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# ANNUAL REPORT

upper great plains transportation institute
north dakota state university, fargo

The Upper Great Plains Transportation Institute (UGPTI) is an independent research and education center at North Dakota State University. Administratively, it is directly responsible to the university provost. The Institute conducts research related to the immediate and long-term transportation needs of the region and disseminates information through conferences, workshops and seminars.

The research program is guided, in part, by an advisory council composed of representatives of various organizations, industries and agencies affecting or affected by transportation. The program areas focus on specific transportation issues, but, united within the UGPTI, they share expertise, staff and other resources to form an overall program with the flexibility to address emerging challenges and opportunities.

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# DIRECTOR'S MESSAGE

Gene Griffin
Director, UGPTI

Mobility continues to be the glue that binds our society and economy together. Mobility of persons and freight underpins all of the critical elements of a civilized society – education, health care, governance, justice, education, commerce, and communications.

The Upper Great Plains Transportation Institute is dedicated to maintaining and improving that mobility. Doing so is essential for residents of our region to continue to enjoy their quality of life. It is necessary to connect our region's agricultural producers, manufacturers, and other businesses to an increasingly global economy. Despite trying economic times, North Dakota continues to experience growth. That growth comes with challenges and opportunities for the transportation system.

An increase in alternative and traditional energy development has placed a tremendous strain on the rural road network in some areas of the state. Today's agriculture production and processing requires an integrated transportation system with a global reach. Manufacturers in the region require complex supply chain management solutions to remain competitive.

The Upper Great Plains Transportation Institute continues to develop programs to address these challenges and opportunities. The institute has developed multiple areas of expertise including agricultural transportation, freight planning, economic analysis, traffic analysis, transit, rural road safety and others. The dedicated and talented staff are adept and tailoring their research and outreach programs to the state, regional and national needs. This report highlights our work to improve the competitiveness of the region's businesses, to assure that transportation investments are as effective as possible, and to improve the quality of life for those that live here.

The work described in this report is made possible by a significant investment by the state of North Dakota and our other partners. These partnerships bring not only dollars, but ideas and innovations to the UGPTI and this region. At the same time, our partners' continued confidence in us is an acknowledgement of our abilities and accomplishments.

Thank you for your interest in our work and in the nation's transportation system.

# PROGRAMS

The UGPTI's programs explore a wide variety of passenger and freight mobility topics. Although each program functions independently and in an entrepreneurial manner, the synergy among the programs contributes to the overall vitality of the UGPTI and to the success of all the programs.

**ACADEMIC PROGRAMS** offered include an interdisciplinary Ph.D. program in transportation and logistics and a transportation option in the master's degree programs in civil engineering and agribusiness and applied economics. Graduates are prepared for careers in wholesale and retail business, construction, consulting, and government. A master's in military logistics (name changed to managerial logistics in October 2008) is also offered. UGPTI academic programs are largely funded by the Mountain-Plains Consortium and the Department of Defense. Go to page 6 for more information.

The **ADVANCED TRAFFIC ANALYSIS CENTER (ATAC)** enhances transportation systems in small to medium-size cities by using advanced traffic analysis and intelligent transportation systems to improve safety and mobility. The center's primary role is to support decision makers responsible for planning, operating and funding transportation systems at the local, regional and state levels. Primary efforts focus on intelligent transportation systems, traffic operations and travel demand modeling. Go to page 20 for more information.

The **AGRICULTURAL AND INDUSTRIAL FREIGHT CENTER** promotes the efficient use of resources and enhances the competitiveness of agricultural products in the region. Staff members evaluate transportation industry trends, policy, and rates – all factors that are critical to maintaining product quality and helping businesses and producers reach key markets. They also examine supply chain management and transportation-related economic development initiatives to enhance the competitiveness of agribusinesses in the region. Go to page 24 for more information.

