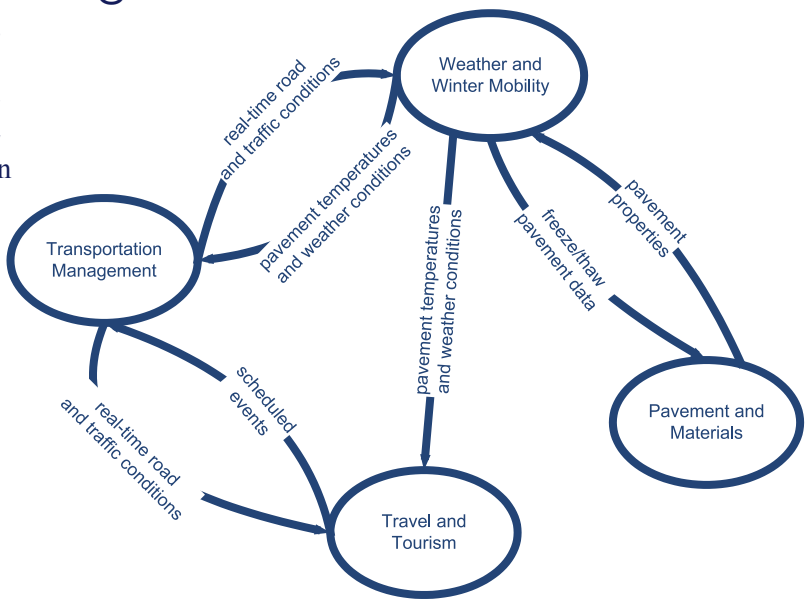
August 2001
Issue 1, Volume 5

Making rural travel and transportation safer, more efficient and convenient through high quality research, education, collaboration and outreach activities.

Western Transportation Institute
Montana State University-Bozeman

WTI Refocuses Research Agenda

In an effort to provide increased focus and depth to the research portfolio to meet our vision of *"making rural travel and transportation safer, more efficient, and more convenient,"* WTI has restructured to concentrate on four program areas– 1) weather and winter mobility, 2) transportation management and public safety, 3) travel and tourism, and 4) pavement and materials. In each of these program areas WTI has directed it's resources to "*create areas of excellence with a multi-disciplinary focus*" that will *"produce high quality research that leads to a demonstration of solutions"* and to invest in laboratories to perform better research that would meet our mission.



While this newsletter will not describe each of the four "areas of excellence," we want readers to recognize that each of the research areas will contribute to the other areas. For example, transportation management operations would include real-time pavement temperatures that are produced from the weather and winter mobility lab. Furthermore, the weather and winter mobility initiatives would be able to use traffic volume data collected through the transportation management initiatives. The figure shows some of the exchanges of information between the different initiatives. Also, it should be noted that while transit is not a primary focus area, it will be an area of concentration for WTI as it relates to rural communities, national parks and other unique areas.

This re-focusing of our strategic research direction was achieved through the cooperation of the University Transportation Center Research Advisory Committee, the WTI Governing Board, and advice from our project partners. By thoroughly understanding partner needs, we feel our proposed research will have a greater likelihood of addressing potential rural transportation applications and producing excellent research results.

We hope you enjoy this newsletter issue which focuses on Weather and Winter Mobility and gives projects updates for several ongoing projects.

Table of Contents

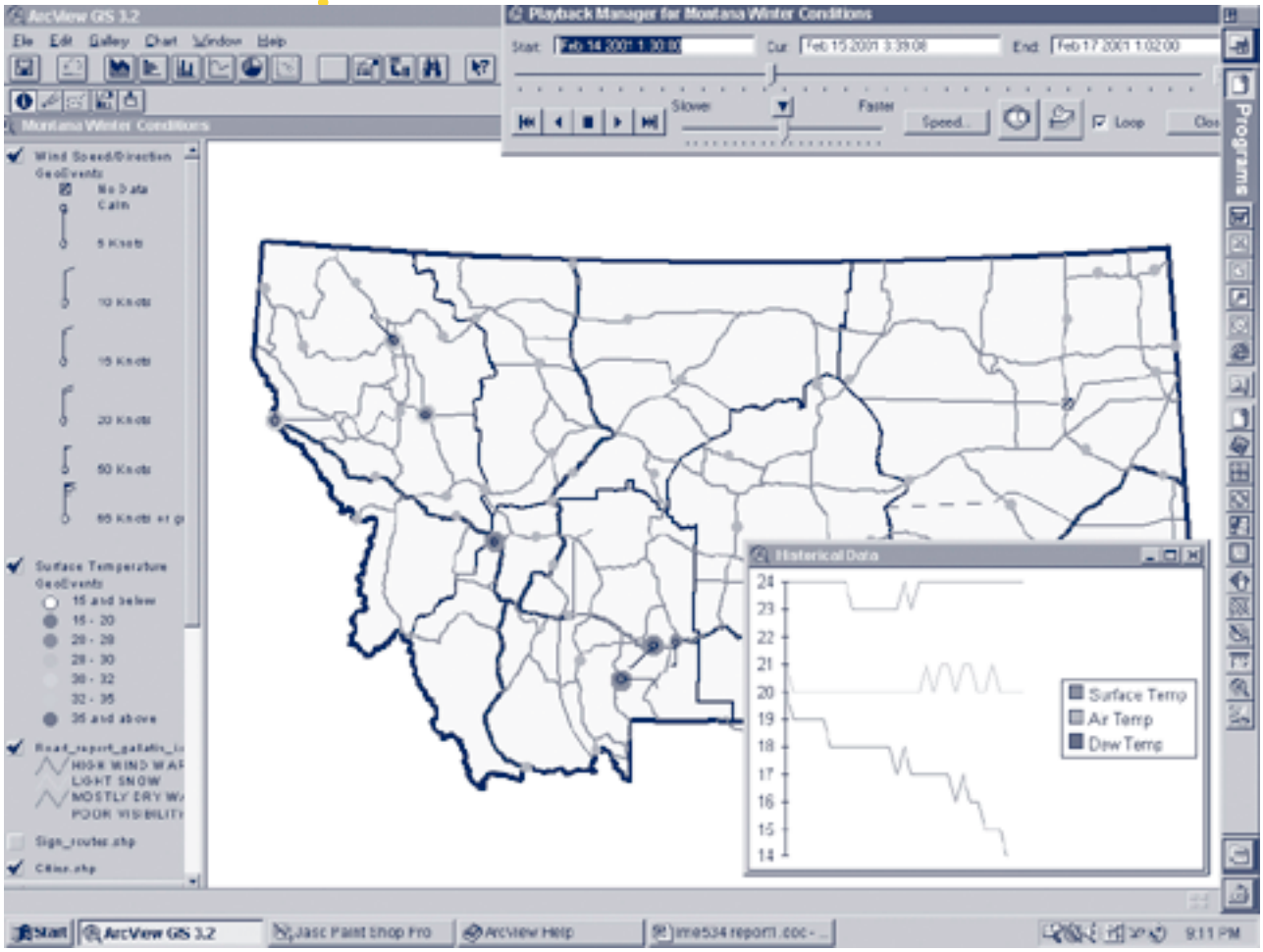
Road Weather Information Needs in Montana

By:

Lisa Ballard
Research Engineer,
Western Transportation Institute

Montana Department of Transportation (MDT) has deployed a Road-Weather Information System (RWIS) including 59 environmental sensor stations throughout the state. Maintenance staff also accesses a variety of other sources of information that can be used to help in winter maintenance. However, MDT has found that these different sources of information are not used as fully as anticipated when installed. Over the last year, WTI has funded a partnership with Meyer Mohaddes and Associates to evaluate how MDT uses RWIS and other tools in making winter maintenance decisions.

