to become a significant place to assess and examine new technologies and methods to address a host of rural transportation challenges that face us today," says Cuelho.

At WTI, eight transportation research groups comprise one integrated team, and TRANSCEND serves as the team playing field. Safety researchers can progress from the simulator to the test track to further human factor investigations. Infrastructure Maintenance and Materials researchers can investigate the relative benefit of new and innovative materials and methodologies. Winter Maintenance and Effects researchers can study deicing chemicals on the asphalt track or compare snow removal systems for DOTs. Road Ecologists can utilize the RADS testbed to evaluate animal detection systems from multiple vendors.

Researchers can utilize the facility to explore innovative development solutions. Even the construction of the buildings instigated an innovative research project. All concrete on site was made using 100 percent fly ash instead of Portland cement as the binding agent. Fly ash is a by-product of coal power

plants that can be recycled and used as an additive with Portland cement in concrete, but in this case, fly ash completely replaced it.

TRANSCEND is an ideal location for creating custom, large-scale, product or equipment testing environments. Field testing has typically been conducted on sections of highway where natural events and traffic cannot be controlled and results can be clouded by a variety of variables. Many of these variables can be controlled at TRANSCEND so that researchers may better understand what technologies, methodologies, or ideas will work best. If a foot of snow is needed to test the capabilities of a snow removal system but the skies are blue, you won't have to wait long for a snow storm at TRANSCEND!

WTI has established a strong reputation for conducting relevant, contemporary research for our clients and sponsors. TRANSCEND represents the next step in WTI's multi-dimensional approach to researching transportation issues, furthering our abilities to improve transportation, particularly in cold and rural regions.

Put TRANSCEND to work for you. For more information on current research or how TRANSCEND can benefit your projects, contact Eli Cuelho at (406) 994-7886 or [visit us online](#).

Testbed for Animal Detection Systems: Ensuring Successful Deployments

A growing number of states have recognized the significant safety and cost impact of collisions between animals and vehicles. Recent research estimates that there are between one and two million crashes between cars and large animals each year in the U.S., with associated costs totaling more than \$8 billion.

State departments of transportation (DOTs) are exploring innovative new mitigation technologies, such as wildlife detection and warning systems, which have been shown to reduce collisions by as much as 80% in countries such as Switzerland. Despite these encouraging results, animal detection systems (ADS) should still be considered experimental as these results are based on only a few studies. In addition, in order for animal detection systems to be effective in reducing collisions between animals and vehicles, they must first detect animals reliably as driver response depends on reliable warning signs.

As part of its state-of-the-practice Road Ecology program, WTI has developed a Roadside Animal Detection System Test-bed (RADS) at its TRANSCEND research facility in Lewistown, Montana. The testbed allows researchers to evaluate and compare the reliability of numerous systems at the same site under similar circumstances. "It's the first facility in the U.S. that has the capability and space to do side-by-side evaluations of the reliability of animal detection systems," said Principal Investigator Dr. Marcel Huijser.

In initial research, conducted in partnership with the Montana Department of Transportation and FHWA, WTI investigated the reliability of nine different animal detection systems from five different manufacturers (Xtralis, ICx Radar systems [formerly STS], Calonder Energie, Camrix and Goodson [Trailmaster]). Researchers installed the nine ADS to detect horses and llamas that roamed in an enclosure. Data loggers recorded the date and time of each detection for each system. The animal movements were also recorded by six infrared cameras with a date and time stamp. "By analyzing the images and the detection data, we were able to evaluate the system for a variety of reliability parameters," said Huijser; "of particular interest, five of the nine systems detected all or nearly all animal movements (>91%) with no or few false positives." Huijser added that this finding is consistent with the minimum norms for system reliability that researchers suggest based on interviews with three different stakeholder groups (employees of transportation agencies, employees of natural resource management agencies, and the public).

Using data from a nearby weather station the researchers also investigated the effect of environmental conditions such as temperature, precipitation and wind on the reliability performance of the individual systems. For example, high wind speeds can cause false detections with some break-the-beam systems that depend on a very narrow signal beam, and relatively high humidity can lead to an increase of errors for some systems and a decrease for others. The results suggest that the choice for certain detection technologies may depend on the site conditions at the road section selected for the potential deployment of an animal detection system.

