MONTANA STATE UNIVERSITY

Mountains 🍪 Minds



Research Outreach Education News from the Labs New Projects Staff News



Message from the Director

Winter Maintenance and Effects - It's not just about moving snow...

The calendar tells us it is spring, but for those of us in the northern regions of the country, it may be wishful thinking and a bit premature to remove the snow tires on our vehicles just yet. As we reflect on this winter, we remember hazardous Thanksgiving driving, Christmas snowstorms that buried New York City, and an ice storm blanketed by a snow storm in Dallas, Texas just days before the much hyped Super Bowl XLV. North, south, east, west, every region of the country experienced some form of atypical winter weather condition that ultimately caused traveling hiccups.



Winter travel delays will never be eliminated, but research conducted at WTI will help travelers make informed decisions about routes and assist state departments of transportation (DOTs) with decisions regarding infrastructure maintenance and future investments. We address a variety of cross-cutting, multi-disciplinary issues faced by today's transportation industry, particularly those related to sustainable maintenance activities and materials integrity in cold climates. It is not just about whether or not the deicer works on the road surface, but how quickly it works. What are the corrosion effects to the vehicle, to the roads, to bridges? What about the wildlife grazing near these chemical treated roadways?

From the WTI Corrosion and Sustainable Infrastructure Laboratory, to the Montana State University Sub-zero Science and Engineering Facility, to TRANSCEND - WTI's outdoor test track, WTI researchers have state-of-the-art tools to conduct cutting edge experiments. Our results provide answers to these questions and will ultimately improve driver safety in hazardous winter conditions, as well as sustain the environment and protect wildlife and their habitat.

In this issue, you'll see the diversity of our winter maintenance program - deicer longevity research for eleven state DOTs participating in a pooled fund study, identifying products and best practices that will protect DOT equipment from corrosion, and testing the defrost capabilities of a locomotive

windshield at -40 degrees. You'll also learn about a website in development that will display road conditions for a four state region on a single website: One-Stop Shop!

If you are interested in solutions and collaborating with WTI on Winter Maintenance and Effects projects or to find out more about our research facilities, please contact me at stevea@coe.montana.edu.

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Research

Winter Maintenance and Effects Research

As regions across the United States braced for snow storm after snow storm this winter, transportation in areas typically unaccustomed and unprepared for these types of conditions came to a grinding halt, paralyzing some cities for days at a time. While most of these scenarios reflect emergency situations where large snow accumulation occurred in a short amount of time, they invite awareness as to how well transportation systems operate in regions that *ARE* accustomed to inclement weather and hazardous driving conditions on a regular basis during the winter season.

In the northern United States and Canada, snow and ice control operations are essential to ensure the safety, mobility and productivity of winter highways. Keeping roads clear of snow and ice is no small task, and the US spends \$2.3 billion a year on winter maintenance. Depending on the road weather scenarios, resources available and local rules of practice, departments of transportation (DOTs) use a combination of tools for winter road maintenance and engage in activities that include anti-icing, deicing, sanding and mechanical removal. As the detrimental environmental impacts of abrasives are generally greater than those of chemicals,



DOTs have begun to minimize the use of abrasives. The increased use of chemicals, however, has raised growing concerns over their negative effects on motor vehicles, the transportation infrastructure, and the environment. Maintenance agencies are continually challenged to provide a high level of service and improve safety and mobility in a cost-effective manner, while minimizing corrosion and other adverse effects to the environment.

WTI's Winter Maintenance and Effects (WME) program has worked very hard over the last seven years to understand and mitigate the effects of winter weather and corrosion on transportation systems and to address challenges and concerns through innovation and multi-disciplinary partnerships. The program serves as a bridge between industry and academia and conducts problemdriven research, emphasizing the development and evaluation of materials, technologies and systems to support winter maintenance best practices and decision making for sustainable transportation systems.

Dr. Xianming Shi, P.E., Principal Investigator for the WME program, and his WTI colleagues, have a unique opportunity to conduct comprehensive research in the WTI Corrosion and Sustainable Infrastructure Laboratory and the Montana State University Subzero Science and Engineering Research Facility, then test their results at TRANSCEND, WTI's outdoor test track. TRANSCEND includes

a state-of-the-art snow making system, which allows researchers to simulate winter conditions in a controlled field setting. The team has systematically evaluated the performance attributes and impacts of alternative deicers as well as traditional chloride-based deicers, under research sponsored by Colorado, Washington, and other state DOTs along with the U.S. DOT Research and Innovative Technology Administration (RITA).