The first component of the project was a survey about use of information for winter maintenance decision making. It was created in a web-based format to allow the respondents to complete the survey on the computer. In some key areas, the survey uncovered some strong trends. The first trend apparent from the survey indicates that the sources of information that MDT pays for (RWIS data and vendor-supplied forecasts) are underutilized. For making, confirming, or changing roadway maintenance decisions, survey responders indicated they were far more likely to use National Weather Service forecasts or commercial forecasts than they were to use contracted weather service reports or RWIS data. Furthermore, when asked about accessing weather information, the MDT RWIS program ranked sixth out of nine methods

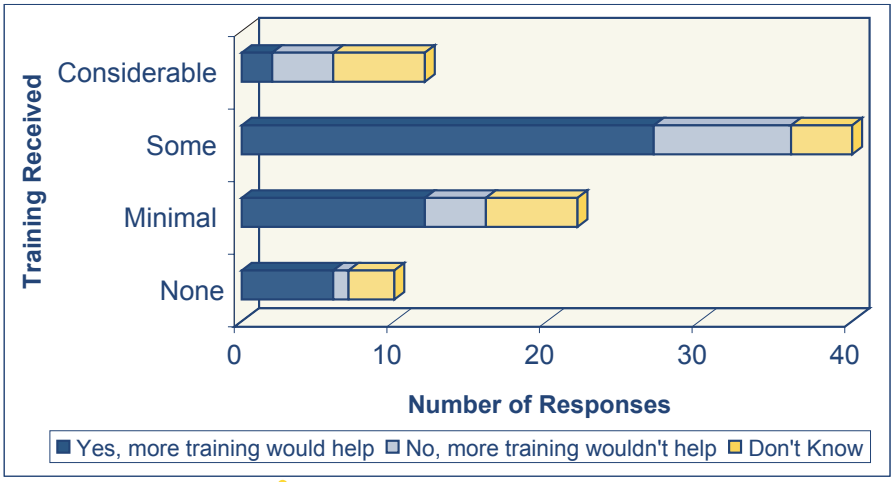


of obtaining information, behind television, radio stations, and other Internet sites.

Results to the questions regarding training unveiled the desire among survey responders to receive more training. When asked, "Do you think that you could use the RWIS to better advantage if you received more training? (Question 20)" the majority of people (56 percent) answered yes. In Question 19, the survey asked, "How much training have you received in obtaining, interpreting, and using RWIS information?" and gave the choices; considerable amount, some, minimal amount, or none. Only 14 percent of the responders indicated they had received considerable training. If these responses are excluded from the analysis in Question 20, 62 percent of people who received some, minimal, or no training on RWIS felt that more training would help. A graph of the cross-tabulation of these two questions is shown in Figure 1.

The survey related some keys for changing the display of RWIS data. When asked, "Would any of the following changes make the display of RWIS data more useful? (Select any that apply)," 74 percent of responders identified "Integrate RWIS data with radar or satellite images" as an improvement. Other popular selections were "Display RWIS data directly on map of RWIS sites" (36 percent), "Provide estimated temperature readings for the length of road (thermal mapping)" (33 percent), and "Make RWIS data easier to read and interpret" (26 percent). These results provide some guidelines and priorities in the potential development of an integrated decision support system.

After completion of the survey and analysis of results, the project team decided to move forward in developing a prototype of a decision support system (DSS). Comments from MDT staff and survey results indicated that a geographic information system (GIS) solution may be appropriate for this application, and priorities were on integrating different sources of data. Two goals for the development of a prototype were to identify what is technically possible and to have a product that shows possible functionality to the maintenance users in soliciting requirements.



Initially, the prototype was developed in a desktop GIS, ArcView 3.2. After demonstrating the capabilities to MDT and receiving comments from the MDT staff, WTI chose to investigate the capabilities of converting the desktop application into a web version, integrating ArcIMS (Internet Map Server) with other web development tools. If this web-based application can include all the capabilities incorporated into the ArcView decision support application and perform at an acceptable speed, this platform will be recommended as the interface architecture for a Montana Winter Maintenance Decision Support System.

Based on the analysis of the survey results and a review of the national Surface Transportation Weather Decision Support Requirements (STWDSR) efforts, MMA developed a list of requirements. The list was used to generate discussion at a meeting on June 12 in the Lewistown Area Office regarding potential activities to address those requirements. Towards the end of the meeting, MDT participants were asked to vote for those areas that were ranked the highest. The areas earning votes are shown in the table below.

The prioritization does not reflect the input from the maintenance personnel statewide, but it does reveal some areas that need emphasis.

Although the project is not yet complete, it is possible at this point to develop some preliminary recommendations for improving the use of RWIS and other decision support tools at MDT.

REQUIREMENT	VOTES
Training in RWIS topics should be provided to winter maintenance decision-makers.	
A refresher course should be offered annually, each fall.	3
Provide training in available source locations of information.	3
RWIS stations should improve winter maintenance decisions.	
Annual calibration of RWIS stations should be provided to improve accuracy of winter maintenance decisions.	2
Additional RWIS stations should be installed to improve winter maintenance decisions.	9
Relocating selected RWIS stations should be undertaken to improve winter maintenance decisions.	7
A plan for RWIS location and functionality should be developed	1
Additional features and functionality should be added to existing locations	3
Delivery of RWIS information should utilize current communications technologies in addition to current methods:	
RWIS data shall be made available through Internet Display.	3
RWIS data shall be made available through Radio.	1
RWIS data shall be made available through alphanumeric pagers.	1
The display of RWIS data should facilitate winter maintenance decisions.	
Integrating radar images with RWIS data shall be used to facilitate winter maintenance decisions.	4
RWIS data shall be easy to read and interpret.	2
Data from other agencies shall be incorporated in decision support to facilitate winter maintenance decisions.	1
The system shall be able to provide active notification of decision makers.	5
Anti-icing is a new maintenance treatment, and should be improved as a treatment option.	
More resources shall be provided to improve anti-icing treatment in each region. ○ More human resources shall be provided to improve anti-icing treatment in each region. ○ More equipment shall be provided to improve anti-icing treatment in each region.	1 2
Methods to improve the reliability of forecasts should be undertaken to improve anti-icing treatment. ○ More reliable weather forecasts shall be sought to improve anti-icing treatment in each region. ○ More reliable road surface forecasts shall be sought to improve anti-icing treatment in each region.	7
More training in the practices of anti-icing shall be provided to improve anti-icing treatment in each region.	1

- Improve the training program aimed at DOT personnel tasked with making winter maintenance decisions
- Continue work towards developing a decision support system.
- Include access via voice phone to site-specific current conditions and forecasts.
- Provide active notifications via pager, phone, or email
- Develop an RWIS plan
- Continue investing in opportunities to improve reliability of surface weather forecasts
- Improve access to the Internet at maintenance offices
- Investigate opportunities to improve resources for winter maintenance decision making

WTI creating new Mobile Laboratory for Transportation Research

By:

Robb Larson
Associate Proffesor,
Mechanical Engineering
Montana State University-Bozeman

WTI is in the process of creating a mobile laboratory designed to support various transportation-related research projects. The lab will enable research and development of new products and technologies for transportation as well as evaluation of prototypes and commercially available systems. Plenty of usage as a "base camp" for fixed position data gathering is also expected during the life of the mobile lab. As scheduling permits, usage by researchers from other organizations or disciplines may be accommodated.

