



**WTI**

Western Transportation  
INSTITUTE

Western Transportation Institute Biennial Report 2006-2008

# Western Transportation Institute

## 2006–2008 Biennial Report

(For the period October 1, 2006 - September 30, 2008)

College of Engineering  
Montana State University



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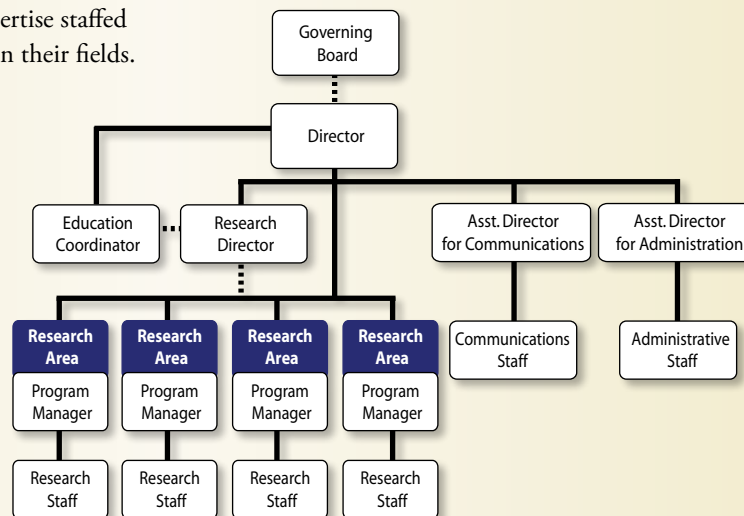


At the Western Transportation Institute, based in Southwest Montana, we understand rural in the unique way that comes only with living what you study. We know what rural transportation looks like, what it feels like, how it moves and how central it is to the entire transportation system. That's not to say that our work, such as our studies on corrosion or intelligent transportation systems, doesn't often translate to the urban environment. It certainly does. But rural is what moves us most, and rural roads are a major and essential part of our nation's highway system. Rural transportation systems and the people that live close to – or far from – them face unique challenges, considerations and opportunities. Rural transportation systems also present significant implications for the ecological environments they traverse. Rural matters. That's why WTI works to provide real solutions for the transportation systems of today and tomorrow.

WTI, a National University Transportation Center at Montana State University, is a leader in research on the concerns of today's transportation networks. With a focus on rural problems and an interest in sustainable road systems, we work with federal agencies, state DOTs, private-sector companies and non-profits to deliver real-world solutions. We work across the country and internationally to raise the bar in transportation research.

Rural transportation networks are more than just sections of infrastructure that connect one place to the next. They're population drivers. They're economic engines. They're community generators. That's why our team of researchers looks at more than a single piece of an issue. We start by finding solutions to a problem—then we step back and take another, broader look. Do the solutions create unintended consequences? Can they be reworked to solve other issues as well? What other insight and knowledge can we add?

WTI has eight individual areas of expertise staffed by researchers who are thought leaders in their fields. They work together to ensure WTI offers clients and sponsors a holistic approach to research. For a safety-related project, we might look at freight movement in the area. Then we would examine public mobility needs and other planning opportunities. Whatever the project, whatever the considerations, we never settle for a narrow view.





# Message from the Director



At the risk of stating the obvious, the economy is going to dominate the national political and policy agenda for the foreseeable future. Initiatives that nurture new economic development will take center stage. At the same time, it is critical to strengthen the foundation of our economy in order to ensure **long-term** stability.

A strong transportation network is one of the cornerstones of a vibrant economy. Without it, employees can not get to their jobs, goods can not be delivered, and service providers can not connect with their clients. And, if these things don't happen, the economy just won't grow.

So, how do we ensure that our transportation system will be stable in the long-term?