The **DEPARTMENT OF TRANSPORTATION SUPPORT CENTER (DOTSC)** provides intellectual capital to the NDDOT to solve complex problems. The center also addresses regional issues within North Dakota and the surrounding states. The center includes a student roadway design section supervised by on-site DOT design staff to employ, train and utilize undergraduate students in DOT design projects. The center's information technology center integrates NDSU computer science and management information systems students with real-world information technology issues and projects related to the DOT. Go to page 27 for more information.

The **MOUNTAIN-PLAINS CONSORTIUM (MPC)** conducts research, education and training on transportation infrastructure and the movement of passengers and freight. It is a competitively selected university program sponsored by the U.S. Department of Transportation, attracting the nation's best talent to study transportation and develop new transportation strategies and concepts. The consortium includes North Dakota State University, Colorado State University, South Dakota State University, the University of Utah, and the University of Wyoming. Go to page 25 for more information.

The **NORTH DAKOTA LOCAL TECHNICAL ASSISTANCE PROGRAM (NDLTAP)** fosters safe, efficient, environmentally sound, and cost-effective highway, road, and street systems by exchanging transportation technology with North Dakota's local units of government and the transportation community. NDLTAP accomplishes this effort through training, technical assistance, and information services as part of the Federal Highway Administration's nationwide LTAP network. Go to page 26 for more information.

The **SMALL URBAN & RURAL TRANSIT CENTER (SURTC)** provides transit stakeholders, users, suppliers and agencies information and training on technology and improved management and operations to increase the mobility of small urban and rural residents through improved public transportation. Research focuses on transit coordination, ITS applications and mobility planning. Go to page 22 for more information.

The **BIENNIAL STRATEGIC FREIGHT ANALYSIS CENTER** addresses key issues in North Dakota transportation. Each biennium, the program focuses on an economic sector important to the state with the goal of improving the competitiveness of firms through transportation enhancement in North Dakota. The current effort focuses on freight planning. Go to page 21 for more information.

The **TRANSPORTATION LEARNING NETWORK (TLN)** is an interactive conferencing network linking the transportation departments in Montana, North Dakota, and Wyoming and the Mountain-Plains Consortium universities. TLN supports quality transportation through a network of people and technology that serves TLN members by enhancing communication, education, professional development, technology transfer and research. Go to page 26 for more information.

The **TRANSPORTATION SAFETY SYSTEMS CENTER (TSSC)** develops and maintains software used by state and federal safety specialists nationwide at weigh stations and ports-of-entry for inspecting commercial vehicles. Additional software is used by safety specialists during on-site reviews of commercial carriers. In addition, the center is also extensively involved in safety-related research and analysis to improve targeting of enforcement efforts and enhance software programs. Go to page 28 for more information.

The **RURAL TRANSPORTATION SAFETY AND SECURITY CENTER (RTSSC)** promotes and enhances the region's transportation safety and security through research, education, and outreach in partnership with stakeholders. It is a collaborative effort between the Upper Great Plains Transportation Institute and the NDDOT, with funding from the Federal Highway Administration. Go to page 27 for more information.

# EDUCATION

UGPTI coordinates the master of managerial logistics program and the doctorate in transportation and logistics program offered by the College of Graduate and Interdisciplinary Studies. These programs prepare students for successful careers involving the movement of people, supplies and agricultural commodities. Students' academic and research success indicate the value the students bring to UGPTI efforts and testify to the quality of the academic program.

**NEW TRANSPORTATION PROGRAMS OFFERED.** The Transportation and Logistics Program in the NDSU College of Graduate and Interdisciplinary Studies now offers two new graduate degrees and two certificate programs. The programs will focus on urban transportation systems; linkages between transportation, land use, the environment, emergency response, and logistical delivery systems; coordinated planning, operations, and security; and the spatial dimensions of urban systems. The programs are coordinated by the Upper Great Plains Transportation Institute at NDSU and many of the classes will be taught by MPC faculty.

"Transportation systems have an enormous impact on urban systems," notes Denver Tolliver, associate director of the UGPTI. "These programs will prepare students and professionals to take an integrated approach to urban and transportation planning."