The laboratory design incorporates a base suite of equipment into a four-wheel-drive "cube van" arrangement. The vehicle will be created by mating a 1-ton GM Savannah cutaway RV chassis (from Grimes Motors in Helena, Montana) with a cab-over modular box (from Intercontinental Truck Body of Conrad, Montana.) The mated assembly then gets a four-wheel drive system from Quigley motors in Manchester, Pennsylvania. The result will be a vehicle similar to a 4WD HAZMAT van or ambulance, but with a focus on research rather than emergency response.

Base equipment in the vehicle includes two Toshiba laptop computers with docking stations, a Mid-Tech DGPS global positioning system & ESRI ArcVIEW GIS software, a National Instruments high-speed multi-channel data acquisition system and a robust Coastal Environmental roof-mounted weather station. 110-volt A/C Power for the facility is provided by a deep-cycle storage battery bank feeding a 3000 watt DC-to-AC power inverter, re-charged by either a 4 KW RV-style generator or the vehicle alternator. Provisions for "shore power" from an auxiliary power source will be included. A high-capacity air conditioner and heater for the "cube" box along with an insulated, finished interior and several windows will help keep the enclosure comfortable. A desk-type workstation with chair is provided for office tasks. Removable, auxiliary bench seating can be installed in the lab space if additional riders are present. Portable, re-configurable equipment rack modules with quick-release mounts will enable rapid installation, removal and retrofit and storage of experiments or equipment. Full-height modules will permit maximum equipment mounting, while half-height modules will be equipped with workbench tops for repair and trouble-shooting of equipment. Ample storage will be present, and a variety of portable power tools, hand tools, safety and repair items will be on hand.

The lab will be able to operate in two distinct modes:

1. Remote, fixed position mode. The measurement and recording of site-specific data such as weather conditions, animal-vehicle interactions, or traffic volumes will be supported in this operational mode. Calibration, maintenance & repair of RWIS and other roadside measurement systems are possible uses. The vehicle will serve as a portable environmental shelter and field laboratory with all required tools and facilities found in a conventional laboratory.

2. Mobile, roving mode. Mobile roadway environment condition & data mapping using a variety of sensors will be supported in this mode. GPS coordinate and time stamping of acquired data will permit association of gathered data with location. Examples of this operational mode include thermal mapping of road surface temperatures, surface roughness or reflectivity studies, and logging of highway surface or roadside features. Inter-vehicle fleet communication as well as roadside-to-vehicle communications research, development and testing

Continuted on page 13.

Greater Yellowstone Regional Traveler and Weather Information System

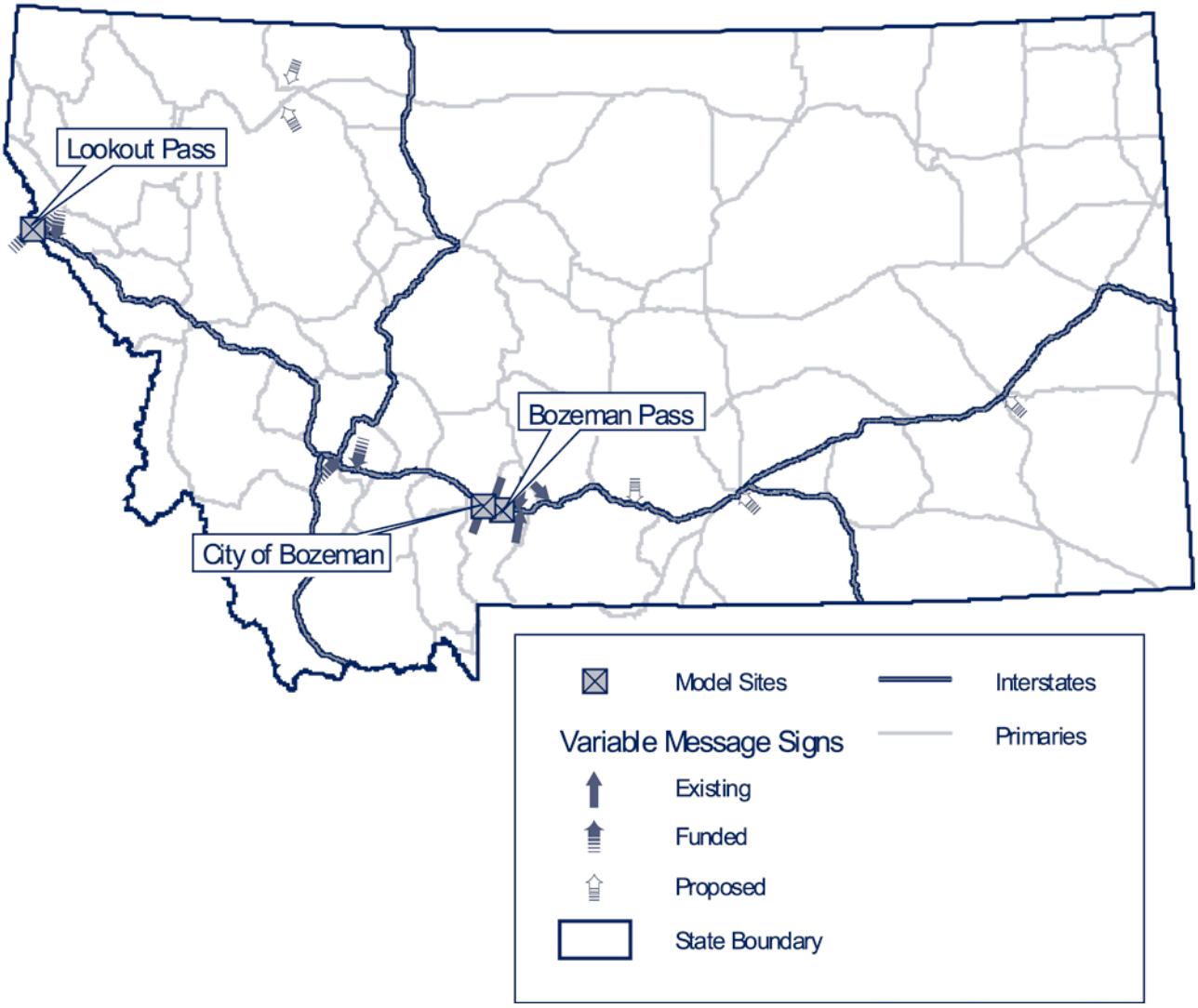
By:

Lisa Ballard
Research Engineer,
Western Transportation Institute

WTI began work on the Greater Yellowstone Regional Traveler and Weather Information System (GYRTWIS) project in late June. For this project, WTI is partnering with Montana Department of Transportation (MDT), Meridian Environmental Technology Incorporated, Federal Highways Administration, and ThermoAnalytics Incorporated. The project constitutes the third phase of the Greater Yellowstone Regional Intelligent Transportation System (GYRITS) project.