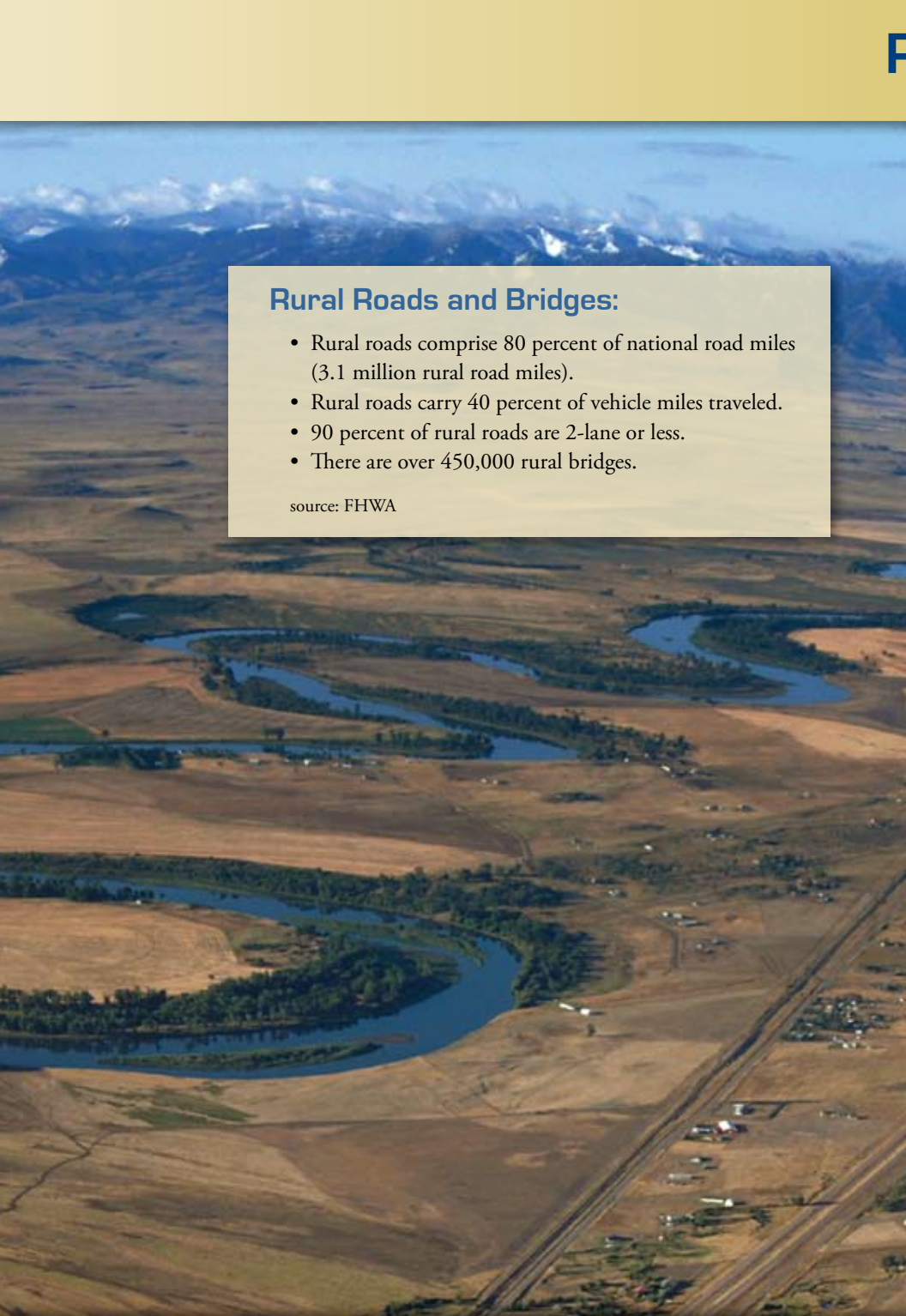
- **Develop a comprehensive network.** To be nationally and globally competitive, American businesses will need to move goods and services efficiently from and to every corner of the country. This means that transportation initiatives must address rural infrastructure and operations needs as well as urban ones, and promote safe and seamless travel across multiple jurisdictions. A comprehensive network is also multi-modal: we need to enhance and coordinate air, rail, bicycle, and pedestrian transport and travel options.
- **Promote sustainability.** In transportation, sustainability has several connotations. As the physical infrastructure ages, we must ensure that it is maintained, reinforced, or reconstructed in order to lengthen or sustain its functional lifespan. Increasingly, however, sustainability also refers to transportation that is energy efficient, uses renewable construction materials, or minimizes adverse impacts on the surrounding environment.
- **Nurture professional capacity.** A strong transportation system must have well-trained professionals to lead, design, construct, and maintain it. The shrinking number of engineers entering the transportation field has serious implications for the long-term development and management of an efficient transportation network. Initiatives must include education, training and outreach to prepare the next generation of practitioners—in fact, you might just call this one more aspect of “sustainability.”

The Western Transportation Institute is dedicated and well-prepared to support all these initiatives. Our mission has always been to develop innovative solutions for rural transportation challenges, which in turn enhance the national transportation infrastructure as a whole. In fulfilling this mission, we have a firm foundation of expertise covering many aspects of the transportation system; in particular, we have conducted state-of-the practice research on many “green highway” issues, including environmentally sensitive winter maintenance products, geosynthetic and recycled building materials, context-sensitive design practices, and habitat connectivity for wildlife.

Developing a modern, safe, efficient, and long-lasting transportation system will be one of the first steps toward revitalizing the economy. WTI looks forward to bringing our experience, enthusiasm, and dedication for transportation to this national partnership—working together toward a bright future for the entire country.

A handwritten signature in blue ink that reads "Stephen M. Allen".





## Rural Roads and Bridges:

- Rural roads comprise 80 percent of national road miles (3.1 million rural road miles).
- Rural roads carry 40 percent of vehicle miles traveled.
- 90 percent of rural roads are 2-lane or less.
- There are over 450,000 rural bridges.

source: FHWA

WTI has been pioneering research to address rural transportation needs for more than a decade. In continuing our leadership role we have expanded our capabilities to address crucial and emerging challenges with the brightest minds and most advanced technologies available. Moreover, we are gratified that we are helping to raise awareness and support for rural transportation issues at the national level.

Why does rural matter? And why now? For one, by all accounts, **rural areas are facing a phenomenal period of growth and development**, accompanied by large increases in travel within and through these areas. For example, the Western Governors Association predicts that 42 million more people and cars will be added to the western transportation system by 2030. Recent migration and land use studies indicate an increase in rural and frontier populations based on “ex-urban flight,” described as urban residents who are bypassing moves to traditional suburban areas in favor of rural destinations that offer greater quality of life. As travel continues to grow on rural highways, we must ensure that these roadways can safely handle more cars, more modal options, and more travelers in a safe, efficient and timely manner while protecting the environment and wildlife.

Secondly, a healthy economy demands a strong transportation infrastructure. With an increased focus nationally on economic matters, we must ensure that goods and services can move efficiently and cost-effectively across and throughout every region of the country. Therefore, **national transportation policy must address the whole transportation network**—not just isolated urban hotspots where congestion is highly visible, but also the large rural regions that hold the country together.

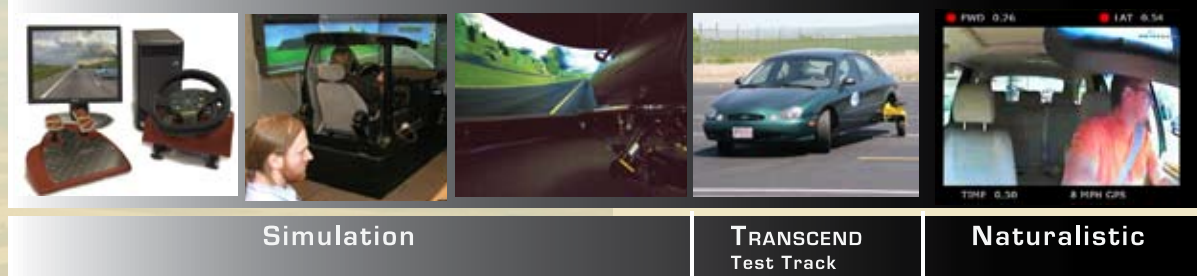
WTI is in an excellent position to take a leading role in rural transportation research because rural issues are our only focus and we live what we study. With our location in Southwest Montana, we see firsthand not only what the issues are, but how they fit together. Therefore we take an **integrated approach to our research**. Instead of looking at one specific challenge from one specific perspective, we try to look at issues in a broader context and develop more comprehensive solutions.