The master's degrees include:

- **Master of Science in Transportation and Urban Systems** targeted at students with strong research interests and capabilities who wish to work in the fields of research or education.
- **Master of Transportation and Urban Systems** targeted at mid-career professionals and other candidates who wish to gain skills appropriate to their career without participating in advanced research.

Certificate programs include:

- **Transportation and Urban Systems Certificate** —an online program designed to enhance working professionals' credentials in the transportation and logistics field.
- **Transportation Leadership Certificate**—an online program designed to prepare future leaders of the transportation industry. This prestigious program is an initiative of the Regional University Transportation Centers. NDSU is one of the premier institutions that will offer courses taught by graduate faculty.

**DISSERTATION PROVIDES FLOOD CONTINGENCY PLAN.** As emergency response officials in North Dakota pondered the possible evacuation of Fargo during the height of flooding in 2009, they looked to information developed by an NDSU Ph.D. student for guidance. Mohammad Naser was nearing completion of his dissertation on simulating emergency evacuations of small to mid-size cities. Most computer modeling of evacuation events had focused on larger cities and regional events such as hurricanes. For smaller cities, such as Fargo, there was little information available. Although Naser's research provides a planning and modeling framework for any small urban area, his work used the Fargo-Moorhead area as a case study, drawing on information and expertise from the area and using local traffic models. The basic scenario he used in his research was a levee breach in the flood protection system along the Red River. "We wanted to know the average number of vehicles per household that would be evacuating the city and how long the evacuation would take," he explained.

Although existing traffic models could partially answer those questions, they were not designed to take into account the many human behavior factors that would come into play during an evacuation. Naser conducted household surveys to learn how many people would evacuate, how they would evacuate, how many vehicles they would use, what routes they would use and other information.

Naser's research indicates that human behavior research conducted in hurricane-prone areas may not translate well to evacuation planning in small communities in other areas of the country. The research will also help small communities identify resources available from their metropolitan planning organizations (like the Fargo-Moorhead Metropolitan Council of Governments, a cooperator in Naser's research) that can help them develop evacuation plans. The resources include traffic and transit plans, regional travel demand models and other data and planning resources.

"Traffic congestion caused by regional emergency evacuations can be life-threatening." Naser said. "The sudden increase in demand will result in excessive loads on roads not typically designed to handle those traffic volumes. The management of the transportation system during regional emergency events is critical to achieve a safe and efficient evacuation. The model developed for this study could be applied at the different stages of the emergency event and develop traffic management plans to support emergency evacuations."

That's exactly what officials in Fargo-Moorhead were looking for as record flood levels inundated the area in April. Fortunately, their plans for evacuation, at least in part based on Naser's research, never had to be implemented.

**STUDENTS PRESENT RESEARCH AT TRF.** Several Ph.D. students from NDSU presented papers at the 50th Annual Transportation Research Forum held March 16-18 in Portland, OR. The Transportation Research Forum is an independent organization of transportation professionals which provides an impartial meeting ground for carriers, shippers, government officials, consultants, university researchers, suppliers, and others seeking an exchange of information and ideas related to both passenger and freight transportation.

Eunsu Lee presented "Location and Routing Problems for Railroad Intermodal Terminal." The paper examines various scenarios for locating intermodal terminals in the Upper Great Plains region and shows diverse transportation cost effects by selecting various routes. The study indicates that a new intermodal terminal in the study region will generate more demand and decrease the total logistics cost and congestion cost in the metropolitan areas.

Lei Fan presented "Optimization Model for Global Container Supply Chain - Imports to United States." The paper analyzes the supply chain network with primary focus on importing containers to the United States. An optimization model that integrates international trade and U.S. inland transport networks was developed. The model presents a framework for capturing impacts on the supply chain network due to underlying cost structure changes and potential infrastructure constraints.

Ieelong (Peter) Chen presented "Improving Cost Efficiency of Implementing RFID in the Railroad Industry." The paper examines potential benefits of adopting RFID technology in the rail industry. The results could be used for refining business processes and increasing the degree of visibility and decreasing expenditures for inventory, logistics, and transportation.