The GYRTWIS project will develop and integrate the pavement temperature thermal model developed by WTI with the #SAFE system

Model Implementation Sites



that is available in North Dakota, South Dakota, and Minnesota. (See page 8 for more details about the #SAFE project.) MDT plans to provide the information to the traveling public in Montana through the new 511 phone number. The traveler information also will be available via web, and the project will package the information from these road-weather systems for availability to other dissemination devices, within Montana and in adjoining states. The new system should provide more information with greater accuracy to the traveling public. The system also should provide detailed forecasts for key stretches of road to state DOT maintenance personnel that can be used to improve efficiency of plowing, anti-icing, and de-icing activities. This approach should, if successful, reduce the number and severity of accidents relating to poor driving conditions.

The new traveler information phone system is scheduled to be in place in October for the winter traveling season, and the team hopes to implement 511 access before the end of the season. The #SAFE traveler information system will provide weather forecasts and road conditions from mesoscale meteorological data via mobile and land-line telephone to the traveler. The system works by interfacing coded weather information, road conditions, and closures with a computer telephony system and providing location-specific information through an interactive process with the traveler. After the traveler has answered three to four questions about their location, they will hear a site-specific road conditions report and a six-hour weather forecast. On average, one minute and 35 seconds later the user will have the road/weather information they need to make a traveling decision.

The pavement thermal model will provide more detailed pavement temperature forecasts for two mountain passes and an urban road segment containing a bridge: Lookout Pass on the Montana-Idaho border, the current site in Bozeman Pass, and a new site in or near Bozeman. Predicted conditions will be provided to the #SAFE system and to MDT maintenance staff. Using this information, the #SAFE system will provide more detailed forecasts for the equipped locations, and MDT maintenance will be able to use the predicted pavement temperatures to plan road treatment activities. The development of the thermal modeling chain for winter highway safety forecasts is an ongoing process that is kept as modular and portable as possible. In the present study, Meridian will provide statewide meteorological forecasts, ThermoAnalytics will provide improvements to the thermal model software and interfaces, and WTI will implement the thermal model and research improvements in its execution.

GYRTWIS is a three-year project. In the first year, the #SAFE system will be deployed in Montana as it works in the Dakotas and Minnesota, and the new sites will be set up for the pavement thermal model. The second year will be consumed primarily with integration and initial evaluations. The third year will produce a stable system and completion of the evaluation. It should be noted this project is one of nine projects designated by U.S. Transportation Secretary Norman Y. Mineta for national evaluation.

#SAFE Update: An Evaluation of a Multi-state Weather and Traveler Information System

By:

Eli Cuelho
Research Associate,
Western Transportation Institute

Accurate road and weather information can mean the difference between life and death on the Northern Great Plains. For those that travel in these areas, being able to access dependable traveler information is important. The #SAFE road and weather information system delivers trip-specific weather forecasts and road condition reports via cellular telephone throughout North Dakota, South Dakota and Minnesota. This information can be retrieved on any state, US or Interstate highway before or during your trip. In addition, #SAFE is soon to be implemented in the states of Montana and Nebraska.

The purpose of this evaluation is to investigate system users' perceptions of the effectiveness of the cellular-based #SAFE road conditions and weather forecasting system available in North and South Dakota. The results of the analysis will be used to improve the quality of services rendered, as well as to gain insight into the possible development of an alternative long-term, user-fee supported program to provide this information.

The specific objectives of the survey were to assess the availability, accuracy and effectiveness of the system, as well as to determine users' willingness to pay and #SAFE awareness. The various sections of the survey solicited the following types of information.

- Basic travel characteristics
- Travel information needs
- Amount and/or likelihood of #SAFE use
- Qualitative assessment of #SAFE system
- Willingness to pay
- Demographic information

Three surveys were conducted as a part of the evaluation process. The first survey (Survey I) was mailed to a geographically diverse group of cellular telephone users in North and South Dakota on July of 2000. The second survey (Survey II), essentially a modification of the Survey I, was mailed out in January 2001. The third survey (Survey III) was designed specifically for querying North and South Dakota maintenance officials.

Survey administration was designed to target cellular telephone owners in North and South Dakota. For each survey, a simple random sample of cellular users within North and South Dakota was purchased. These lists of individuals were geographically diverse across the two-state region. Survey I was sent to 3500 households and Survey II was sent to 2000. Survey III was sent to 43 maintenance officials throughout the bi-state area. To improve the rate of response, a drawing from those who responded to Surveys I and II before the specified due date, was offered as an incentive. The prize for each winner was $100 of free gasoline from Conoco. There were five winners for Survey I and three winners for Survey II. No incentive was offered for participation in Survey III. The following table shows the numbers distributed and quantities returned for each of the three surveys.

Accuracy of the information conveyed via #SAFE is extremely important to maintaining repeated users. Questions designed to identify overall accuracy of the #SAFE system focused on timeliness and accuracy. Mean values for the timeliness and accuracy of #SAFE were very similar showing a

positive consensus regarding #SAFE road condition reports and weather forecast information.

System functionality also is important because a dysfunctional system will not allow participants to understand or receive the proper information. Questions were designed to assess #SAFE availability, understandability, and ease-of-use of the #SAFE system. Again, #SAFE users were quite positive about these system features. Overall, the means for these questions suggest that #SAFE does in fact provide a functional service to the user.

The system also must have the potential to affect driver behavior or travel plans, as opposed to simply providing neutral information. Two questions were asked to assess #SAFE effectiveness. One related to potential of #SAFE to affect travel behavior and the other to assess the overall usefulness of #SAFE. In general, the means of these questions suggest that some people find the information useful, but probably not sufficient to alter their travel plans.

To gather information about a user-fee supported system, survey participants were asked to estimate how much they would be willing to pay for the #SAFE service. Analyzing the responses from this question resulted in an average price of $.08 to $.10 per call.

Survey participants also were asked how they had become aware of #SAFE. Results from this question indicate that many people were unaware of #SAFE before this survey and most of the other respondents learned of the service through highway signs.

The survey sent to maintenance officials throughout the bi-state region showed that the ATWIS system is easy to understand and provides useful data for their everyday responsibilities. Results from the means of this survey showed that respondents ranked accuracy higher than timeliness, and, timeliness higher than reliability. When asked how the information effects their everyday assignments, the mean showed that maintenance officials were only somewhat likely to change their plans based on the information received from the ATWIS system.

Finally, the most meaningful results from these surveys have been to show that #SAFE has not been publicized as well as it can be. Additional advertising is needed to raise the level of awareness of current and potential cellular owners. Subsequent surveys will monitor levels of awareness. The 2001 annual report contains specific results of the evaluation. To access the 2001 annual report, go to www.coe.montana.edu/wti/projects/currentprojects.htm.

Pavement Thermal Model Update: Moving to a Forecast Mode

By:

Ed Adams
Associate Professor,
Montana State University-Bozeman

In the March 2000 WTI newsletter, we introduced a first principles thermal mapping model that is under development at WTI, in collaboration with ThermoAnalytics Inc. The purpose of the model is to provide additional information to highway maintenance personnel in making operational decisions with regard to road icing conditions. The model is designed to utilize digital elevation maps (DEM) which define topography and superimposing on this, such terrain features as interstate highway, foliage, snow, water etc. These terrain identifications are obtained from a geographic information system (GIS) database. Influences of the types of terrain cover as well as topographic influences such as shadowing are calculated in the model. At the time of the last article, the weather input driving the pavement temperature calculations was obtained from a single meteorological site, specifically, a road weather information station (RWIS) situated along the highway. This provides what might be termed a "nowcast," since it provides a calculation of the road temperature based on the current measured meteorological conditions.