For state DOTs, the WTI facility represents an invaluable opportunity to test systems prior to deployment. This research facility can help DOTs to select the system that meets their needs and that performs well given the environmental conditions at the road section concerned. Through these efforts, agencies will likely save time and resources during installation, and increase the probability of a successful deployment that protects humans and animals from collisions. WTI will test a new set of animal detection systems starting in 2009 on behalf of both the California and Colorado Department of Transportation.

To learn more about how the Roadside Animal Detection System can be used to meet your research and testing needs, contact Dr. Marcel Huijser at mhuijser@coe.montana.edu.

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Road Ecology Research and Deployment Wins Prestigious Award at ITS America

The Intelligent Transportation Society of America (ITS America), the leading national organization for the promotion of advanced transportation systems, has honored WTI's road ecology research partnerships with a 2008 "Best of ITS" Award. The Best of ITS Awards program is the only one in the world that honors the most innovative, effective, and influential achievements in the Intelligent Transportation System (ITS) industry. This highly competitive program recognizes organizations whose projects have demonstrated specific and measurable outcomes and exemplified innovation by establishing a "new dimension" of performance.

WTI Director Steve Albert accepted the award (on behalf of WTI Research Scientist Marcel Huijser, PhD) during a



special ceremony of the ITS America Annual Meeting and Exposition, held in New York in November 2008. This year's Expo was held in conjunction with the ITS World Congress, which was attended by international world leaders in advanced technology applications.

WTI's "Partnerships for Deploying Animal Vehicle Crash Mitigation Strategies" was one of eight programs or projects honored in the category of "Best New Innovative Practices." "This award has become highly competitive, with entries from both the public and private sector" said Albert; "we're thrilled to be selected in company with other winners like BMW and the City of New York."



The award recognized WTI's integrated efforts to advance the development of new technologies that detect the presence of animals along the roadside, and highlighted the Animal Vehicle Pooled Fund Study, the Roadside Animal Detection Systems (RADS) testbed, and the National Wildlife Vehicle Collision Reduction Vehicle Study. "Individually, these projects have achieved important goals such as enhancing the capabilities of an individual animal detection system, or producing valuable comparison data on the reliability of nine different systems," said Albert. "By integrating the projects, however, we can pool resources and share data among partners, advancing our progress further and faster."

WTI's Road Ecology program focuses on the interaction between roads, natural resources and the ecological environment, with a particular focus on wildlife migration near highways and animal vehicle collisions. The staff has grown to include nine full-time scientists and researchers, who provide national and international expertise and leadership on these issues. "We have been building our program and doing cutting-edge animal vehicle research for more than a decade," says Albert; "I'm so proud that our researchers are starting to receive the recognition they deserve for their many years of hard work and dedication."

Albert added that there were many public and private partner agencies who participated in the various components of this research. "Their contributions were integral in achieving this award," Albert emphasized; "we thank them for their insight, innovation and courage to explore new ideas and applications." Partners included the FHWA; Western Federal Lands Highway Division; US Fish and Wildlife Service; USDA Forest Service; U.S. Humane Society; the Sand County Foundation; the Center for Excellence in Rural Safety (University of Minnesota); Turner-Fairbank Highway Research Center; the Louis Berger Group, Inc.; Calonder Energy, Camrix Engineering; Goodson and Associates, Inc; ICx Radar Systems; Vikon International, Inc.; Xtralis, and the State Departments of Transportation in Alaska, California, Indiana, Iowa, Kansas, Maryland, Montana, Nevada, New Hampshire, New York, North Dakota, Oregon, Pennsylvania, Wisconsin, and Wyoming.

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Outreach

WTI Kicks Off North American Wildlife Crossing Design Competition

In response to an emerging critical priority for both transportation and natural resource agencies to make highways safer for both motorists and wildlife, WTI and the Woodcock Foundation initiated the North American Wildlife Crossing Design Competition (NAWCDC). The competition will raise international awareness and promote realistic context sensitive solutions for safe, efficient, cost-effective, aesthetically pleasing and environmentally friendly mitigation for the impacts of busy roadways that pass through important wildlife habitats.

Wildlife crossing structures, constructed either over or under transportation corridors, have had demonstrated success decreasing wildlife-vehicle collisions and maintaining connectivity for wildlife. The competition will select a North American site where the expansion of the highway will require a wildlife crossing structure. Competitors will be encouraged to explore creative new approaches, materials, and designs that address the fundamentals of transportation engineering and wildlife ecology. The competition is being developed to engage landscape architects, engineers, ecologists and others, in the interdisciplinary nature of road ecology with a real-time, in-situ application.