Xianzhe Chen presented "Optimal Dispatching Policy Under Transportation Disruption." The paper proposes an optimal vehicle dispatching policy for transportation disruption. This policy determines the optimal vehicle capacity and dispatching time along a route. The proposed method can be applied to various scenarios, such as mass transit dispatching, freight transportation, and aircraft shuttle scheduling.

**STUDENT EARNS TRF FOUNDATION SCHOLARSHIP.** Steven Leon, Ph.D. student in transportation and logistics, was awarded the Transportation Research Forum Foundation scholarship. This scholarship recognizes excellence in scholarship, research, and writing and is intended to encourage students to develop the interest and knowledge to support the long-term growth and modernization of the transportation industry. MPC Director Denver Tolliver recommended Leon for the award.

In addition to his studies, Leon is an adjunct professor at the University of North Dakota, teaching operations management and is a contributing writer for Professional Pilot Magazine. He is also the founder and president of the HighTOP Company, an e-learning enterprise which facilitates training and workforce development for small- and medium-sized companies.

**STUDENTS EARN PAPER AWARD.** A paper presented by NDSU Ph.D. students Khalid Bachkar and Charles Briggs was selected as Best Paper in the Supply Chain Management Track at the 16th Annual Conference of American Society of Business and Behavioral Sciences Feb. 19-22 in Las Vegas. Their paper, "Managing Risk in Pharmaceutical Global Supply Chain Outsourcing: Applying Analytic Hierarchy Process Model," examines some of the risks associated with the trend toward global supply chain outsourcing in the pharmaceutical industry. The paper also suggests some management strategies that can be employed to tame a firm's exposure to supply chain outsourcing risk.

**SCHOLARSHIPS AWARDED AT NDSU.** The UGPTI awarded four scholarships at its annual Awards Banquet Oct. 9. The $1,500 scholarships are awarded each year through the Mountain-Plains Consortium with funding from the US DOT University Transportation Centers Program.

Andrew Bratlien and Jacob Loegering received Transportation Engineering Scholarships. The scholarships recognize academic achievement and promote the education of transportation students at NDSU. Bratlien is a senior in civil engineering from Laporte, MN, and has been an undergraduate research assistant at the Institute's Advanced Traffic Analysis Center. Loegering is a senior in civil engineering from Milaca, MN.

Kevin Buxa and Tyler Klain received Paul E.R. Abrahamson Scholarships. The scholarship is named in honor of Paul E.R. Abrahamson, the first administrator of the North Dakota Wheat Commission and a leader in the North Dakota agricultural community. Buxa is a junior in agricultural economics from Harvey, ND. Klain is a senior in agricultural economics from Ruso, ND.

**NEW STUDENT ORGANIZATION FORMED.** A new student organization at NDSU, the Association of Transportation and Logistics, met for the first time in October 2008. The group focuses on examining solutions to transportation challenges based on logistic technology. The group will look at "optimal multi-location shipment management, multi-carrier management, consolidations, real time tracking/tracing, and automation of processes and security," said Peter Chen, president of the new student organization. The group has a variety of activities planned, including RFID trainings and tours of various technology companies in the area. Chen said he hopes membership in the group can be increased to more than 50 by January. ATL is joining NDSU's list of more than 250 organizations.

**STUDENT WINS APTF SCHOLARSHIP.** SURTC graduate research assistant Marc Scott was awarded a 2008 American Public Transportation Foundation Scholarship. The foundation awards scholarships to increase and retain the number of young professionals entering the public transportation field as a career in order to sustain growth and improvement throughout the industry. The award was presented at the 20th Anniversary Scholarship Awards Program in October 2008 held in conjunction with the American Public Transportation Association Annual Meeting and International Expo. The American Public Transportation Foundation is the charitable affiliate of the American Public Transportation Association. Scott is one of 22 students selected for the honor. He is a 4.0 student, pursuing a doctorate in transportation and logistics.