While the nowcast has utility in providing spatially continuous information at sites away from the RWIS and for establishing the accuracy of the model, a greater utility will be in providing a pavement surface "forecast". This will allow the maintenance crews to be proactive and timelier in addressing potential hazards. Although forecast data, in place of the RWIS, obviously could be used to drive the model, accurate site-specific forecasts are not generally available. This is particularly problematic in regions of complex mountainous topography and it is in terrain such as mountain passes and coulees for which this thermal modeling has its greatest potential utility. It should be noted that meteorological conditions in topographically varied terrain will also be highly varied spatially. Wind patterns are a clear example. In an effort to address this, a modeling chain has been developed. The chain begins with a National Weather Service (NWS) forecast based on a global weather model (ETA) which provides data at a 40 km resolution. This information is then spatially refined to a one km mesh using ARPS, a model developed at the University of Oklahoma, which accounts for topography. Finally, extrapolation to the 30 m scale of the DEM provides a weather set specific to each of the 30 m surface nodes used in the highway thermal model.

The meteorological calculations are very computational time consuming. In an effort to more effectively utilize resources, we have teamed with Meridian Environmental Technology Inc. (a company closely associated with the University of North Dakota's Regional Weather Information Center), which has high-speed computers dedicated to meteorological forecasting. Meridian will be providing the computationally intensive fine scale meteorological data for the pavement modeling study and the surface temperature forecast will be computed at WTI. By freeing the WTI computers from the meteorological forecast obligation, additional locations can be added for the more detailed surface analysis.

This chain of computer models has the potential of forecasting road surface conditions that are not proximate to an RWIS. This winter

Mike Kelly Joins WTI Staff as a Senior Research Engineer

Mike Kelly is returning home to work for WTI as he was born in Deer Lodge and grew up in Bozeman. He still remembers spending hours during his childhood climbing on and through the two mothballed fighter airplanes that used to be parked on the present site of Cobleigh Hall. Mike graduated from MSU in 1970, played on the tennis team, and was a flight instructor for the university flying club. In 1972, he moved to Baltimore to earn his Ph.D. in human factors engineering at Johns Hopkins University. He had the good fortune to study under Prof. Alphonse Chapanis who is widely considered the grandfather of the field of human factors. Mike then spent two years at the University of Illinois Aviation Institute doing research on transportation systems risk analysis, safety, and pilot training. He also taught aviation human factors and statistics. These lines of research continued during the subsequent decade that he spent with a consulting company in Arizona. Mike then moved to Atlanta where he was Principal Research Scientist and Head of the Human Factors Branch of Georgia Tech Research Institute. His recent research has been heavily oriented toward human factors in intelligent transportation systems and the design of advanced cockpit instrumentation.

In his spare time Mike enjoys boating and water skiing, fishing, gardening, travel, and youth sports. He has been married for 24 years to Caroline, a medical records administrator and (currently) stay-at-home mom who enjoys tennis, walking, and reading. Their daughter, Caitlin, is in 8th grade and loves fastpitch softball. Her team of 12-year-old girls recently won fourth place in the United States Fastpitch Association World Series and Caitlin was recognized by being named pitcher on the All-World Team. Their older daughter, Cristin, received her BA degree in Arts Management and was appointed Associate Artistic Director of a regional theater company in Sarasota, Florida. Their son, Shaun, is a senior at Kenyon College in Gambier, Ohio, and plans to begin business school when he graduates next spring. Welcome back to Montana, Mike!

Mike can be reached at 406-994-7377 or mkelly@coe.montana.edu.

Pavement Thermal Model Update Continued

will begin an evaluation phase in an operational setting. Predicted conditions will be provided to the Montana Department of Transportation maintenance staff. Working together, we will evaluate the utility of the predicted pavement temperatures to plan road treatment activities.

The development of the meteorological modeling chain was accomplished in large part by Dr. Peter Gauer, who we were fortunate to have working with us as a visiting Scientist for a year and a half. Peter has returned to Europe, working at the Norwegian Geotechnical Institute. His expertise and camaraderie will be missed.

John Taylor is a new WTI Senior Research Engineer

WTI would like to welcome John Taylor to our research staff. Most recently, John was the Transportation Systems Manager, Pima Association of Governments. The Pima Association of Governments (PAG) is the federally mandated Metropolitan Planning Organization in eastern Pima County responsible for receiving and distributing all State and federal transportation funds targeted for the area through a collaborative, consensus-based process. It also develops technical programs in consultation with area jurisdictions. His responsibilities included: strategic planning, development, initiation and deployment of Intelligent Transportation Systems (ITS).

Following a series of progressively responsible positions, John was promoted to Regional Director, the highest competitive position in State government. He worked for the New York State Department of Transportation from 1966 to 1992. The New York State Department of Transportation is the multi-modal organization responsible for planning, designing, constructing, maintaining and operating the State's highways and bridges. The Department also administers extensive grant-in-aid programs throughout the State for aviation, transit and rail programs. John also worked for the California Department of Transportation from 1959 to 1965. John received his Bachelor of Civil Engineering Degree from Clarkson University, Potsdam, NY in 1959. In 1966, John recieved a Certificate in Highway Transportation from Yale University, New Haven, CT.

John is a Fellow of the American Society of Civil Engineers, Past President and Member, Board of Directors, Literacy Volunteers of Tucson, and a former Board of Directors Member, ITS Arizona. John is a Registered Professional Engineer in Arizona and New York . He was also the first recipient of the Fred Burggraf Award for "Outstanding Excellence" of Research, presented by Transportation Research Board in 1967.

John and his wife Bonnie have been married for 39 years. They have two dogs; Casey, an English Springer Spaniel and Bailey, a rotund miniature Dachshund. John enjoys fishing and is looking forward to exploring some of the Bozeman area waters.

John can be reached at 406-994-7357 or jtaylor@coe.montana.edu.

Sponsored in part by WTI, the *Context-Sensitive Highway Design Workshop: Transferring Lessons from our Collective Experiences* is intended to bring together a wide variety of individuals engaged in the planning, design, construction and maintenance of our highway systems. Writing about context-sensitive design, Lloyd Rue, FHWA has stated, "Context-sensitive highway design responds to every-changing circumstances. Continuous learning through workshops ensures that transportation facilities meet an array of needs and expectations."

The event is very timely, in that context-sensitive design is just now beginning to enter the mainstream transportation community. From highway designers to community leaders, the emphasis is shifting. Speaking recently about a redesign/rebuild of a portion of U.S. Highway 93, Montana Governor Martz praised the "context-sensitive design for the highway…The groundbreaking approach to safety and environmental sensitivity of the U.S. 93 project marks a new era in Montana highway construction." *(Missioulian, June 7, 2001).*

With over 275 individuals from all over the US, currently pre-registered for the four-day event, the workshop intends to deliver on its goal of "expanding the stakeholder group." Training sessions, panel discussions, and professional tours will all provide a conduit to advance the state of the practice for context-sensitive design of highway and transportation projects.