## Ecological Validity



WTI's comprehensive facilities allow us to spearhead, develop and test a research idea from the conceptual stage, through lab and "off-the-grid" field testing, and finally to trial and full deployment.

The expertise of our research staff has grown considerably over the past two years, and we have also made major advancements in **enhancing our testing capabilities and facilities**. At our MSU campus location, we have advanced laboratories to conduct leading edge research in the areas of human factors and safety, corrosion, materials, transportation management and operations, systems engineering, and development. In the field, we are partnering with state and federal agencies to develop TRANSCEND, an outdoor cold region test facility/track located in central Montana.



# Research Programs



Thanks to our integrated approach and enhanced capabilities, WTI is growing. Our research portfolio has grown from \$5.2 million in 2006 to \$7.7 million in 2008.

The following selection of projects highlight accomplishments in each of our focus areas, as well as how well our researchers benefit from our facilities and multi-disciplinary collaboration to achieve innovative results.

## Safety and Operations

Enhancing traveler safety and roadway operations has been the cornerstone of WTI research since its inception. Pioneers in the development and deployment of Intelligent Transportation Systems in rural locations, we are broadening our expertise to include human factors, traveler information, multi-jurisdictional coordination of operations, and in-vehicle technologies. WTI has one of the largest research simulator suites in the nation in our state-of-the-art Driver Simulation Laboratory, and we are conducting nationally significant research on rural driver behavior. To address the environment in which drivers must operate, WTI has expanded the Transportation Research Application and Instrumentation Laboratory (TRAIL) which simulates a rural traffic management center, allowing small local governments to use advanced technologies to monitor and improve traffic operations.

**Advanced Vehicle-Based Countermeasures for Alcohol-Related Crashes:** Drinking and driving continues to pose a major safety hazard on our nation's highways, accounting for nearly 40 percent of traffic fatalities. The National Highway Traffic Safety Administration is exploring the potential of in-vehicle devices that can detect alcohol impairment. WTI, in partnership with the University of Iowa, is using its driver simulation facilities and expertise to develop driving scenarios and experimental plans that can test the effectiveness of these potentially life-saving technologies.

## Winter Maintenance and Effects

The Winter Maintenance and Effects program at WTI develops solutions for transportation agencies challenged to keep roads open, safe, and well-maintained during and after severe weather events. Using the Corrosion and Sustainable Infrastructure Laboratory, researchers can test materials and practices for both effectiveness and durability. A growing number of projects conducted by WTI also help maintenance personnel select winter maintenance treatments, products and procedures that are effective as well as environmentally sensitive.

**Evaluation of the UDOT Weather Operations/RWIS Program:** In partnership with the Utah Department of Transportation, WTI identified and quantified the benefits of the Weather Operations/RWIS Program, which provides detailed, often customized, area-specific weather forecasts to UDOT maintenance and operations divisions. Researchers from WTI's winter maintenance program and safety and operations program worked together to develop a unique artificial neural network model to analyze labor and materials costs for each of UDOT's 77 maintenance sheds, concluding that the Weather Operations Program saves the department \$2.2 million per year for snow and ice control activities. ITS America selected the UDOT evaluation for its "Best of ITS" Award in the "Best Return on Investment" category.



## Road Ecology

WTI's national and international experts continue to lead groundbreaking research in the field of road ecology, which attempts to understand and balance the complex relationship between roads and the surrounding environment. Researchers completed and presented a national study to Congress detailing the most effective methods to reduce collisions between vehicles and wildlife. In the field, road ecologists are testing new practices and technologies, taking full advantage of the TRANSCEND outdoor laboratory under development at the Lewistown, Montana airport.

**Comparison of Animal Detection Systems in a Testbed:** In partnership with the FHWA and the Montana Department of Transportation, WTI conducted research to evaluate the reliability of nine different animal detection systems from five different manufacturers at the same site under similar circumstances. This evaluation, conducted at the TRANSCEND research facility, is the first known side-by-side evaluation of animal detection systems in the United States. This project identified four systems that detected 90 percent or more of animal movements, produced valuable data for comparing similar systems, and helped establish minimum standards for system reliability.

## Infrastructure Maintenance and Materials

As the safety and durability of the national transportation infrastructure becomes a growing priority, WTI's maintenance and materials program leads state of the practice research on advanced materials and innovative design techniques. Increasingly, researchers work across programs to address multiple engineering and environmental aspects of infrastructure construction and maintenance. Recent expansions and enhancements to the WTI Materials Lab allow for expanded research into the use of geosynthetic and recycled materials for roadway construction and rehabilitation.

**Evaluation of 100 percent Fly Ash Concrete:** Using the Materials Lab, WTI researchers created and evaluated concrete mixes that use fly ash (a recycled material) as a substitute for traditional Portland cement. The project demonstrated the long-term durability and economic benefits of using this "green" concrete in infrastructure construction.







### Systems Engineering Development and Integration

The Systems Engineering program sets the standard for cooperative research at WTI. Researchers have created advanced tools and integrated systems for researchers in all of the other programs, ranging from handheld devices to pinpoint animal-vehicle collision hotspots to specialized websites that facilitate coordinated transit services. The Systems group conducts much of their work in-house, using a growing Systems Lab where hardware and software can be developed and tested, and the TRAIL lab that can simulate a rural or small city traffic management center.

**WeatherShare:** WTI researchers from the Systems Group worked with the Winter Maintenance program to develop the WeatherShare system for the California Department of Transportation. WeatherShare streamlines and integrates available road weather data into a single source, which is quickly and easily accessible by incident responders, operations and maintenance personnel, and the traveling public. In addition to routine use for roadway operations, officials in California also used WeatherShare to monitor and plan response activities during recent wildfires. Originally created for rural transportation districts, Caltrans now plans to deploy the system statewide.