**TRANSIT CLASS INTEGRATES GUEST LECTURERS.** The NDSU graduate course in transit was restructured to better serve students. As often as possible, each of the weekly three-hour class periods featured a theoretical section, a guest lecture from a professional in the transit industry, as well as a student seminar. "The guest lecturers will focus on how that theory applies in the field," noted Jill Hough, instructor for the course. TL 786: "Public Transportation" will continue to be taught on campus and via the Transportation Learning Network, an interactive network that makes the course available to students at universities across the country. Bob Prince, a consultant and former manager of the Massachusetts Bay Transit Authority, Boston's transit system, was a guest lecturer. Prince recently advised President Barack Obama's transition team on transit issues. Other lecturers included SURTC associate director Carol Wright; former Easter Seals Project ACTION director Al Abeson; Vincent Valdez, FTA associate administrator for Research; Bill Millar, president of the American Public Transportation Association; Jim Gilmour, city planner for Fargo, and Jeanne Krieg from Eastern Contra Costa Transit in California.

**STUDENT GAINS TRANSIT EXPERTISE AS INTERN.** Marc Scott, a Ph.D. student in Transportation and Logistics at North Dakota State University, gained a wealth of hands-on experience as an intern at the Transit Authority of River City in Louisville, KY, during the summer of 2008. He was placed in the intern position because of outreach activities conducted by the Small Urban & Rural Transit Center (SURTC) at NDSU. In Louisville, Scott worked on finance issues for the agency, developing spreadsheet models, conducting investment analysis of various fleet purchase options, and developing reports and white papers for staff and administration. He also assisted with public meetings focused on proposed fee increases and service charges.

**NDSU PROGRAM RENAMED TO REFLECT BROAD FOCUS.** The Master of Managerial Logistics Program is a new name for the Master of Military Logistics Program at North Dakota State University that more accurately reflects the program's breadth. "The new name reflects the content of the courses in the program and will allow us to market the program to a broader audience and recruit students from a wide variety of disciplines," notes Denver Tolliver, director of the program. Tolliver also serves as director of the MPC.

The program was developed three years ago to educate military and department of defense professionals in principles and applications of business transportation and logistics and supply chain management. It was anticipated that they would apply those principles in military settings. "We do not want to imply that we are focusing entirely on logistics within the military," Tolliver says.

Students in the intensive, one-year program leave with a strong grasp of the business side of transportation and supply chain management. "This education will benefit them after they leave the military," Tolliver says. "The new name will help them market themselves in the civilian job market."

Non-military students are more likely to enroll in the program if the name reflects its focus on supply chain practices in the private sector. "Broadening enrollment is critical to the sustainability and growth of the program. The simple change to 'managerial' logistics greatly increases our chances of growing the program and offering a broader perspective for class discussions," he says.

"The name change does not reflect disconnect between the original program and the current program," Tolliver notes. "The courses and content have not changed and the name change is consistent with the history and our growth expectations for the program. Retaining the MML acronym will allow us to capitalize on our existing name recognition. This step simply reflects the growth and progress of this program."

**NDSU STUDENTS EARN BEST PAPER AWARD.** Doctoral students Chris I. Enyinda and Charles Briggs and Won Koo, professor of agribusiness and applied economics, received a best paper award during the Global Academy of Business and Economic Research international conference in Orlando, FL, Sept. 17-19. Briggs and Enyinda presented the paper, "The Role of Competitive Intelligence Leverage in Supply Chain Risk Management Strategy." The paper proposes a competitive intelligence approach to managing supply chain risks. The paper has been published in the Global Academy of Business and Economic Research Proceedings. It also is being considered for publication in the Journal of Global Business and Research. Briggs is studying transportation and logistics. He is from Nigeria and is on sabbatical from the faculty at Alabama A&M University in Normal, AL. Upon completion of his doctorate, he plans to return to Alabama A&M to continue a teaching, research, and publication career. Enyinda is a professor and coordinator of the Logistics/Supply Chain Management Program at Alabama A&M University and is working on his second doctorate. He originally is from Huntsville, AL. Academic advisers are Denver Tolliver, MPC director, and Koo, who also is director of the Center for Agricultural Policy and Trade Studies at NDSU.