The WME Program recently completed a pooled fund study on inhibitor longevity and deicer performance. The study was funded by *eleven state DOTs* (WA, ID, OR, MT, CO, IN, IO, MN, ND, UT, and VA), the U.S. DOT RITA, Redmond Minerals, America West, and Tetra Technologies, in order to evaluate the longevity and performance of corrosion inhibitors in deicing chemicals when in storage or on the road.

"The investigation of inhibitor longevity and deicer performance is very important to the multiple agencies and private entities which contributed to this project," says Monty Mills, WSDOT Maintenance Operations Branch Manager. "This research is the first such comprehensive effort to quantify the benefits of corrosion inhibitors when added to common deicer products. The results of this research will help these agencies and others to determine how best to proceed in the purchase and application of inhibited products."

Additionally, new research projects sponsored by the Alaska Department of Transportation and Public Facilities, Oregon DOT, and Washington State DOT will develop locally sourced salt brine additives for anti-icing, understand and mitigate effects of chloride deicer exposure on concrete, and establish best-practice guidelines for protecting DOT equipment from deicer corrosion.

Shi says, "Delivering the right type and amount of materials in the right place at the right time for snow and ice control is the ultimate goal. Our research helps to establish best practices that are expected to improve the effectiveness



and efficiency of winter operations, to optimize material usage, and to reduce associated annual spending and corrosion and environmental impacts."

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A View from the Window – the Locomotive Windshield

While defogging and chipping ice off of automobile windshields can be slow, tedious work, motorists typically have the tools and the ability to pull over to complete the task. For operators of locomotives pulling freight cars, the task is a bit more daunting. Locomotives are designed to operate in very harsh weather conditions in order to minimize delays associated with inclement weather. Manufacturers have stringent performance specifications regarding the defogging equipment integrated into the windshields they install on their locomotives. To facilitate meeting this standard, the Western Transportation Institute (WTI) has been contracted to test the defogging performance of a windshield, utilizing the Subzero Science and Engineering Research Facility at Montana State University.

WTI designed and constructed a frame to hold the locomotive windshield with its rubber seal at a 60 degree angle from horizontal to simulate the actual position of a locomotive windshield. Both sides of the windshield will be exposed to the same ambient air temperature; however, the "inside" will be shielded from the wind. The "outside" of the windshield will face a fan assembly capable of simulating a maximum wind speed of approximately 30 miles per hour.

A 10 mm thick layer of ice will be frozen to the "outside" of the windshield glass by creating a water dam around the edge of the glass and filling the surface with water while the windshield is positioned horizontally, then reducing the temperature of the environmental chamber to below-freezing temperatures. Once the water is frozen, the windshield will be mounted in the test frame and the temperature in the cold chamber will be reduced to -40°F. Once the chamber reaches this temperature, the defogger will be switched on. A video camera will be used to monitor the visibility of the windshield and record the amount of time it takes to achieve clear conditions. The window must be clear of ice within 60 seconds to meet the industry performance standard.



WTI Researcher prepares the "inside" of the windshield before activating the defrosting mechanism.



"Outside" of the locomotive windshield, frozen to -40 degrees in the MSU Subzero Science and Engineering Research Facility.

Opened in 2008, the MSU SubZero lab is a unique and state-of-the-art suite of laboratories used to study the effects of cold temperatures on projects across many scientific disciplines. It is an ideal setting to replicate the very cold and harsh environments in which the windshields will operate.

Jason Harwood, Research Associate for WTI, designed and constructed the frame and will conduct the freezing and defogging testing. "The parameters that we are testing have much to do with the safety of operating the new locomotives," says Harwood. "This testing process is significant to locomotive manufacturers because it verifies that subcontractors have met specific requirements for various components of the locomotive." At the end of the project, the manufacturer will be provided with a report showing the defogging rate and overall performance of the windshield in the extreme conditions.