### Mobility and Public Transportation

WTI's Mobility and Public Transportation program has helped a growing number of rural areas and small communities create or expand public transit options, often by identifying innovative ways to coordinate services. Increasingly, researchers are exploring transit development that incorporates multi-modal options, such as integrated airline, auto, bicycle and pedestrian facilities.

**Promoting Bicycling on Federal Lands:** On behalf of the FHWA, WTI researchers have completed a "Guide for Promoting Bicycling on Federal Lands." This new resource is designed to provide Federal land managers with practical information and guidance, including the benefits of bicycling programs, a review of policies that support bicycling, issues and challenges, and a description of the many resources already available to meet these challenges. In addition, it highlights a number of national parks, recreation areas, and other federal land units that have implemented bicycle friendly policies and programs. The guide in its entirety will be available in November from the Pedestrian and Bicycle Information Center at [www.pedbikeinfo.org](http://www.pedbikeinfo.org). The Guide will also be available on the Transportation Toolkit for Federal Land Managers at [www.cflhd.gov/ttoolkit/ftt/default.htm](http://www.cflhd.gov/ttoolkit/ftt/default.htm) and on the FHWA Central Federal Lands website at [www.cflhd.gov](http://www.cflhd.gov).



## Logistics and Freight Management

Efforts to move freight more quickly and efficiently across the country will increase in national importance as the federal government focuses on economic growth and vitality. WTI's research continues to emphasize the value of smart logistics and coordinated transport through rural areas. The Logistics and Freight Management program can work with the Systems group to develop and test advanced tools, and with Mobility researchers to explore multi-modal integration.

**Research in Support of Container/Trailer on Flatcar in Intermodal Service on Montana's Railway Mainlines:** WTI researchers are working with Prime Focus LLC (DePere, Wisconsin) on a project to identify opportunities to expand the availability of intermodal container freight service in Montana. Containerized intermodal freight service, an important mode of freight transportation particularly to access international markets, is limited in rural areas. Researchers are investigating such service in Montana's rural environment with respect to the potential demand for such service, obstacles to its implementation, and incentives that might be appropriate to promote it.

## Transportation Planning and Economics

As rural areas experience substantial population growth, comprehensive transportation planning becomes increasingly important. WTI's Transportation Planning and Economics program helps local and regional agencies identify solutions for sustainable development, frequently drawing on advancements developed through other WTI focus areas. Rural areas, particularly in the Western United States, also frequently contain substantial areas of publically held land, such as parks, preserves, forests, etc. With their increasing use for recreational and other purposes, these lands have developed their own unique transportation needs, which again with its expertise and facilities, WTI is well equipped to address.

**Transportation Toolkit for Federal Land Managers, Phase 2:** In partnership with FHWA, WTI created a web-based toolkit for federal land managers that helps them identify solutions to mobility and congestion challenges in national parks, forests and recreation areas. The toolkit has helped familiarize managers with many Intelligent Transportation Systems and other advanced technologies they may not have otherwise considered. In the second phase of this project, researchers will explore expansion of the toolkit into a national clearinghouse of transportation information for federal lands managers.





# Research Future Initiatives

WTI will continue to strengthen our expertise across our eight focus areas. With the solid foundation we have already established, we plan to build on our integration efforts to address cross-cutting issues of national import:

**Green Highways.** The FHWA is encouraging initiatives that promote environmentally sensitive, “green” highways. Much of WTI’s past experience and current expertise is related to “green” highway themes. WTI’s work on with animal vehicle collision research, recycled construction materials, transit development, context sensitive design, environmentally safe winter treatment practices, and other issues will contribute to a variety of green transportation efforts.

**Airport Maintenance and Operations.** In the coming year WTI will be utilizing its expertise in corrosion, weather monitoring and forecasting, multi-modal connectivity, infrastructure condition assessment, and ecology/environmental impacts to address aviation issues in rural America. WTI looks forward to complementing our current

skill base, leveraging the Transcend Research Facility at the Lewistown Airport, and expanding our research portfolio from surface transportation to addressing surface and air issues to meet local, state and federal needs.

**Rural Traffic Safety Culture.** WTI’s depth of experience with ITS safety deployments, combined with the addition of a second driving simulator, increase our capacity to lead comprehensive, nationally significant safety studies. Traffic crashes represent the largest cause of fatal injury for nearly all age groups, especially in rural America. Rural states such as Montana have the misfortune of having the highest traffic fatality rates both in terms of exposure (VMT) and population risk (per capita). WTI’s goal is to increase understanding and unify concern amongst traffic safety researchers, practitioners, and policymakers about the role of traffic safety culture on (1) behavioral factors that increase rural (and national) traffic crash risk; and (2) attitudinal barriers to public and political acceptance of traffic safety interventions.





# Where Transportation Research “meets the road”

WTI takes pride in the state-of-the practice research we conduct in our laboratories and in the field. Our greatest satisfaction comes when one of our projects solves a specific problem on a roadway or makes a maintenance engineer’s job a little easier on a day-to-day basis. Therefore, our outreach efforts—putting our research findings into the hands of people who can use them—are just as important as the research itself. Since its earliest beginnings, WTI has supported and encouraged researchers--from both WTI and other organizations—to share their findings through presentations, training workshops, and other forums. Building on 14 years of experience with a broad range of technology transfer activities, WTI continually explores new and refined methods of communication and collaboration, to ensure that we reach as many people as possible with the information they need the most.

With our unique understanding of rural transportation challenges and solutions, WTI engages in outreach activities that make important contributions to national transportation policy and practice. Within this context, WTI focuses on efforts that are:

- Topical – identifying emerging issues of concern and raising awareness
- Timely – continually integrating our latest research into forums and workshops so that practitioners have the most up-to-date information
- Targeted – providing the research to busy professionals with time and resource constraints through regional events, webinars, onsite trainings, and other alternative forums.





### Outreach and Professional Development Program

Over the past two years, WTI researchers have given 111 presentations at a variety of professional gatherings. In addition, we have sponsored 11 events with nearly 900 attendees at the local, state, and national level. In addition our website and online resources combined with traditional print publications, reach countless other transportation professionals. Some of our most successful outreach efforts over the past two years are highlighted below.