A kick-off meeting in Banff National Park took place in October 2008 where partners WTI and the Woodcock Foundation met with various interested individuals and Dr. Nina-Marie Lister from Ryerson University, who is serving as a consultant on the project. This steering committee has been working to engage a broader community in the competition process and the partners are seeking additional

experts to guide the development of the competition. Corporate, agency, professional, and foundation sponsors are also being contacted to help fund the competition.

For sponsorship opportunities or additional information on the NAWCDC, please contact Rob Ament at rarent@coe.montana.edu.

Nurturing Future Collaborators: WTI mentors New UTCs

As a long-established UTC with a history of successful research collaborations, WTI receives frequent requests to visit or meet with newer UTCs, who wish to learn about WTI's strategic, organizational, and management practices. While in some industries this might be viewed as creating and educating new competitors, WTI views this as a mentoring opportunity to nurture productive collaborators, and establish working relationships that will lead to future partnerships.

In past years, WTI has met with representatives from the University of Alaska, the University of Vermont, and Oregon State University, either prior to their federal designation as a UTC or shortly thereafter, in order to assist with their start-up activities. Most recently, WTI Director Steve Albert traveled to Oklahoma State University last fall to make a presentation on WTI's approach to research, and to share lessons learned on a variety of topics, including:

- Evaluating and selecting research opportunities
- Leveraging funding resources
- Communicating and working with sponsors
- Successful business development and marketing
- Exchanging information and technical expertise
- Building successful teams and partnerships

"Why not share all of our experiences to help other UTCs get off to a good start?" said Albert. "They can learn a lot from specific examples of projects that worked well, and probably even more from some of our mistakes," he joked.

Response to these forums has been overwhelmingly positive. Several of the UTCs stated that WTI's guidance and recommendations helped get their research programs underway more quickly, while also encouraging them to develop a long-term approach. "Steve really gave us the 'big picture' – a greater understanding of the charge of a University Transportation Center," said Tony Dark, Director of the Oklahoma Transportation Center. "It gave us a great strategic sense," added Richard Watts, Research Director for the Transportation Research Center at the University of Vermont; "a way to think about our transportation research so it stays nimble and relevant."

Albert believes that the entire UTC system benefits from this mentoring process. "Every successful UTC builds up the national reputation and integrity of the program at large," said Albert; "Besides, each UTC has its own strengths and expertise that we can draw on when we work together in future collaborations. In the long run, we can achieve a lot more through our mutual success."

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Upcoming Conference: National Rural Summit on Traffic Safety Culture 2009

The National Rural Summit on Traffic Safety Culture will be held in Big Sky, Montana June 22-25, 2009. This conference is being held in conjunction with the [5th International Driving Symposium](#) on Human Factors in Driver Assessment, Training and Vehicle Design. Traffic safety culture is an important determinant of driver risk taking and acceptance of traffic safety interventions. Attempts to make our transportation system safer cannot succeed without considering the cultural factors that define our values and govern our behavior. In recognition of this, the Western Transportation Institute and the AAA Foundation for Traffic Safety are hosting a summit to discuss traffic safety culture and its role in the safety of our rural transportation system.

What can participants expect? The Summit will strive to increase understanding and unify concern amongst traffic safety researchers, practitioners, and policymakers about the role of traffic safety culture on (1) behavioral factors; and (2) attitudinal barriers to public and political acceptance of traffic safety interventions. Presentations by national and international experts followed by focused discussion will ensure that this event is a must attend for individuals in the traffic safety arena.

For more information please visit the conference websites: www.meetingsnorthwest.com or www.westerntransportationinstitute.org.

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Director Travels Across the State to Meet with Montana Business Leaders

WTI Director Steve Albert began 2009 with a series of presentations in Montana cities, focusing on the link between a strong transportation network and a healthy economy.

Albert served as the key note speaker for the Annual Economic Outlook Seminar, which is presented by The University of Montana and the Bureau of Business and Economic Research (BBER), and cosponsored by local area Chambers of Commerce across the state. "The seminars are an opportunity for us at the BBER to continue our mission of informing Montanans about the economic environment," said Director Pat Barkey; "we have found that face-to-face exchanges are still one of the most effective ways of doing this."