WTI Welcomes a New Research Associate Ecologist

Amanda Hardy has joined the WTI staff as its lone ecologist. She will be working with WTI engineers to make transportation better for critters as well as people. Amanda is a proponent of incorporating ecosystem functions, including community needs, into shaping the growth in the west. She would like to see transportation planning projects integrate holistic goals and apply science and adaptive management techniques to achieve these goals. She will be investigating fish and wildlife-transportation issues including fish culvert passage, animal detection device testing, pooled-fund animal-vehicle crash mitigation, and kicking off the proposal for the US 93 wildlife crossing structure evaluation project.

Amanda grew up in Wisconsin and came west in 1990 for her first field technician job in Colorado then in Yellowstone National Park later that summer. She has weathered a lot of time in the field conducting coyote behavioral work, snow tracking wolves, tagging pronghorn fawns, serving as a fire monitor and forestry technician, conducting snow surveys, and working in the varied fields of resource management in Yellowstone National Park. In 1997, Amanda completed a B.S. in Fish and Wildlife Management from Montana State University-Bozeman. Amanda then worked in the Yellowstone National Park Service Planning Office from 1997 to 1998 before returning to MSU-Bozeman for a M.S. in Fish and Wildlife Management. Her thesis, to be completed this August, addresses how winter recreation in Yellowstone National Park affects elk and bison behavior, distribution, and stress hormone levels.

Amanda is fueled by fresh air, sun, snow, sweat and loves to be in motion, on foot, bike, skis, or hockey skates. She is very pleased to be working in applied ecological sciences and settling down in Bozeman for a while. Welcome aboard Amanda.

She can be reached at 406-994-2322 or ahardy@coe.montana.edu.

Mobile Laboratory Continued

Continued from page 5.

projects will be possible.

In addition to the fixed and mobile research modes, the platform will serve as a technology demonstration unit for educational outreach and will support Montana State University undergraduate and graduate research. The flexible nature of the facility will ensure that a wide variety of future research projects can be accommodated.

Project leader Robb Larson has taught in the Mechanical and Industrial Engineering department since 1993, and has worked with WTI researchers on various projects for the past 3 summers. Assisting Mr. Larson is Mechanical Engineering Technology student Erik Anderson, recipient of a one-year, $10,000 undergraduate fellowship award. Erik is helping with initial fielding of the vehicle and specification of base systems for the lab. Initial fielding of the lab is scheduled for Autumn 2001.

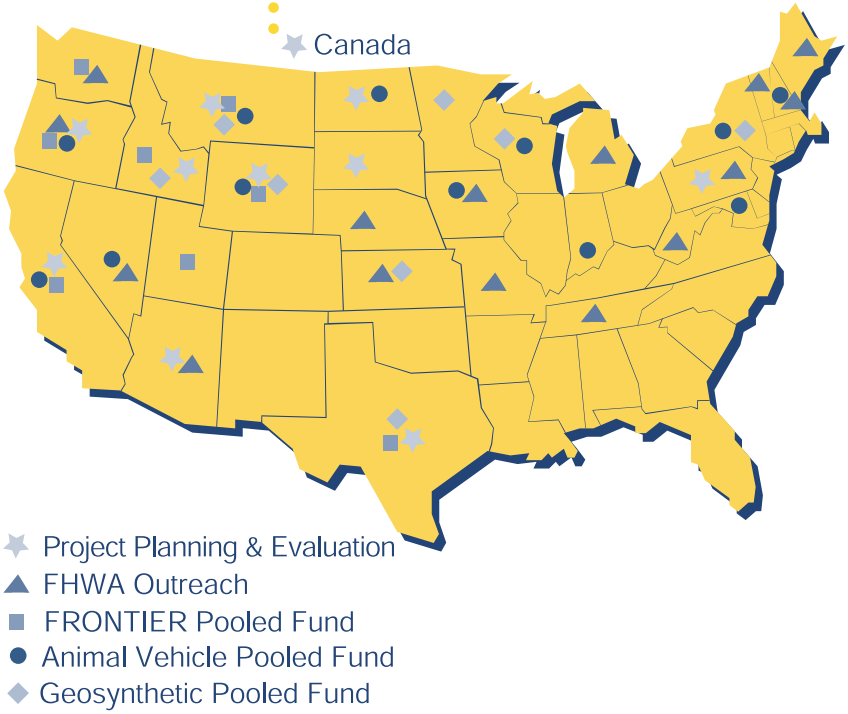
WTI Continues Outreach to Rural States

By:

Steve Albert
Director,
Western Transportation Institute

WTI staff continued to assist local, state and federal organizations on the rural transportation challenges and advanced technology applications with outreach workshops and conference presentations. These meetings were held in an attempt to see what advanced technologies might be able to do for transportation concerns in local and regional multi-state applications. Outreach was conducted, in partnership with FHWA and Penn DOT, FHWA Southeast Resource Center, Michigan DOT, National Park Service and Volpe Center, Western States ITS/ Commercial Vehicle Operations, and North Dakota, South Dakota, Wyoming and Montana with the second phase of a quad-state architecture. These workshops have included the Pennsylvania Rural ITS Workshop in Ridgway, PN, the Southeast Region Rural ITS Workshop (8 southeastern states) in Nashville, TN, National Park Service ITS Workshop in Lakewood, CO, Great Lakes Rural ITS Workshop (12 mid-west states) in Kalamazoo, MI, Western States ITS/ Commercial Vehicle Operations in Las Vegas Nevada and Quad-State Architecture in Rapid City, SD. At these meetings WTI provided an overview of Advanced Rural Transportation Systems in the United States, lessons learned in research and development, or the application of technology for the specific modal challenges.

In total WTI has conducted outreach related activities in 28 states.



Also, WTI staff provided an overview of the application of advanced technology to address rural traveler, economic and operating agency needs for the CANAMEX project Executive Committee. The CANAMEX project presentation featured work WTI is beginning along the I-15 Corridor with the state departments of transportation from Canada, MT, ID, NV, UT and Mexico. This project involves the highest levels of each DOT and the respective directors from those organizations. It is anticipated that the project will focus on developing a Smart Tourist Corridor (smart card, traveler information, incident management, National Park coordination), multi-state architecture development and the implementation of the Highway Closure Restriction System to provide information exchange between DOT, NPS, tourism, local agencies, trucking fleets, and researching the benefits of these improvements on local economies and coordination between operating agencies.

For additional information on this project please contact John Taylor, 406-994-7357 or jtaylor@coe.montana.edu.

WTI Partnering With Texas Transportation Institute

By:

Chris Strong
Research Engineer,
Western Transportation Institute

The Texas Transportation Institute, Texas A&M University System (TTI) and WTI have signed a second partnership agreement to conduct collaborative research on a national level and to mutually support each organization in research, education and training projects related to advanced rural transportation systems. A meeting was held in College Station, Texas in May to identify specific areas of research where the two research institutions could work together. The meeting identified several areas, including travel and tourism, safety and human factors, traffic management, advanced construction and maintenance systems, and emergency service technology applications, where the two organizations may be able to work together.

As a first initiative under this partnership, WTI is leading a research effort for the California Department of Transportation's (Caltrans) New Technology and Research branch to examine the applicability of intelligent transportation systems to California's National Parks. Key project partners include Caltrans, the National Park Service and the Federal Highway Administration's Central Federal Lands Highway Division. WTI leads a research team consisting of TTI as well as Texas A&M University's Department of Recreation, Park and Tourism Sciences that will seek to identify ITS applications that may be applicable to the diversity of National Park lands located within California. The project is planned to consist of two phases.