#### National Testimony and Committee Activity – Rural Transportation Policy

WTI Director Steve Albert has participated actively in national level discussions of the future of the U.S. transportation system, notably with respect to rural transportation issues. In April 2007, he was invited to testify at a hearing of the National Surface Transportation Policy & Revenue Study Commission chaired by U.S. Transportation Secretary Mary Peters, where he presented many examples of how improving the rural transportation infrastructure is essential to ensuring safe and seamless national travel, promoting efficient movement of freight, and protecting national security. As a result of this and other outreach activities this year, Secretary Peters selected Albert to serve on the Intelligent Transportation Systems (ITS) Advisory Committee, where he will have the opportunity to review initiatives and make recommendations to the USDOT on ITS research under consideration for funding, further ensuring that rural needs are taken into account.

#### National Wildlife Vehicle Collision Reduction Study Executive Summary for Congress

On behalf of the Federal Highway Administration, WTI researchers from the Road Ecology program (in partnership with the Louis Berger Group, Inc.) have completed a national study that details the causes and impacts of Wildlife Vehicle Collisions (WVCs). This Report, submitted to Congress in August 2007, synthesizes and analyzes research from the U.S., Europe, and Australia, and may be the most thorough work ever done on this topic. The study identifies and evaluates 34 different techniques for reducing the number of wildlife-vehicle collisions. A separate Executive Summary document was prepared for the members of Congress so they (and their staffs) could more readily understand the information being presented. As they begin drafting the next transportation bill, staffs could more readily it is critical that they are well educated on rural issues such as WVCs.

#### Road Ecology Field Courses

Road Ecology researchers at WTI have developed a series of field courses that bring together at the same event representatives from the various stakeholder groups that are







involved with road ecology issues. At these events, the participants (variously consisting of a mix of conservationists, university researchers, department of transportation staff, other public agency staffs, etc.) are able to collectively learn from each other about road ecology issues, present research work, and current and emerging practices.

A two-day workshop for Canadian transportation engineers on the principles and techniques for mitigating highways impacts on wildlife and fisheries was held on October 12–13, 2006, at the Banff Centre. The course was designed to provide decision makers and transportation professionals field-based knowledge and information on guiding principles for planning, designing, evaluating and maintaining mitigation measures aimed at reducing animal-vehicle collisions and increasing habitat connectivity for wildlife and fisheries. The workshop brought science and solutions together, described general guidelines used in the planning process, information needs, and practical applications of current state of the art mitigation measures.

The Non-Profit Conservationists and Transportation: New Intersections Workshop was held at Montana State University, on March 28–30, 2007. Transportation professionals, road ecologists and conservation biologists from several non-profit conservation organizations met to learn about the latest in highway wildlife mitigation science, successes in public-private partnerships, and recent innovations in road ecology. The primary objective for holding the workshop was to help improve working relationships between state transportation departments and other organizations, such as other state and federal agencies, NGOs, and citizens groups. In an effort to reach a broader audience, videoed portions of this workshop are available free on-line for professional development. To view the workshop, visit [www.wti.montana.edu/Education/continuing\\_education.aspx](http://www.wti.montana.edu/Education/continuing_education.aspx)

In January 2008 the At the Crossroads: Highway 3 Transportation Corridor Workshop convened in Fernie, BC. The two day event focused on the Highway 3 transportation corridor, and was designed to help participants understand the efforts underway to minimize and mitigate adverse road and rail impacts on wildlife populations and ecological connectivity. The workshop convened a variety of research scientists and agency specialists with experience on highway wildlife mitigation strategies, ungulate movement and collision zones, and carnivore movement opportunities. These specialists joined transportation planners, the local conservation community and allied interests to develop a better understanding of wildlife research in the southern Canadian Rockies.

### **Western States Rural Transportation Technology Implementers Forum**

Many times the personnel tasked with using or installing new technology were not involved with the development of the technology, nor were they afforded the opportunity to attend conferences and workshops at which the new technology was introduced and discussed. So, in conjunction with the California Department of Transportation, WTI has brought the conference





to the practitioners. The Annual Western States Rural Transportation Technology Implementers Forum (WSRTTIF) in Mount Shasta, California is a unique, two-day event specifically designed to give ITS implementers and engineers the opportunity to engage in detailed discussions about innovative engineering and communications projects addressing rural transportation challenges. Presenters explain how solutions are developed. Participants are encouraged to actively criticize and evaluate the practicality of the technologies being showcased. Extended presentation times, limited attendance, and informal atmosphere facilitate and encourage questions and open dialogue about equipment functionality, system performance, vendors, and other key information. The 3rd annual forum was held in 2008. WTI will continue to work with Caltrans to ensure the training doesn't lose its unique approach while steadily increasing attendance each year. An exciting initiative that is currently being explored is to collaborate with other DOTs in bringing this same workshop to their state.

### **Making Sense of Sensors Used to Monitor Bridges**

The Dynamics and Field Testing of Bridges Committee of the Transportation Research Board identified a need for its members to better understand how active instrumentation in bridge structures can be properly used and how the data can be interpreted and applied. Consequently, researchers from WTI's Infrastructure Maintenance and Materials program area developed and moderated a half-day seminar entitled “Making Sense of Sensors Used to Monitor Bridges” as part of the Transportation Research Board annual meeting in Washington, D.C. in January 2007. The workshop provided bridge owners, designers, practitioners and researchers with basic information to develop an instrumentation plan, select sensor technologies, install and maintain sensors, and collect and analyze data. The presentations were made by national experts in the field and included examples of instrumentation projects and extensive technical guidance. By coordinating the event with the TRB meeting, organizers were able to present detailed information on the latest in bridge sensor technologies to 105 transportation practitioners from around the country.