From January through early March, Albert spoke to business leaders in Helena, Great Falls, Missoula, Billings, Bozeman, Butte, and Kalispell. WTI Program Manager David Kack also participated, speaking at the seminars in Sidney and Miles City.

In his presentation, Albert described the key factors that are straining the transportation system in the

state, including the growth of Montana's population, the aging of the population, and the aging of the infrastructure itself. He emphasized how investing in transportation is critical to revitalizing the state's economy, because an efficient transportation system supports economic generators such as the growth in Montana tourism and an increase in freight movement throughout the state. "Transportation is the driving force for society," said Albert. "It's played a key role in the past and will in the future; but demand is about to exceed supply."

In Montana, 80 percent of the roadways are rural highways, so the state must also work to insure that national transportation policy addresses the unique challenges and needs of rural areas. "Now is the time," Albert concludes, "to put the focus on developing a complete, integrated, seamless national transportation infrastructure that allows people, goods, and services to move safely and efficiently across and throughout every region of the country."

The presentations provided a valuable, interactive forum for Montana leaders to share information and ideas on critical economic issues. "We find that we learn a tremendous amount about local economies and the challenges they face when we get out of the office and meet people on their own turf," said BBER Director Pat Barkey. He added that the transportation theme of the forums was very timely and relevant: "As the seminars were occurring, all the news was about the stimulus bill, and transportation vaulted right into the limelight. We couldn't have planned it any better."

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TRB Provides National Forum for WTI Research

WTI researchers from a broad range of disciplines had the opportunity to present their latest projects and findings at the 2009 Transportation Research Board Meeting in Washington, D.C. Each January, the TRB meeting attracts more than 10,000 transportation professionals from around the world, representing government, private industry and educational institutions. The spotlight theme for the 2009 meeting was "Transportation, Energy and Climate Change."

Attendees can select from more than 600 informational sessions during the five day conference. Presentations by WTI staff members included:

- "Beyond 3D: Progressive Visualization for Geometric Design," by Dr. Ahmed Al-Kaisy
- "Bears and Barbed wire: Banff's DNA monitoring of crossings," by Wildlife Biologist Michael Sawaya
- "Guide to Promoting Bicycling on Federal Lands," by Research Engineer Rebecca Gleason
- "Laboratory Evaluation of Alternative Deciders: the Path to Decision-Making based on Science & Agency Priorities," by Dr. Xianming Shi
- "Relationship between Precipitation Variation and High-Risk wet Accident Locations in the state of California," by Dr. Xianming Shi
- "Evaluation of the Effects of Weather information on Winter Maintenance Costs," by Dr. Xianming Shi
- "Benefit-Cost Analysis of Maintenance Decision support system," by Dr. Xianming Shi
- "Safety effects of Winter Weather: State of Knowledge and Remaining Challenges," by Dr. Xianming Shi

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Usability Day

WTI hosted a workshop on November 13, 2008 to mark World Usability Day. Founded in 2005 as an initiative of the Usability Professionals' Association to ensure that services and products important to human life are easy to use, this program has grown to over 200 events held worldwide. Usability refers to the extent to which a product can be operated by users to achieve specified goals effectively and safely. Applying this concept to transportation systems, a mode of transportation is usable if it is easily accessible and safely supports individual mobility for a wide range of users. In addition, usable transportation modes must be sustainable and not conflict with the local ecology.

The workshop included presentations on topics of safety, accessibility, and sustainability within different transportation modes including road vehicles, public transit, bicycling and pedestrians. Workshop attendees also toured the institute's suite of advanced driving simulators. [Click here for more information](#) on World Usability Day.

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Education

Girl Scouts Explore Engineering at Montana State University

The Western Transportation Institute coordinated the 2009 "Introduce a Girl to Engineering Day" at MSU, a Saturday event capping off a week of activities to commemorate National Engineering Week. Area Girl Scouts from 4th to 8th grades were invited to learn about different engineering disciplines through hands-on activities facilitated by MSU engineering student chapter organizations. Eighty-five girls participated, representing troops from Helena, Belgrade, Bozeman, Townsend, and Emigrant, Montana.