- Phase 1 of the project will focus on conducting outreach with these stakeholders and others to identify one to three candidate Parks for further study. These Parks will be selected as representative of the diversity of Parks within the state. Upon Park selection, the research team will be conducting visitor intercept surveys at the Parks during peak and off-peak visitation seasons. Survey responses, combined with feedback received from stakeholders involved with each of these Parks (e.g. counties, Gateway communities, non-profit Parks associations, etc.), will be used to develop ITS themes for each of these Parks. Phase 1 will be completed with the issuance of a summary project report, scheduled for late 2002.
- Pending additional funding, Phase 2 of the project will focus on the installation, demonstration and evaluation of ITS technology in the candidate Parks to see if it is meeting visitor and stakeholder needs.

It is hoped that the results of this project will be transferable to other National Park units both within and outside of California. It may have applicability to other rural tourism destinations as well. For further information about this project, please contact Chris Strong at (406) 994-7351 or ChrisS@coe.montana.edu.

WTI Technology Transfer Activities

October 2000

Safe-Passage Pavement Temperature Thermal Model. MDT Total Maintenance Workshop, Butte, MT, October 2000.

MDT Road-Weather Information System Survey Results. MDT Total Maintenance Workshop, Butte, MT, October 2000.

Application of Advanced Technology to Prevent Crashes. MDT Total Maintenance Workshop, Butte, MT, October 2000.

Application of Advanced Technology to Address Rural Traveler, Economic, and Operating Agency Needs. CANAMEX Corridor Coalition Meeting, Great Falls, MT, October 2000.

Rating System for Rural Culvert Crossing Repair and Maintenance. 2000 American Water Resources Association Montana Chapter Meeting, West Yellowstone, MT, October 2000.

NTNU Seminar Series on *Geosynthetic Reinforcement of Flexible Pavements: Seminar 1, Introduction and Overview; Seminar II, Experimental Modeling; Seminar III, Numerical Modeling*. NTNU, Trondheim Norway, September 18, October 2, December 13, 2000.

Geosynthetic Reinforcement of Paved Roadways. A workshop on subbase-stabilization for flexible pavements, Colbond Geosynthetics, Arnhem, The Netherlands, November 2000.

A Finite Element Model Illustrating Reinforcement Mechanisms for Paved Roadways. Second European Geosynthetics Conference, EuroGeo 2000, Bologna, Italy, October 2000.

November 2000

Yosemite National Park Vehicle Management System Project. 14th National TRB Rural Public and Intercity Bus Transportation Conference, Lake Tahoe, NV, November 2000.

Rural Mobility Solutions for the 21st Century. 14th National TRB Rural Public and Intercity Bus Transportation Conference, Lake Tahoe, NV, November 2000.

December 2000

SafePassage Pavement Temperature Thermal Model. Office of the Federal Coordinator for Meteorological Services and Supporting Research and U.S. DOT-FHWA, Weather Information for Surface Transportation Forum, Washington D.C., December, 2000.

January 2001

National Coordination Efforts of Mitigation of Animal Vehicle Collisions. TRB Annual Meeting, Subcommittee on animal vehicle collisions, Washington DC , January 2001.

Third Advisory Meeting for the Pooled Fund Study on Numerical Modeling and Design Development of Geosynthetic Reinforced Flexible Pavements. Full day meeting with participants from FHWA, WTI, and the following State DOT: Kansas, Minnesota, Montana, New York, Texas, Wisconsin and Wyoming; January 2001, Washington, DC.

Projects Addressing Experimental Modeling, Numerical Modeling and Design Methodology Development – Past, Current & Propose. Meeting of the AASHTO Subcommittee on Materials Technical Section 4E, Task Force on Geogrids/ Geotextiles, January 2001.

Research Needs for Geosynthetic Reinforced Pavements. FHWA, MSU-Bozeman, Norwegian Foundation for Industrial and Technical Research, MDT, US Army CRREL, Maine DOT, University of Maine, University of Maryland, Christopher Consultants, January 2001.

February 2001

Greater Yellowstone ITS Projects. National Park Service Intermountain Transportation Advisory Committee, Mammoth, WY, February, 2001.

Geosynthetic Reinforcement Roadways. Annual meeting of Fulbright Scholars, Gausdal, Norway, February 2001.

Pavement Design with Geosynthetics. Full-day Workshop held at the Geosynthetics Conference 2001, Portland, OR, February 2001.

March 2001

Advanced Rural Transportation Systems: An Opportunity for Meeting Commercial Vehicle Operations Needs. Western States ITS/CVO Deployment Forum, Las Vegas, Nevada, March 2001.

Animal Detection/Driver Warning. Road Builders Conference, Coeur d'Alene, ID, March 2001.

April 2001

US-93 Wildlife and Transportation Research Opportunities. MDT, Helena, MT, April 2001.

An Overview of Advanced Rural Transportation Systems in the Untied States. FHWA/PennDOT Rural ITS Workshop, Ridgway, PN, April, 2001.

Tribal Transportation and Safety Improvement Project: A Road to Improved Living. 8th Annual NW Regional Tribal Transportation Symposium, Coeur d'Alene, ID, April 2001.

Continued on page 19.

Education

WTI Student Success Stories

By:

Pat McGowen
Research Engineer,
Western Transportation Institute

Mike Lohrenz
Intern,
Western Transportation Institute

One of the missions of WTI is to provide college undergraduate and graduate students with a positive experience that will help improve them as professionals, spark an interest in the field of transportation, and give them exposure to projects, organizations and other professionals. Approximately 20 graduate and undergraduate students work for WTI as summer interns, undergraduate hourly, undergraduate fellowship, graduate fellowship, or graduate research associates. Although all students at WTI are exceptional, three students have been chosen to be highlighted here as student success stories.

LAURA GAMRADT, UNDERGRADUATE

WTI has partnered with many research organizations over the years. With the help of one undergraduate student, WTI has continued this partnering spirit. Laura Gamradt, a junior in Civil Engineering at Montana State University-Bozeman, is participating in a joint work program with Idaho National Engineering and Environmental Laboratories (INEEL) and WTI. Over the course of this summer, Laura will split her time working for WTI and at INEEL. She is co-located working mostly at WTI's offices in Bozeman with several weeks at INEEL's laboratories in Idaho Falls. WTI & INEEL have projects that are very similar. With Laura working for both organizations, more collaboration and resource sharing is possible. These projects include: Idaho RWIS Evaluation (INEEL), Caltrans RWIS Assessment (WTI), Greater Yellowstone Works (INEEL), and Greater Yellowstone Rural ITS Project (WTI). Laura appreciates the opportunity to travel to another state and broaden her horizons while working with experts in fields other than transportation. Laura has been responsible for coordinating and running meetings with experts of energy, environmental indicators, information systems, and transportation. The "Works" project has Laura excited about how certain actions can affect other aspects of an area, such as wildlife, property values, road maintenance, and others. Laura hopes to learn more about the "big picture" and continue working in the transportation field, while pursuing her undergraduate degree. Laura is from Missoula, Montana and enjoys backpacking, traveling, and hanging out with others.