### **Geosynthetics in Roadway Systems**

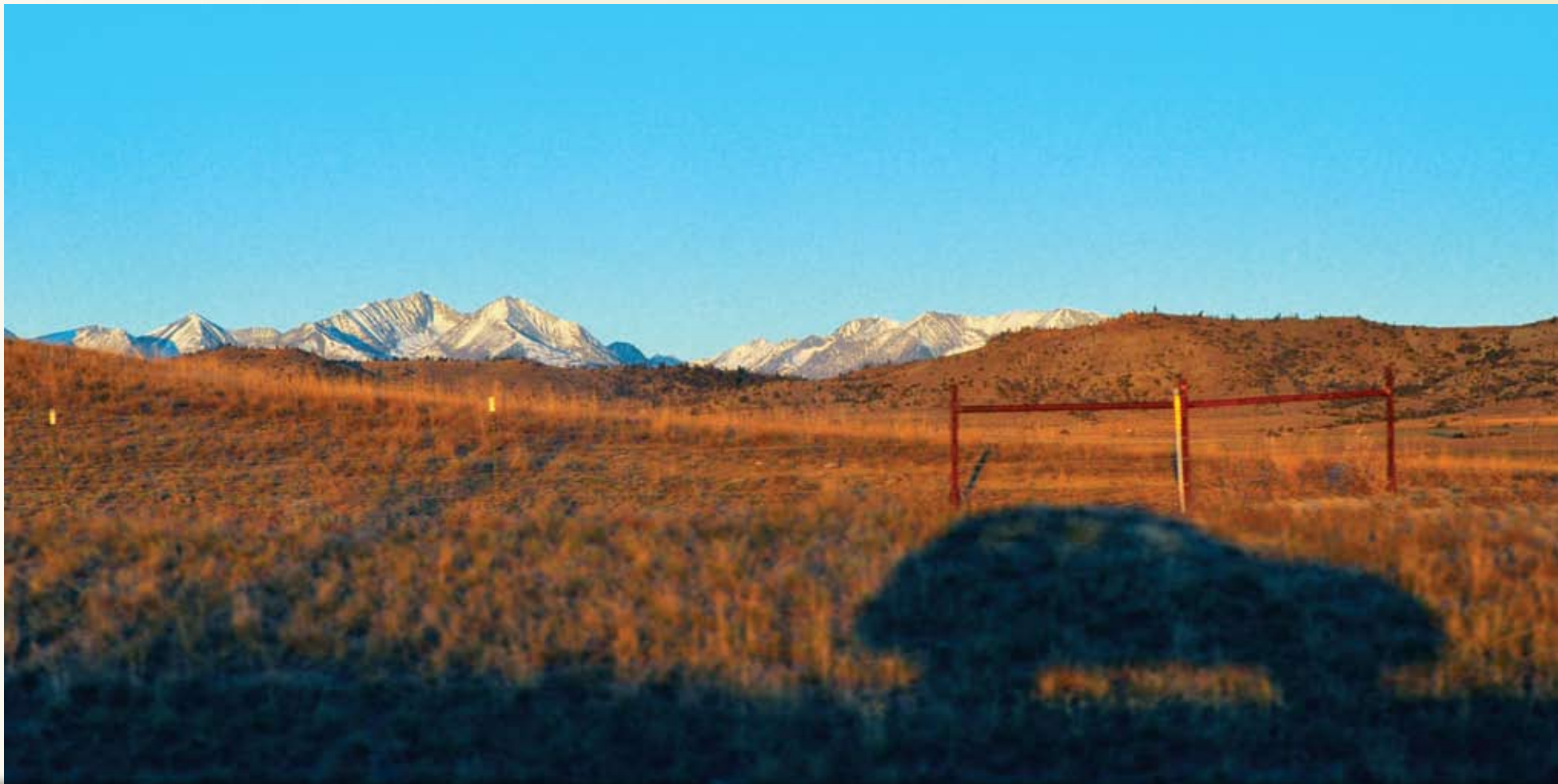
MSU Engineering Professor and WTI Researcher Steve Perkins served as one of two instructors for an eight-hour short course entitled “Geosynthetics in Roadway Systems” taught in January, 2007, in Washington D.C. The course was taught as a workshop preceding the Geosynthetics Conference 2007 and the Transportation Research Board Annual Meeting. The course reviewed material selection guidelines and design methods for a wide range of geosynthetic materials, which can be used in the construction of roads, airport runways, bridges and related structures, as well as for reinforcement of soil foundations. As a professional development course, participants had the opportunity to receive continuing education credits for completing the class. Approximately thirty-five students consisting of consulting engineers, FHWA and state DOT personnel, USFS personnel and contractors attended the course.



### Future Initiatives

As the economy contracts it is more important than ever to deliver information in the most efficient method available. With shrinking travel budgets it becomes more difficult to gather people in one room at one location. Therefore, WTI will bring more focus to bear on adapting its outreach activities to reflect this new economic environment. That is, as possible and appropriate, distance delivery methods will be used in conjunction with, or instead of, the more traditional conference/workshop delivery method. The obvious challenge in this regard is in maintaining essential connectivity

and communication between event participants if they are not all physically present in one room at one location. Opportunities for distance delivery include webinars, videoconferencing, etc., many of which WTI has already engaged in to some degree. Additionally, conference/outreach activities can be brought to the participants, rather than bring participants long distances to the conference, such a strategy may be employed in expanding the Western States Implementers Forum beyond the western United States.





# Educating Tomorrow's Workforce



At WTI, research and education are intrinsically linked. While we advance the state of the practice in rural transportation through innovative research, we ensure the continued technical expertise of practitioners through education. Both are fundamentally necessary for transportation to progress and flourish in the long-term.

The ever evolving nature of today's transportation systems and the dynamic character of the transportation work place demands technologically literate professionals with a diversity of background and skills. Transportation practitioners and researchers alike will have to be able to function in a multi-disciplinary environment and affect integrated, holistic solutions to the challenges they face.

As a federally designated University Transportation Center for more than ten years, WTI has developed and nurtured a comprehensive education program that targets students at many levels, encourages them to learn about the many inter-related fields that affect transportation, and prepares them to succeed in the professional world. With our location on the campus of Montana State University, we offer students access to faculty with wide-ranging expertise, advanced laboratory facilities, and cutting edge research—overall, a vibrant learning environment.