**STUDENTS ATTEND INTERNATIONAL CONFERENCE.** Transportation and logistics graduate students attended the International Transport Economics Conference June 15-16 at the University of Minnesota, sponsored by the MPC. The conference brings together researchers, practitioners, and policy makers interested in questions of transport economics. Graduate student Lei Fan presented his paper, "Global Supply Chain in Container Shipments: Impacts of Congestion on Imports to United States," at the conference. Other students who attended the conference were Qing Liu, Eunsu Lee, Elvis Ndembe, Khaled Bachkar, Eileen Campbell, Steven Leon, Ieelong Chen, and Chris DeHann.

**CHEN PRESENTS RESEARCH.** PhD student Xianzhe "George" Chen presented, "Supply Chain Risks Analysis by Using Jump-Diffusion Model," at the annual Winter Simulation Conference in Orlando, FL, in December 2008. His presentation was about modeling the supply chain demand disruption by using a jump-diffusion model and investigating the effects of demand risk on the performance of supply chain in continuous time setting by using simulated annealing simulation optimization method. The conference is the premier international forum for disseminating recent advances in the field of system simulation. Chen was selected as the chair of the "Monte Carlo Risk Analysis in Finance, Operations, and Optimization" track, which includes presentations from Northwestern University, the University of Maryland and NDSU.

## DEPARTMENT OF TRANSPORTATION SUPPORT CENTER ACTIVITIES

**Real-world design.** The Engineering Center at DOTSC has been utilizing civil and construction engineering interns to develop multiple highway improvement projects over the past year. These projects include widening, blended base, asphalt pavement overlay, urban reconstruction, interstate reconstruction, and safety (rumble strip) projects. Six projects were completed in the last year. All six projects were built during the 2009 construction season across the state of North Dakota.

In addition to the completed projects, preliminary engineering work has begun on four new projects and the final design is active on eight projects. One of these improvements is a urban reconstruction through an underpass beneath a arterial roadway and railroad structure. The proposed design will feature new Portland cement concrete pavement, structure repairs, sidewalks, retaining walls, storm drains, and lighting.

**Putting experience to work.** Twelve different civil and construction engineering students have worked at the DOTSC in the past year. Of those, five have graduated from their respective program and are active in the engineering field. Two went to work for the NDDOT, one is pursuing a graduate degree from NDSU, and one is employed at the Missouri DOT.

- **DriveSafety simulation project.** In January 2009, the DOTSC information technology students started work with the NDSU Psychology department and their DriveSafety driving simulator. In May 2009, it was realized that the current tile suite could not provide what was needed for the environment required. As of June 2009, the students are attempting to create custom tiles for this project.
- **Software updates.** The DOTSC information technology department also worked to convert and/or update existing programs to run with updated software programs. These programs can help store data in a way that is easily accessible and maintainable. Such conversions also improve usability and take advantage of newer technology.
- **WIM Data Query System.** In June 2008, work was started to develop a query system for data gathered by Weigh In Motion stations. Currently, there are 12 stations scattered throughout North Dakota, with plans to construct more. By June 2008, there were over 6.6 million vehicle records in the WIM database. To extract relevant information from such a huge data set, newer data mining technology had to be learned and will be implemented. As of June 2009, more advanced setup of a data cube is needed. The database has grown with over 2 million vehicle records as of June 2009.

# OUTREACH

UGPTI staff members have close working relationships with professionals in government agencies and industry. Many UGPTI staff members have work experience as consultants and transportation professionals. Those relationships and that experience are channeled into training programs and applied research. In addition, staff members are resources for colleagues to consult on emerging issues and technology. Results from the Institute's research programs are key components of outreach efforts.

**SURTC EXPANDS OUTREACH.** SURTC's training and outreach programs have grown dramatically over the past year. The demand for the center's training programs and services is growing along with its reputation in the industry as a "Center of Excellence." Over the past year, SURTC staff members traveled to 18 states and conducted 6 three-day courses, 21 workshops/training sessions, and 18 individual presentations. They also provided Passenger Service and Safety (PASS) training to dozens of bus drivers in North Dakota and South Dakota. In addition, staff members field phone calls and answer email requests daily, giving them the opportunity to serve as a national resource for small urban and rural transit related issues.