Student-facilitated activities covered various engineering disciplines. MSU electrical engineers taught the girls to program small, wheeled robots to navigate a maze. The girls learned about stiffness, trajectory, and other science concepts as Society of Women Engineers (SWE) chapter members guided them through the construction of marshmallow catapults. They then tested their designs by trying to hit targets with accuracy and precision using the catapults. Chemical Engineering students provided the girls with a tasty treat as they demonstrated the use of liquid nitrogen to make ice cream. Engineering honor society Pi Tau Sigma members tested the girls' egg drop vehicle designs from a ladder in an egg survival competition. Two Computer Science student organizations teamed up to demonstrate programming techniques using Lego MindStorm robots. Finally, the girls learned about environmental engineering concepts as they strove to design the least damaging and most cost-effective oil (syrup) pipeline across delicate tundra and protected resources in an activity facilitated by the American Indian Science and Engineering Society (AISES).

The Girl Scout Engineering Day annual event provides an opportunity to excite the interest of young girls in engineering disciplines and careers.

Research Experience for Undergraduates: 2009 Research Projects

In January, WTI announced the four projects selected for the 2009 Safe Passages Research Experience for Undergraduates (REU) program. WTI researchers submitted potential projects for consideration centering around three interdisciplinary topic areas: Water and Fish Passage, Habitat Connectivity and Wildlife Movement, and Public Safety and Mobility. The selected projects for the 2009 summer REU program are:

1. Effect of Alignment and Sight Distance on Drivers' Speed Selection in the Gallatin Canyon (Principal Investigator: Ahmed Al-Kaisy)
2. Examining the Effect of Traffic Noise on Avian Species along US Highway 191 (Principal Investigator: Angie Kociolek)
3. Assessment of Aquatic Connectivity for Fish across the Gallatin River Corridor (Principal Investigator: Matt Blank)
4. Field Demonstration of an Autonomous and Self-Sustained Sensing System to Monitor Water Quality near U.S. Highway 191 (Principal Investigator: Xianming Shi)

All REU research will center around U.S. Highway 191 between Bozeman and West Yellowstone. Undergraduates from all fields of engineering, ecology, biology, environmental sciences, and related fields were invited to apply and applications are currently under review. An interdisciplinary team of two undergraduate students will be selected to work together on each of the four 2009 REU projects.

Experienced WTI research staff and faculty will mentor the diverse group of eight students. In addition to their project involvement, the students' REU experience will be enriched by research seminars, training workshops, and similar educational activities over the course of the 10 week program. [Click here for more information](#) on this year's research projects.

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New Projects

Replacing Thermal Sprayed Zinc Anodes on Cathodically Protected Steel Reinforced Concrete Bridges

The objectives of this project are to determine the most cost-effective method to remove existing zinc anodes from a concrete surface, and to develop a protocol to prepare the concrete surface for the new anode. [Find out more](#)

Validation of Rehab Strategies to Extend the Service Life of Concrete Bridge Decks

The objective of this research is to investigate the long-term effectiveness of Caltrans' preservation and rehabilitation strategies for concrete bridge decks. Caltrans currently employs high molecular weight methacrylate (HMWM)-based crack sealing and polyester overlay. This research will also explore the value of Portland cement concrete (PCC) and asphalt concrete (AC) overlays on bridge decks, and identify the appropriate treatment time and frequency for these strategies. [Find out more](#)

Measurement and Evaluation of Subgrade Soil Parameters: Phase 1 - Synthesis of Literature

The objective of this project is to conduct a comprehensive literature review of the state of the practice pertaining to testing and evaluation of subgrade soils. [Find out more](#)

Evaluation of the UDOT Weather Operations/RWIS Program on Traffic Operations

The objective of this research project is to conduct a second phase of evaluation of Utah Department of Transportation's (UDOT) Weather Operations/RWIS Program, in order to identify how the program benefits users in the Traffic Operations Center. [Find out more](#)

Distracted and Drowsy Driving Intervention for Teen Drivers in Rural America

The goal of this project is to test a driver education program on the hazards of distracted and drowsy driving, and to quantify its effects on the behavior of novice teen drivers in rural communities. [Find out](#)

[more](#)

Development of a Toolkit for Cost-Benefit Analysis of Specific Winter Maintenance Practices, Equipment and Operations

The objective of this project is to help the Wisconsin DOT, along with its partner states in the Clear Roads pooled fund program, develop a toolkit to facilitate cost-benefit analysis for winter maintenance managers. [Find out more](#)

Reliability and Effectiveness of an Electromagnetic Animal Detection and Driver Warning System

This project will investigate the reliability and effectiveness of an electromagnetic animal detection and driver warning system (ADS-DWS) that was installed along U.S. 160 between Durango and Bayfield, La Plata County, Colorado. [Find out more](#)

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New Staff

Dr. Zhirui (Jared) Ye is a WTI research scientist in the Safety and Operations program. He earned his doctorate in Transportation Engineering from Texas A&M University, and his Bachelor of Science and Master of Science degrees in civil engineering from Southeast University (China). He was awarded Most Outstanding Student in Transportation at Texas A&M University by the Federal Highway Administration and also received a Jacobs Engineering Scholarship.