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"One-Stop Shop" Website to Display Rural Traveler Information Across Four State Region



Real-time weather information is a valuable resource for highway travelers making long distance trips, especially when they are faced with snow, ice or other challenging driving conditions. While there is plenty of weather and road information available on the Internet, it can be scattered over numerous websites, especially if a traveler's route crosses over a state line.

Researchers at WTI have conducted several projects for Caltrans over the last few years to create traveler information tools that gather weather and road data from multiple sources and display it on a single, user-friendly website. "We've teamed with the California Department of Transportation to create several traveler information websites that initially served a specific region of the state and eventually the entire state," said Doug Galarus, WTI's Systems Engineering Development and Integration Program Manager; "but travelers planning longer trips outside the state would still have to consult another resource for the weather conditions in the next state, even if they stay on the same highway."

Building on their previous work, Galarus, David Veneziano and the project team are currently developing a website that will display conditions for a four state region, including California, Oregon, Washington, and Nevada. This region coincides with the member states of the Western States Rural Transportation Consortium, a pooled fund effort to investigate the use of Intelligent Transportation Systems (ITS) in rural areas. Website users will view a map that allows them to see a variety of information for a selected point along the roadway, including Closed Circuit Television (CCTV) images, road closures, weather sensor readings, or National Weather Service forecasts. The website will also offer route planning and trip planning tools.

The project is sponsored by the FHWA, and supports the objectives of its *Clarus* Initiative, which seeks to alleviate the impacts of adverse weather by expanding access to accurate and timely road weather information. "Access to, and utilization of, important road weather information from Clarus through the One-Stop Shop will help both the transportation agencies and the travelers deal effectively with adverse weather conditions", said Roemer Alfelor, project manager for FHWA.

In September 2010, WTI received a Broad Agency Announcement Award from the U.S. Department of Transportation for integrating *Clarus* data into the Western States One -Stop Shop for Rural

Traveler Information. As part of the award, WTI will present the project at the 2011 Road Weather Management Stakeholder Meeting next September.

"Tools such as these help travelers make safe driving decisions about when and where to travel," said Veneziano; "but they can also benefit many others, including freight haulers who schedule delivery routes, and transportation agencies who assign snowplow and maintenance crews. Good road weather information makes roads safer and more productive for everybody."

For further information, please visit: <u>www.westernstates.org/Projects/OSS/Clarus/default.html</u> or contact Doug Galarus at <u>dgalarus@coe.montana.edu</u> or 406/994-5268.

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The Road Less Traveled: *Can well-informed visitors help ease congestion in gateway communities and near or within our National Park Roads?*

As winter comes to a close and the days become longer, summer travelers begin looking for places to wander. Despite the recession, or maybe because of it, national parks stand poised to receive yet another summer of near record visitors.

A National Park in the Colorado Rockies is investigating whether drivers with more information about their transportation options will change how they travel to and through the park, and ultimately, reduce traffic and delays on popular roads and have a better visitor experience.

Rocky Mountain National Park (ROMO) is a 400 square mile, mountainous park in northern Colorado, which attracts nearly three million visitors each year for hiking, camping, scenic drives, wildlife viewing and other recreational activities. In fact, the large number of visitors, especially during peak seasons, has led to serious congestion issues on certain corridors, including the Bear Lake Road Corridor that connects the gateway community of Estes Park with locations in the eastern part of the National Park.

Recently, ROMO received a major federal grant to develop a long-term congestion management plan for this corridor, including the deployment of Intelligent Transportation Systems (ITS) technologies. As a preliminary step, ROMO is also interested in deploying one ITS system right away. "While developing a comprehensive ITS technology strategy will have the most long-term impact, sometimes getting one system up and running right away can help park and community managers see how technologies work and which ones might be the best choice for their facility," said John Hannon, Management Specialist - Business Programs at ROMO.

In partnership with ROMO, FHWA/Federal Lands Highway Division, the city of Estes Park, and the Colorado Department of Transportation, WTI will assist with the implementation of a traveler information system serving visitors who approach the park on the east side (near Estes Park). The system will disseminate real-time messages to drivers, using technologies such as dynamic messages signs and Highway Advisory Radio. "Drivers who enter the Park may not be aware of all the public transportation options that are available, such as park and ride lots, shuttles, or even travel times during the day or week when there is generally less crowding," said Steve Albert, WTI Director.