JEFF RYAN, GRADUATE FELLOW

One of the benefits of the education program at WTI is sparking an individual's interest in transportation. As an undergraduate Jeff Ryan wanted an internship that would keep him in the Bozeman area so he applied for a WTI internship and was hired for the summer of 2000. Although he didn't know it at the beginning, Jeff's work over the summer with transportation research became very interesting to him. Jeff's internship became a building block for continuing work with WTI. He received an undergraduate fellowship for the last year of his undergraduate degree. Upon receiving his bachelors degree in civil engineering in May 2001, Jeff decided to accept a gradu-

ate fellowship to pursue his master's degree in civil engineering with an emphasis on transportation. Over the past year Jeff has been working on several projects including the "#SAFE Evaluation" and "Siskyou Pass." These projects have kept him busy, while still being able to maintain focus with his school-work. Along with working on these projects, he has been able to make several trips with WTI to do re-search, visiting Oregon, California, Washington D.C., and Las Vegas, Nevada. Upon completion of his master's requirements, Jeff hopes to continue working in the transportation field. Jeff is from Butte, Montana and enjoys participating in ITE, golfing, and fishing during his free time.

ALYSSA REYNOLDS, RECENT GRADUATE

Alyssa Reynolds came to WTI during the summer of 1998, looking for a job upon the recommendation of a friend. That summer job turned into a life altering interest in transportation. She originally thought she would like to get into structural work, but upon taking some classes in structures, she knew that wasn'the career path that she wanted to follow. Her first summer at WTI made a lasting impression that transportation is where she belonged. Following up her summer employ-ment, she received an undergraduate fellowship and eventually decided to pursue her master's with the help of a graduate fellowship from WTI. Alyssa obtained her master's degree in civil engineering in May 2001. During her time at MSU Alyssa was the President of the student ITE chapter and enjoyed the enthusiasm that other students and faculty advisor, Jodi Carson, brought to the group. While with WTI, Alyssa worked on COATS, COATS Showcase, and Rail Locked Gate projects while improving her personal performance in writing and public speaking. Alyssa has continued her interest in transportation and is employed as a transportation analyst for Orth-Rodgers & Associates Inc. in Las Vegas, Nevada. She is currently working on a project to implement traffic control in school zones, several proposals including two corridor studies and a transit alternatives study. Alyssa was born and raised in Great Falls Montana and enjoys crafts, and traveling. She is learning to golf because as she puts it "it is practically required for my job." Sounds like a tough job Alyssa!

These three students are only a sampling of the great students WTI employs. For more information about the opportunities for students at WTI please contact Pat McGowen at patm@coe.montana.edu or 406-994-6303. We look forward to meeting more great students in the fall.

WTI Technology Transfer Activities Continued

Continued from page 16.

May 2001

Smart Travel and Tourism Opportunities: A New Paradigm in Transportation, Economic Viability and Partnerships. TTI meeting, College Station, TX, May 2001.

CANAMEX Bold Initiatives: Moving from Concepts to Reality. CANAMEX Project Technical Advisory Group, Salt Lake, UT, May 2001.

WTI Regional ITS Projects. Quad-State Architecture Workshop, Rapid City, SD, May 2001.

COATS Architecture and Lessons Learned. Quad-State Architecture Workshop, Rapid City, SD, May 2001.

Base Reinforcement: A Workshop on Roadway Construction Techniques. SINTEF, Trondheim Norway, Sponsored by ENRECO Inc., May 2001.

Geosynthetics for Pavement Design With an Emphasis on Base Reinforcement. Two invited lectures at Bogazici University and the 17th Division of the Turkish Road Administration, Istanbul, Turkey, May 2001.

June 2001

California/Oregon Advanced Transportation Systems Bi-State Planning, Deployment and Evaluation. ITS America Annual Meeting, Miami Beach, FL, June 2001.

ITS in the Rocky Mountain: Expanding Locally with a Regional Focus. ITS America Annual Meeting, Miami Beach, FL, June 2001.

Broadening Stakeholder Participation. ITS America Annual Meeting, Miami Beach, FL, June 2001.

Showcasing WTI's Role in Rural ITS Technology Transfer. ITS America Annual Meeting, Miami Beach, FL, June 2001.

10-Year Program Plan and Research Agenda: Native American Issues. ITS America Annual Meeting, Miami Beach, FL, June 2001.

National Park and ITS Deployment Challenges. National Parks and ITS Workshop, Lakewood, CO, June 2001.

An Overview of Advanced Rural Transportation Systems in the United States. Great Lakes Rural ITS Workshop, Kalamazoo, MI, June 2001.

Potential Partnership Opportunities to Improve Public Safety. Critical Illness and Trauma Foundation Board of Directors Meeting, Big Sky, MT, June 2001.

Overview of WTI. USDOT RSPA University Transportation Centers Directors Meeting, Fayetteville, Arkansas, June 2001.

UTC Summer Undergraduate Research Program. USDOT RSPA University Transportation Centers Directors Meeting, Fayetteville, Arkansas, June 2001.

UTC Technology Transfer and Outreach. USDOT RSPA University Transportation Centers Directors Meeting, Fayetteville, Arkansas, June 2001.

July 2001

Animal Detection / Driver Warning System on US Highway 191. Yellowstone Nat. Park, July 2001, West Yellowstone, MT.

CANAMEX Project: Bold Initiatives: Moving from Concepts to Reality. Western Association of State Highway Transportation Officials, Scottsdale, AZ, July 2001.

Federal Lands: Making Transportation the Opportunity Not the Threat. Western Association of State Highway Transportation Officials, Scottsdale, AZ, July 2001.

Greater Yellowstone Rural ITS Project Phase III: Integrating Weather and Traveler Information Systems. Western Assoc. of State Highway Transportation Officials, Scottsdale, AZ, July 2001.

August 2001

Technology and ITS: Potential Partnership Opportunities to Improve Public Safety. Intermountain Regional EMS for Children Coordinating Council, Big Sky, MT, August 2001.

Evaluation of Dynamic Curve Warning Systems in Northern California. RATTS Conference, Burlington, VT, August 2001.

Animal Detection Driver Warning Systems. RATTS Conference, Burlington, VT, August 2001.

Workshops on Rural ITS Evaluation Methodologies. RATTS Conference, Burlington, VT, August 2001.

Evaluation of #SAFE: An Advanced Traveler and Weather Information System in North Dakota and South Dakota. RATTS Conference, Burlington, VT, August 2001.

Winter Road Maintenance Decision Support in Montana. RATTS Conference, Burlington, VT, August 2001.

California-Oregon Advanced Transportation Systems from Planning to Implementation. RATTS Conference, Burlington, VT, August 2001.

ITS Applications for Native Americans. RATTS Conference, Burlington, VT, August 2001.

Overview of WTI Wildlife Transportation Related Initiatives. Deer Vehicle Collision Research Center For Excellence Development Group, Chicago, IL, June 2001.

Evaluation of Dynamic Curve Warning Systems in Northern California. ITE 2001 Annual Meeting, Chicago, IL, Aug. 2001.

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ADA/AA/EO/Veteran's Pref.

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This newsletter is published semi-annually by the Western Transportation Institute at Montana State University-Bozeman to inform readers about our research and outreach activities. Readers are encouraged to contact the Principle Investigator for information on specific projects. For general information or to be added to our mailing list contact Robbi Colvin at 406-994-6114, via email at wti@coe.montana.edu or write to: Western Transportation Institute, 416 Cobleigh Hall, PO Box 173910, Montana State University-Bozeman, Bozeman, MT 59717-3910.

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