Jared has eight years of experience in transportation engineering and science research and has been involved in the development of Chinese Intelligent Transportation System (ITS) architecture, freeway construction management, traffic flow data analysis, work zone traffic study, freeway sensor data fusion, and arterial signal timing optimization. He has also conducted research in traffic safety which focused on crash data analysis and development of statistical methodologies for safety issues. At WTI, Jared is leading several projects in the areas of ITS, surface transportation and weather, traffic operations, and traffic safety.

Jared lives in Bozeman and enjoys being with his family and playing badminton when he is not "on the road." He can be reached via email at jared.ye@coe.montana.edu.

Dan Richter is a WTI Research Associate with the Systems Engineering Development and Integration program. He received a Bachelor of Science in Computer Science from the University of Delaware and contributes over twenty years of experience in information systems, including system design and integration, documentation, implementation, and maintenance to WTI projects.

Dan has been assisting within the Systems group on project software documentation, development and support. He has lent his expertise to several projects including Automated Safety Warning System Controller, Weathershare Phase 2, Redding Responder Phase 2, Integration of Aviation Automated Weather Observation System with RWIS, and Integrated PDA/GPS System to Collect Standardized Road Kill Data. Dan can be reached by email at daniell.richter@coe.montana.edu.

Paula MacKay joined WTI in 2008 as a Research Associate with the Road Ecology group. Her areas of expertise include noninvasive wildlife research methods (remote cameras, hair sampling), carnivore recovery and conservation, and writing and editing. She currently provides support to WTI's I-90 Snoqualmie East Wildlife Monitoring Project, conducting wildlife surveys at potential highway crossings, fostering partnerships with pertinent groups, and coordinating outreach efforts. She also assists with WTI's broader wildlife research efforts in the Cascades of Washington, where her primary interests lie in enhancing habitat connectivity for wide-ranging carnivores.

Originally from Boston, Massachusetts, Paula graduated magna cum laude from the University of Vermont with a B.A. in Psychology and later pursued graduate work in wildlife ecology at the University of Maine. She has over 20 years of experience working in project coordination, communications, and wildlife field research for non-profits including Greenpeace, New England Aquarium, Northeast Organic Farming Association, and the Wildlands Project. Paula spearheaded and served as managing editor for "Noninvasive Survey Methods for Carnivores," a book published by Island Press in 2008. She also serves as a writer/editor for the Humane Society of the United States Wildlife Land Trust.

Paula and her husband, Research Ecologist Robert Long, and their dog, Cedar, live in Ellensburg WA. When not observing wildlife, Paula can be found hiking, snowshoeing, or canoeing. She can be reached via email at paula.mackay@coe.montana.edu.

James Begley joins WTI as a Road Ecology Research Associate. He specializes in GIS mapping and modeling, and conducts wildlife monitoring and research for projects including the I-90 Snoqualmie Pass East project and the Steven's Pass Wildlife Dispersal Habitat Modeling project. His responsibilities include conducting remote camera surveys, snow tracking, non-invasive surveys for carnivores, and small mammal live trapping.

A Washington state native, born and raised in the Seattle area, James earned an A.A.S. in Fisheries Technology from Peninsula College, Port Angeles, WA, a B.S. in Wildlife Management from Washington State University, and an M.S. in Resource Management from Central Washington University. Prior to joining WTI last year, he worked 16 years for the Okanogan and Wenatchee National Forest as a Wildlife Biologist and for the Washington Department of Fish and Wildlife as a Scientific Technician.

James and Stella, his black Lab, live in Roslyn, WA (set of TV's Northern Exposure) where he also serves as member of the Roslyn City Council. He can be found hiking, backcountry skiing, bird hunting, and playing guitar in a rock and roll band ("Free Beer at Exit 80"). James can be reached regarding his work in Washington (or to book his band) at james.begley@coe.montana.edu.

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