After the pilot system is implemented, WTI researchers will also conduct an evaluation to determine if technology is influencing visitor behavior, mode shift, peak spreading, air quality, and potentially, economic activity. As Albert explained, "At the end of the day, we need to know if and how drivers will act on the information they receive - if they know that a certain destination is less crowded later

in the afternoon, will they change their travel plans?"

Efforts to reduce congestion have far-reaching benefits for visitors, the park facilities, and the surrounding region. "We're excited about the long range potential of this project," said Scott Zurn, Public Works Director for the Town of Estes Park; "if we can reduce over-crowding in gateway communities and on park roads, we can improve the quality of the experience for park visitors, preserve the natural resources of the area, and support regional tourism development and economic sustainability efforts."

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Outreach

WTI continues to use a variety of outreach activities to disseminate research findings, share lessons learned and help advance the state of the practice in rural transportation. Our researchers have led field trips, are working to develop an institute dedicated to road dust and will be sponsoring relevant conferences.

UTC Partnerships Highlighted in National Transportation Magazine

Successful research partnerships developed by the University Transportation Center program were the focus of a cover article in the January/February 2011 issue of *Public Roads* magazine.

WTI Director Steve Albert and **O. A. Elrahman**, head of Research Coordination & Technology Transfer in the Transportation R&D Bureau at the New York State Department of Transportation (NYSDOT), authored "Pooling Talent and Technologies - How University Transportation Centers are improving transportation through innovative partnerships, creating a win-win for government, universities, industry -- and motorists." The article describes the evolution of the UTC model for transportation research and education, and how UTCs continue to play a leadership role by coordinating collaborative research on critical and emerging issues.

"UTCs have developed their own expertise and facilities for conducting transportation research, but they are also in an excellent position to pool and leverage resources from multiple partners," Albert explained; "we wanted to emphasize how UTCs, public agencies and private businesses can integrate their individual strengths toward the development of a new transportation tool or practice."

Drawing from the work of UTCs around the country, the article describes numerous examples of collaborations to create real-world transportation solutions, as well as workforce development efforts to train the next generation of transportation professionals. "We were pleased to be able to showcase some of the successful initiatives spearheaded by University Transportation Centers and how they're providing national leadership on advancing the state of transportation," Albert concluded.

The full article is available at <u>www.fhwa.dot.gov/publications/publicroads/11janfeb/06.cfm</u> For more information on UTCs, please contact WTI Director Steve Albert <u>stevea@coe.montana.edu</u> 406/994-6114

National Rural ITS Conference

Coeur d'Alene, Idaho -- August 28-31, 2011



Named by French-speaking fur traders, Coeur d'Alene, Idaho has long been a hub for exchanging goods. In 2011, we will continue this tradition as we exchange knowledge and information at the 2011 National Rural ITS Conference and ITS Rocky Mountain Annual Meeting. Located on the shore of beautiful Lake Coeur d'Alene, attendees can mix family-friendly fun with training and networking opportunities, dozens of technical sessions and exciting professional tours. Don't forget to save time for the golf tournament hosted by the ITS Rocky Mountain Chapter. You wouldn't want to miss the opportunity to hit a golf shot onto the world's only moveable, floating green! It's always an adventure here, so join us for "Adventures in ITS".

This conference will provide participants the opportunity to network and share experiences within and across a wide variety of ITS disciplines. In addition to traditional ITS topics, this event will bring together both traditional and non-traditional ITS users to

address such issues as rural safety, creating and maintaining livable/sustainable communities, multiagency coordination, and workforce development, as well as EMS and transit issues. The 2011 sponsors include Ada County Highway District, Idaho Transportation Department, ITS America, ITS Joint Program Office, Research and Innovative Technology Administration (RITA), ITS Rocky Mountain, Open Roads Consulting, Inc., RouteMatch Software, Inc., Washington State Department of Transportation, and Western Transportation Institute.

The many different training and networking opportunities available through this event will provide participants with the tools necessary to effectively plan and deploy ITS technologies within their own jurisdictions. More information can be found on the conference website: http://nritsconference.org/

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2nd Road Dust Best Management Practices Conference—Save the Date!