**PRINCIPLES OF TRANSIT MANAGEMENT OFFERED.** This three-day course, originally titled *Introduction to Transit Management*, was renamed *Principles of Transit Management* and is now marketed to include transit managers with multiple years of experience. It features eight modules covering basic transit management including: human resource management, financial management, administration, operations and service design, procurement, vehicle and facility management, safety/security/emergency management, and drug/alcohol compliance. The 600-page course manual features an extensive resource section, and the class participants receive 4 CDs to assist them in personalizing the class materials for their own transit agencies. This course was offered in North Dakota, South Dakota, Rhode Island, Texas and Colorado.

**BUSINESS PLAN DEVELOPMENT TRAINING.** This training program teaches rural and small urban transit programs how to analyze their individual budgets, statistics and goals in order to develop a business plan that can be implemented by their individual transit agencies. Participants learn how to clarify their organization's goals and priorities and construct up to a 3-year operating and capital budget projection for their agency. This training can provide an individualized plan that offers a launching point for a transit organization's decision-making processes. A co-sponsored training with the National Center on Senior Transportation was offered at NDSU in August 2009 for nine transit agencies from across the entire United States. This course was also taught at Rutgers in New Brunswick, NJ, under the sponsorship of the National Transportation Institute in October 2009 and is scheduled for Texas in February 2010.

***LEADERSHIP AT RURAL AND INTERCITY BUS CONFERENCE.** Jill Hough served on the planning committee for the 2008 Rural and Intercity Bus Conference held in Omaha, Nebraska in October 2008. She was the facilitator of the student paper competition and the special topics coordinator for sessions on rural medical transportation, veterans' transportation, and transportation in the parks. SURTC staff also had a very visible presence at the conference. As a result of her work for the 2008 conference, Dr. Hough will chair the 2010 National Conference on Rural Public and Intercity Bus Transportation in Burlington, Vermont.

***PASSENGER SERVICE AND SAFETY TRAINING AND RECERTIFICATION (PASS).** Gary Hegland heads up the PASS training and recertification process for all rural transit drivers in North Dakota and South Dakota. In addition, two new trainings have been added for all ND and SD drivers. These trainings include: *"Defensive Driving* and *Maltreatment Abuse and Prevention."*

***BUS SAFETY AND SECURITY PROGRAM WORKING GROUP.** Carol Wright serves on the national Bus Safety and Security Program Working Group for the Federal Transit Administration. The working group was established to improve program coordination and feedback on technical assistance materials before they are sent to a wide-scale audience. The working group consists of representatives from FTA, AASHTO, APTA, and CTAA, as well as representatives from industry organization committees and sub-committees, bus transit agencies, state Departments of Transportation, and from Federal partners, including the National Rural Transit Assistance Program (RTAP) and the Transportation Security Administration (TSA). This program has launched its website and is in the process of its rollout of state-by-state orientation sessions at this time. Carol Wright attended the South Dakota orientation session in September 2009. SURTC will host the North Dakota orientation session in August 2010.

**RURAL ITS CURRICULUM DEVELOPED.** Associate research fellow David Ripplinger worked with the National Transit Institute to develop an Intelligent Transportation Systems (ITS) training module. The course helps rural transit providers explore how technology can help increase operating efficiencies and improve safety. Technology can transform scheduling and dispatching operations, provide new levels of customer service, and support innovative business practices. This course presents a structured approach for planning, implementing, and evaluating rural transit projects to help ensure that agency needs and expectations are met. A pilot training course was offered at NDSU in June 2009. The course was attended by 32 participants consisting of transit agency managers and state DOT transit project managers. It also has been taught in California, New York and Wisconsin.