WTI engages in a full range of educational activities, from sponsoring programs to introduce and attract elementary and secondary school students to the transportation profession, to providing university students with challenging multi-disciplinary research, coursework, and professional opportunities, to collaborating with academic departments to bring on board new faculty in new areas of transportation study. These activities collectively have touched almost 1,100 students over the past two years, with, for example, over 70 undergraduate and graduate students virtually from across the entire campus being supported through paid research and mentoring opportunities at WTI in the current school year alone.

## Education Program

A few of our most successful educational programs and students are highlighted here.

### Summer Transportation Institute

WTI hosted its fourth successful Summer Transportation Institute for high school students, with participants from five different Montana towns, plus two other states. Students lived on the MSU campus for two weeks while learning about the transportation field, through classes, field work, hands-on laboratories, field trips, and team design-build projects.



### **Safe Passages Research Experience for Undergraduates (REU) Program**

Over the summer of 2008, the Western Transportation Institute hosted eight non-MSU undergraduate students from colleges and universities nationwide in a unique ten-week summer research program. The Safe Passages Research Experience for Undergraduates (REU) Program is funded by the National Science Foundation and was established to explore the complex issue of simultaneously providing for safe passage of humans, wildlife, and aquatic organisms through rural transportation corridors. Interdisciplinary student teams gained hands-on, professional research experience by collecting field data, producing technical reports, and making presentations on five distinct but interrelated projects. The program was designed to enhance students' ability to integrate a variety of strategies in addressing a given problem.

One participant said, "I liked that what we were studying was relevant to real world engineering problems, and I liked the multidisciplinary aspects of combining civil engineering with ecology, geology, and environmental studies."

### **Graduate Fellowship Program**

WTI's Graduate Transportation Award covers tuition and a monthly stipend for students pursuing advanced degrees on a transportation topic. Over last year, WTI supported fourteen graduate students from six different academic departments with this award.

### **Road Ecology Course**

In Spring 2007, Montana State University offered a new graduate course in Road Ecology. Dr. Patrick McGowen (MSU professor and long-time WTI researcher) taught the course in partnership with other researchers from WTI's Road Ecology program. The course was the first of its kind and fuses principles from civil engineering, ecology, and environmental science.

### **Joint Faculty Appointments**

The Western Transportation Institute works closely with academic departments to broaden the range of transportation course offerings and faculty with transportation expertise. In 2006-07, WTI and the MSU Civil Engineering Department jointly appointed Dr. Pat McGowen to the transportation faculty, which has led to expanded course offerings in the topics of transportation planning and road ecology. In 2007-08, WTI partnered with the MSU Industrial Engineering Department in the joint appointments of Dr. Nic Ward and Dr. Laura Stanley, who will greatly expand coursework and student research opportunities in transportation safety and human factors, which will include hands-on exposure to driving simulation laboratories.





## Students of the Year

### **Katie O'Keefe, 2006**

Katie O'Keefe helped produce a major report on anti-icing for the Winter Maintenance Program, and was invited to present the findings to the Transportation Research Board Meeting in Washington, D.C. She is pursuing an M.S. in Biomechanics at MSU.

### **Jeff Sharkey, 2007**

Jeff Sharkey contributed his expertise in Artificial Intelligence to several network design projects in WTI's System Integration program. In 2008, he earned his Master's Degree in Computer Science from MSU, and placed among the top 10 entrants in the Google Android Developer Challenge, earning him a \$275,000 cash prize.

## Future Initiative

An especially exciting initiative WTI is pursuing in the future is the establishment of a graduate degree program in the field of Road Ecology, and we have submitted a substantial proposal to the National Science Foundation for help with this effort. WTI has a solid foundation of leading edge research and internationally recognized staff in the field of road ecology, which can be applied to develop a curriculum that teaches state-of-the-practice principles and methods of balancing transportation needs with wildlife habitat considerations.





# Research, Relationships, Results

From California to Canada, WTI research is shaping transportation networks across the United States and beyond. We do much of our work in WTI's well-equipped, advanced laboratories in Bozeman on the Montana State University campus and in satellite offices in other cities and states. But we also believe in spending time in the field gathering information or implementing research and plans.

We work with a variety of clients and sponsors including government agencies, such as state departments of transportation and federal entities. WTI serves private-sector businesses and can act as a subcontractor on large projects. We also conduct research for nonprofit organizations and foundations. WTI builds dynamic relationships not just with—and between—its clients and sponsors, but also with other research organizations. We partner with universities, consortiums and other groups to further the field of transportation research. If rural is what matters to you, then WTI is your partner.

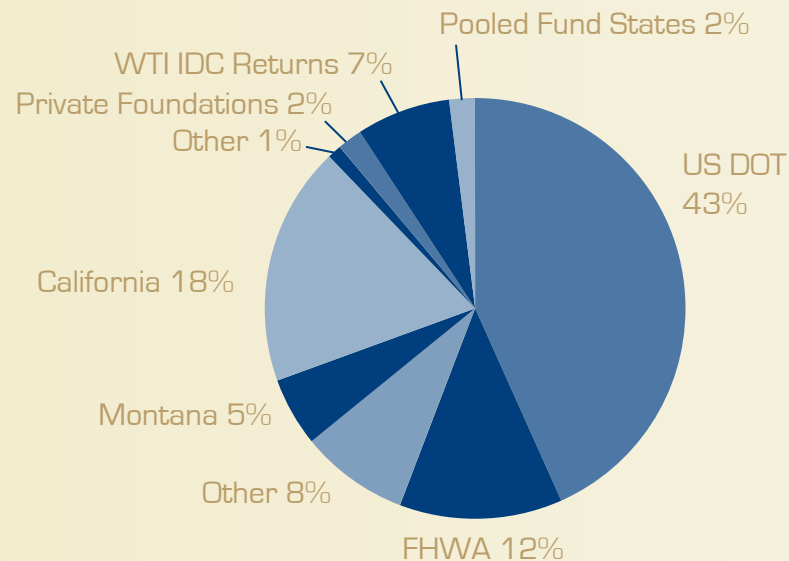
WTI works with all types of clients, sponsors and partners to conduct relevant, contemporary research, particularly on projects requiring expertise on rural issues and sustainability concerns. Contact us to find out how to put WTI to work for you and fast-track your research needs.