Las Vegas, Nevada - November 7-9, 2011



The 2011 Road Dust Best Management Practices Conference will bring together local, state and county road practitioners, as well as researchers and federal agencies to discuss current practices, identify best practices and share lessons learned, to enhance the management of dust on unpaved roads. The themes of the 2011 Road Dust Best Management Practices Conference will be Environmental Compatibility and Sustainability, General and International Best Practices, and Unique and Extreme Conditions.

The conference will feature national and international experts presenting current best management practices and will use presentations and poster sessions, roundtable dialogue and training sessions to accomplish this. To better serve our road dust community, we will also be offering a training session on How to Put Down Product and/or Understanding Dust Plume Opacity. The event is sponsored in part by the Federal Highwav Administration-Federal Lands Highwavs. University of

Nevada-Las Vegas, the Alaska University Transportation Center, and the Western Transportation

Institute.

To learn more about registration, lodging, submitting an abstract or sponsorship, and vendor opportunities, please visit <u>http://roaddustinstitute.org/conference</u>. Questions may also be directed to our event support staff at Meetings Northwest (866.633.8110).

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WTI Hosts Bike Sharing Program Webinar

More and more cities around the country are considering bike sharing to help achieve environmental, public health, and transportation related goals, while also improving a community's livability. The Association of Pedestrian and Bicycle Professionals (APBP) presented a 90 minute webinar on Bicycle Sharing Programs on January 19. WTI served as a host site for the event with members of the Bozeman community in attendance.

The webinar presented an overview of bike sharing in the U.S. and other countries, with case studies from Minneapolis and San Antonio and a detailed discussion of the implementation process (building support, funding models, RFPs, contracting, launch, and operations). Participants learned about the planning and implementation steps necessary to launch a public bike share system, the different financial models and funding sources, and the positive implications of an exponential increase in bicycle traffic for public infrastructure.

Webinar presenters included Alison Cohen, Program Manager of Alta Bicycle Share; Julia Diana, sustainable transportation analyst for the City of San Antonio's Office of Environmental Policy; and Bill Dossett, Executive Director of Nice Ride Minnesota. Following the presentation, Bozeman participants at WTI engaged in discussions regarding bike sharing potential at Montana State University and the surrounding Bozeman community. This webinar raised awareness of shared bicycles as a form of public transportation and began a dialogue between the City, University, local businesses and bicycling advocates regarding what type of bike sharing program could be appropriate in the Bozeman setting and beneficial to residents.

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Education

Student Successes

Jessica Mueller successfully defended her thesis "Safety Evaluation of a Medic's Work Environment during Rural Emergency Response," completing all requirements for her Master's degree in Industrial Engineering. The naturalistic data collected in her study allowed researchers to perform analysis in a rural emergency driving environment to identify contributing factors to attending medic behavior, severity of biomechanical forces experienced in the driver and patient compartment, and an evaluation of emergency medical response safety culture. The project includes development of a series of environmental, ergonomic, policy, or training recommendations to mitigate circumstances that cause potentially unsafe operations in the driver's and patient's compartment of the ambulance. This study used naturalistic data and video, survey responses, focus groups, and agency patient care records to analyze the rural medics' working environment during emergency patient

transportation. Accelerometer data was analyzed for 102 separate emergency transports to provide descriptive statistics relevant to whole-body vibration experienced by the medics during patient care. Five years of patient care records were analyzed to identify specific patient illnesses and medical procedures associated with traveling in emergency response mode. Restraint compliance rates were collected for both self-reported (21.5% restrained) and observed (2.6% restrained) data collection methods. Focus groups identified factors influencing medics' choice to be unrestrained, characterized by a reduced ability to provide patient care, the belief that restraint devices will cause harm to the medics, and the belief that the restraint devices are ineffective in a crash situation. Finally, reach analysis was conducted to highlight the procedures and equipment retrieval which require the medics to assume positions resulting in awkward and unstable postures during transport. The results of this study will add to the growing body of knowledge surrounding the behaviors of EMS workers in a real work setting, and will aid in understanding the complexities of EMS safety culture. Jessica was a recipient of the WTI Graduate Transportation Award and was selected as the 2009 UTC Student of the Year.