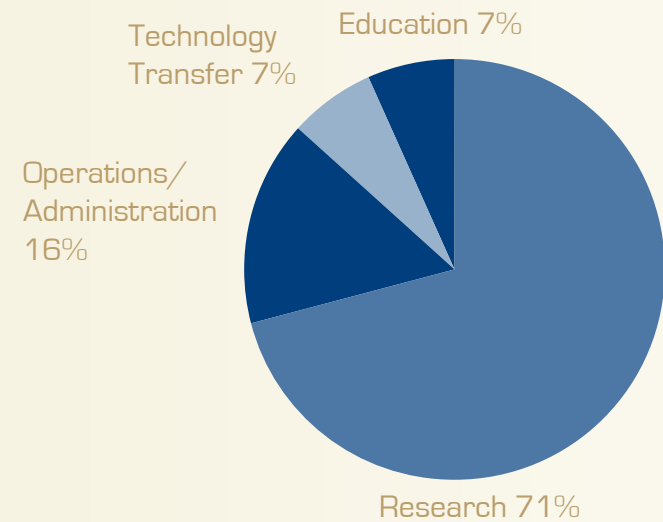


# Financials

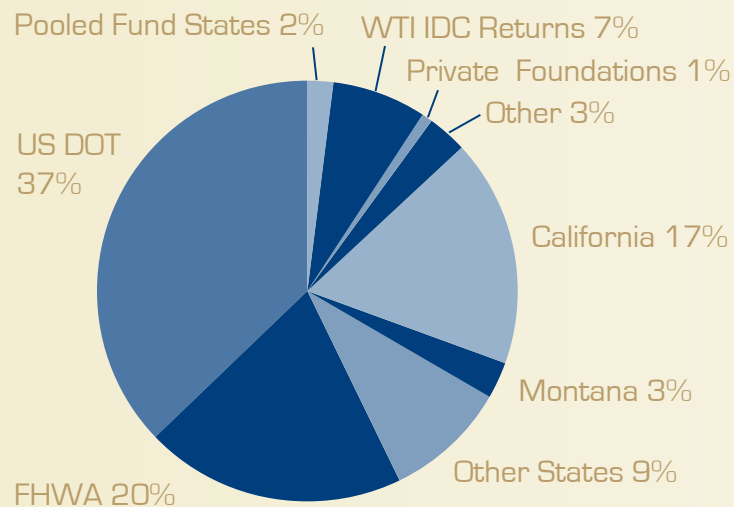
## WTI Funding 2007



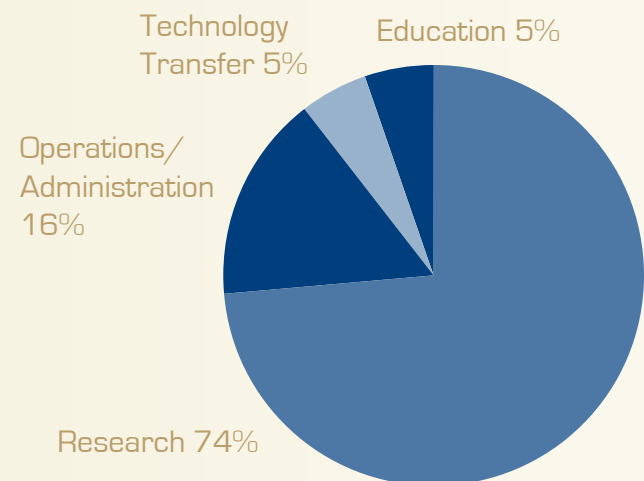
## WTI Expenditures 2007



## WTI Funding 2008



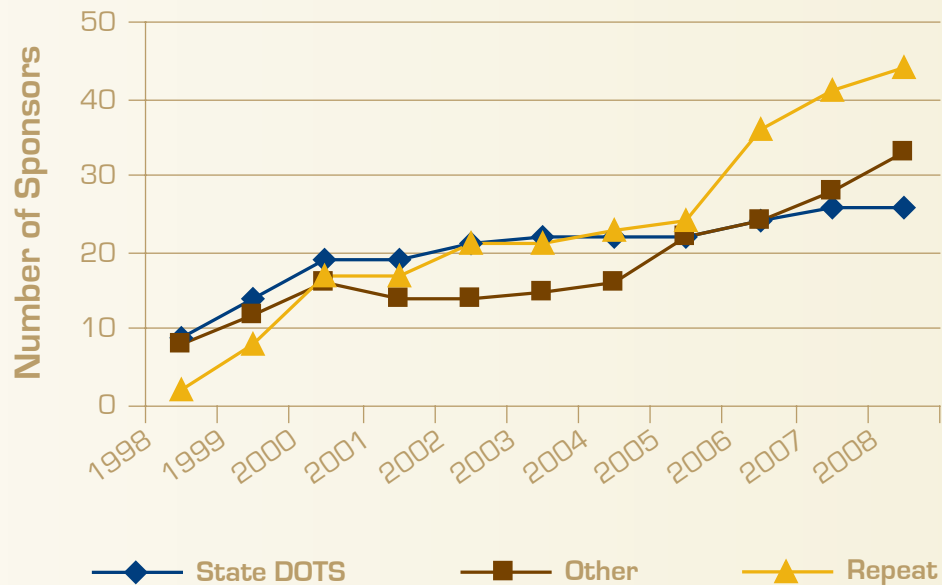
## WTI Expenditures 2008





### Diversified Sponsor Base

WTI has promoted a culture of leveraging funds and partnering on research which allows us to meet common research goals, efficiently expand the scope of research projects, maximize the value of the research dollar and address the needs of the various sponsors. WTI's diverse sponsor base includes 26 state departments of transportation, the United States Department of Transportation (USDOT), other federal funding agencies such as the National Science Foundation, Department of Homeland Security, Transportation Research Board, and the National Park Service. WTI also receives funding from private foundations, Parks Canada, and several companies. A broad base of research funding is essential to maintain continuity of staffing levels and other resources. Under this model of diversity, if one source of funding is decreased or ends, other sources are available.



### WTI Annual Funding