Sommer Roefaro, WTI Graduate Fellow and Master's Candidate in Civil Engineering, presented *Effectiveness of Signal Control at Channelized Right Turning Lanes: An Empirical Study* during a poster session at the Transportation Research Board 2011 Annual Meeting in Washington, DC.

Civil Engineering graduate research assistant Colter Roskos presented a poster at the National Science Foundation's Civil, Mechanical and Manufacturing Innovation Division Grantees Conference, which was held January 3-7, 2011 in Atlanta, Georgia. Colter's paper on "*Building Green: Development and Evaluation of the Design Properties of an Environmentally Friendly Concrete*" will also be published in the conference proceedings.

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Safe Passages Research Experience for Undergraduates

The Western Transportation Institute completed the final year of its three-year NSF-funded Safe Passages Research Experience for Undergraduates (REU) program this summer. The goal of the program was to address the nation's need for innovative solutions to issues arising at the interface between the nation's rural transportation infrastructure and the natural environment. The intent of the REU was to integrate a variety of strategies in addressing problems in the program's three research focus areas: 1) water and fish passage; 2) wildlife movement and habitat connectivity; and 3) public safety and mobility. Student projects utilized the U.S. Highway 191 travel corridor between Bozeman and West Yellowstone, Montana. REU research conducted on this busy two-lane roadway, which cuts through a major riparian corridor, important wildlife habitat, and a portion of Yellowstone National Park, was designed to provide a model for developing integrated transportation solutions to address both public safety and environmental concerns on rural highways nationwide. Each year, eight participants were selected from colleges and universities nationwide for the ten week summer research program.

Recruitment of underrepresented groups in engineering, specifically women and Native American students, was a primary program goal. Diversity recruitment efforts were quite successful. Over the course of the three year REU program, 21% of the twenty-four participants were from underrepresented ethnic/racial groups (including Native American), 8% were Native American, and 63% were female. Participants also represented a wide range of academic majors (13 total) and home institutions (21 total).

The program strove to provide research experiences to students who have limited access to research at their home institutions. Recruitment efforts targeted non-research intensive two-year and four-year colleges to achieve this goal. One-third of participants in the program came from home institutions that do not grant degrees beyond a Master's. Four of the participants came from institutions offering Bachelor's degrees only.

Research projects were selected from each of the three thematic research focus areas: water and fish passage (5 projects); wildlife movement and habitat connectivity (3 projects); and public safety and mobility (5 projects). An interdisciplinary team of two students worked on each project. Four of the twelve REU projects have resulted in successful submissions to professional conferences or publications.

The successful REU program provided valuable research experience to a diverse group of twenty-four undergraduate students, which will impact their problem-solving skills and their career and academic choices after graduation. In the words of one of the 2010 participants:

"This summer was the best summer of my life. I learned so much, gained so many new skills, and experienced so many new things. It truly has been life changing."

WTI will seek additional support from NSF to continue offering undergraduate research opportunities focused on safe and sustainable transportation in rural environments.

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Girl Scouts Engineering Day

Approximately one hundred Girl Scouts from Bozeman and surrounding communities visited MSU on Saturday, February 26 to explore engineering careers and activities. The event, sponsored by the Western Transportation Institute, was held to commemorate Introduce a Girl to Engineering Day during National Engineering Week. The girls (fourth through sixth graders) had the opportunity to interact with MSU engineering students during fifteenminute hands-on activities that introduced them to Civil, Electrical, Industrial, Environmental, and Chemical Engineering. During the two-hour event, the girls explored ergonomics, programmed robots, ate ice cream made with liquid nitrogen, designed the layout for an oil pipeline through tundra, and built soil retaining



MSU students make ice cream with liquid nitrogen for Girl Scout Engineering Day.

walls. They also completed a team problem-solving task. Engineering student chapter organizations hosted the activities representing the various engineering disciplines. WTI, the College of Engineering, and Girl Scouts of Montana and Wyoming jointly coordinated the event. Participants traveled from Bozeman, Pony, Livingston, Belgrade, Whitehall, Norris, and Harrison to attend the popular event.

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News from the Labs





Located in Central Montana at the former Lewistown airport, TRANSCEND's research facility offers four miles of real-world paved test surface, snow making equipment, and a comprehensive communications, power, and data networking infrastructure. The 230 acre facility offers extensive space for large and custom-designed projects. Some of the projects conducted to date include testing de-icing equipment and techniques, evaluating animal detection systems, and confirming the durability of fly-ash concrete.

Instrumentation boxes and conduit have been installed on the data tower that was erected last fall. Pending good weather, a camera and antennas will be installed on the tower along



Recently installed instrumentation boxes on data tower. Newly constructed storage shed sits in the background.

with a server, DVR, and other network equipment in the shop in the coming weeks. A wireless connection between the shop network and the weather station will also be established.

Final closeout on the newly constructed storage shed has been completed and the larger pieces of equipment have been moved out of the shop building and into the storage shed. Extra materials and other equipment will gradually be moved over when cabinets and shelving have been installed. Space in the shop building has now opened up and new office furniture was installed in February.

WTI staff held a snowmaking event in February to check and tune the snowmaking equipment. Based on data from this event, the fan guns will be updated with new weather stations and nozzle upgrades to make snow more



Large equipment in new home.

consistently and efficiently at temperatures slightly below freezing. Snowmaking equipment upgrades will be completed by next winter.

For more information on the research conducted at the facility, please contact Eli Cuelho (406) 994-7886, <u>elic@coe.montana.edu</u>. Visit our website at <u>www.TRANSCENDlab.org</u>.

Human Factors Research Facilities Update

The Western Transportation Institute is dedicated to understanding the driver role in fatal rural traffic crashes and developing driver support systems to improve traffic safety. WTI's state-of-the-art facilities allow our team of researchers to conduct complex and realistic traffic research in a controlled environment, then extending the research to the naturalistic setting of test track and open road studies.



Naturalistic Data Lab

In 2008, WTI was awarded a grant by the M. J. Murdock Charitable Trust Foundation to instrument a fleet of vehicles for naturalistic studies of rural traffic safety human factors and field tests of rural traffic safety interventions. The Murdock Naturalistic Driving Fleet and Lab uses vehicles and sensor systems to help researchers find ways to make rural roads in the US less deadly. The vehicles can be equipped with a variety of data logging and measuring devices to evaluate the driver's performance in real world driving scenarios. Future use of the Murdock equipment includes assessing the validity and transferability of simulated training for teen drivers.

Dr. Laura Stanley's Ambulance Biomechanics project has recently been completed, with publications currently underway. The fleet and driving simulators are being investigated for use as part of an older driver assessment in conjunction with Bozeman Deaconess Hospital's occupational therapist team. Undergraduate researcher Kaysha Young will begin her work evaluating hands-free texting systems using the driving simulator as well. Graduate students Tawny Hoyt and Jessica Mueller recently presented their findings from their NHTSA ESV student project presentation titled "Improving Restraint Feasibility through Ambulance Layout Redesign" at the regional competition level.

For more information, please contact Laura Stanley (406) 994-1399, <u>laura.stanley@coe.montana.edu</u>. Visit our website at <u>www.westerntransportationinstitute.org/laboratories/fleet</u>.

Driving Simulator Laboratory

WTI's driving simulator suite now represents one of the most advanced simulation capabilities funded and operated by any research university in North America. The suite includes high, medium, and low Fidelity simulators, eye tracking technology, and instrumented vehicles, allowing researchers to match each simulator's capabilities to the needs, complexity, and budget of the project. The simulators are used to do experimental research on driver behavior and to help engineers "visualize" new technology systems or traffic engineering designs at early stages of development.

The Human Factors lab is currently being utilized for a FHWA project (in partnership with Battelle, University of Iowa, and University of Wisconsin) to examine the use of driving simulators for engineering projects. Part of this research involves comparing traffic data from real locations to driver data obtained from a virtual representation of that location in a driving simulator. Currently, WTI is replicating an Arizona roundabout in the virtual environment of the WTI driving simulator.



whether you are interested in traffic safety

research, product usability testing or driver skill training; WTI can help you conduct valid research, efficiently test products, or create specialized training scenarios.

Modeled over terrain maps captured from Google Earth, the image represents the Happy Valley and I-17 interchange in North Phoenix, Arizona. Data was collected from multiple points at this roundabout slated for an Arizona DOT study.

For more information please visit <u>www.westerntransportationinstitute.org/laboratories/driving</u> or contact <u>Nicholas Ward</u> (406) 994-5942.

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New Projects

Establishment of the Road Dust Institute and Website - UTC

Project Objective: The main objective of this project is to establish an organization dedicated to improving road dust management and a website that collects and disseminates information about the issue.

Find out more »

Montana Intercity Bus Service Study

Project Objective: The goal of this project is to provide the Montana Department of Transportation (MDT) with an assessment of current intercity bus services within the state, and a methodology for determining future needs.

Find out more »

Cost-Effective and Sustainable Road Slope Stabilization and Erosion Control

Project Objective: The objective of this synthesis is to compile available knowledge and useful, costeffective practices on roadway slope stabilization and erosion control. <u>Find out more »</u>

Rocky Mountain National Park Intelligent Transportation System Pilot Deployment/Evaluation

Project Objective: The purpose of this project is to help implement and evaluate traveler information technologies on a pilot basis in Rocky Mountain National Park. <u>Find out more »</u>

Carnivore Mortality and Movements On and Across the Transportation Corridors, Jasper National Park and Mount Robson Provincial Park Project Objective: The objective of this project is to identify mitigation efforts that will help reduce animal-vehicle collisions, particularly for carnivores, and preserve habitat connectivity across the roads and railroads in Mount Robson Provincial Park (MRPP) and Jasper National Park (JNP) in Canada.

Find out more »

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Staff News

Natalie Villwock-Witte

Natalie Villwock-Witte joined WTI in November 2010 as a Research Scientist for the Paul S. Sarbanes Transit in Parks Technical Assistance Center (TAC). Specializing in both Transportation Safety and Alternative Transportation on Public Lands, Natalie will focus on the evaluation of the Rocky Mountain National Park Intelligent Transportation System and the Bicycle and Pedestrian Planning on Federal Lands project within the TAC Project. Natalie will be based out of New Mexico where she recently obtained her Professional Engineer License.

Originally from Nashotah, Wisconsin, Natalie earned a B.S. in Civil Engineering from the University of Minnesota, then pursued a M.S. and Ph.D in Civil Engineering from Purdue University. Through the generosity of a Travel Grant she was awarded on three separate occasions through the Dwight D. Eisenhower Graduate Fellowship Program, Natalie attended and presented at the Transportation Research Board Annual Meeting in Washington DC. Natalie has traveled to Paris, France; Florence, Italy; Perth and Sydney, Australia; and São José dos Campos, Brazil for study abroad programs. In 2008, she was selected by the National Park Foundation and their partners as a Transportation Scholar.

Natalie and her husband reside in Rio Rancho, NM with Padre and Nibbler - their two cats. Natalie spends her spare time downhill skiing, running, hiking, painting, and traveling. She can be reached at <u>Natalie.Villwock-Witte@coe.montana.edu</u>.

Zachary Zupan

WTI welcomes Montana native Zachary Zupan to the Infrastructure Maintenance and Materials team as a Research Associate. Specializing in steel and reinforced concrete structures, with a special interest in bridge structures and reinforced concrete instrumentation and analysis, and extensive knowledge in geotechnical engineering and finite element modeling, Zachary is an asset to the IMM team. He is currently involved in a Caltrans project, Validation of Rehabilitation Strategies to Extend the Service Life of Concrete Bridge Decks, which aims to improve current bridge deck rehabilitation strategies in California's box girder bridges by fatigue testing laboratory models of bridge deck sections.

Zachary was raised on a cattle ranch at the south end of the Bridger Mountains outside of Bozeman on the Flathead Pass where his family still lives. He attended Montana State University (MSU) where he earned a BS in Civil Engineering with a Minor in Business Administration and a MS in Structural Engineering. Before joining WTI, he worked on the bridge design group for Morrison and Maierle in Helena, Montana. He also worked as a MSU Graduate Teaching Assistant for Geotechnical Engineering classes under the direction of Dr. Robert Mokwa and Dr. Steve Perkins. both WTI researchers.

During the winter months Zachary enjoys backcountry skiing and snowmobiling. When the sun comes out and melts away the snow you can find him either golfing with friends or at his parent's house, roping with his three brothers - ALL of whom currently attend MSU in Bozeman. Go Bobcats! Contact Zachary at: zachary.zupan@msu.montana.edu

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