**VISION SAFE DRIVE CONFERENCE HELD IN SOUTH DAKOTA.** Nearly 100 state and federal transportation officials, engineers, law enforcement personnel, first responders, and traffic safety experts attended the Vision Safe Drive Conference in Rapid City, SD, in May. The goal of the regional conference was to exchange information on emerging issues, successes, and challenges so that research and outreach efforts could be directed most effectively toward enhancing the region's traffic safety. "Given limited resources and the vast number of lane-miles of rural roads in the United States, particularly in the Upper Great Plains and Mountain West, it is important to identify common priorities and share knowledge for reducing crashes and fatalities," noted Kimberly Vachal, director of the Upper Great Plains Transportation Institute's Rural Transportation Safety and Security Center. The center organized the conference with sponsorship from the MPC. The conference featured panel discussions on strategies for improving road safety as well as presentations on successful efforts in states across the region. There were two concurrent sessions. The first focused on driver behavior and strategies to affect that behavior to improve rural road safety. The second session focused on implementing rural road safety improvements in planning and operations. The 2009 Vision Safe Drive Conference was the second event in the region. The first Vision Safe Drive Conference was held in Bismarck, ND, in 2007.

**AG FOOD TRUCK TRANSPORTATION SUMMIT HELD.** The 2008 International Summit on Agricultural Food Truck Transportation Dec. 2-3 brought together representatives from the trucking industry and agriculture and food transportation organizations, to discuss critical issues and generate ideas to strengthen commercial agricultural trucking as a key partner in the future success of U.S. and international agriculture. More than 100 participants gathered in Washington, DC for the event. More than 20 speakers/presenters from Congress, trucking and national and international agriculture organizations, federal government agencies, and private sector experts, addressed the 2008 Summit. The MPC was a primary sponsor of the event which was organized by the UGPTI. "The summit was important to remind everyone of the importance of trucking and highways to food, agriculture, and rural development during the current economic crisis and in the future," noted Bruce Blanton, director of the USDA's Transportation Services Division. "The trucking industry, rural America, shippers, and receivers need to work together during the legislative and regulatory process to ensure a safe, efficient, and reliable transportation system."

**SOURCE FOR TRAINING.** More individuals and agencies are taking advantage of the training opportunities offered by the NDLTAP. In the past year, a greater number of staff members from local police departments as well as forestry departments at the state and local level have been enrolling in NDLTAP training events. The participants have found that the courses meet their needs for professional development hours while minimizing the need for travel and time away. Topics include highway and work zone safety, gravel and asphalt road management, bridge maintenance, tractor and mower safety, disaster and emergency services, and leadership development, All told, the NDLTAP furnished 33 training sessions to more than 1,427 workers in state, local, tribal and private agencies for more than 7,275 participant hours in 2009.

**STATES SHARE IDEAS FOR ROADS.** NDLTAP was a co-sponsor of the 2008 Regional Local Roads Conference with LTAP centers in Colorado, Nebraska, South Dakota and Wyoming. The states collaborate to identify topics and speakers for the event, held annually in Rapid City in October. The conference focuses on rural road management and maintenance topics that are common among the four states. Federal officials also provide updates on programs and policies that affect roads in rural states.

**"YOU SHOW US" CONTEST.** Some of the best inventions come from creative minds in shops and garages and that holds true for local road agencies. The NDLTAP coordinates a "You Show Us" contest for North Dakota counties. Entries are featured in the NDLTAP newsletter and are often entered in a regional contest held annual in conjunction with a four-state regional roads conference in Rapid City. The inventions are often innovations that save time, labor or money for local road agencies. Entries have ranged from improved culvert installation techniques to a pick-up mounted machine for taking roadway core samples.

**PARTNER FOR TRAINING.** The NDLTAP has entered into partnerships with several agencies and organizations to assist those groups meet the training needs of staff and members. For example, the program worked with the ND Health Department to provide training on erosion control and storm water runoff regulations to local agencies. NDLTAP also sponsored training with the Dakota Asphalt Pavement Association on proper techniques for asphalt use. Staff also worked with industry suppliers to provide training on concrete culvert installation, corrugated steel pipe installation, warm mix asphalt, tractor mower operator safety training and other topics. As a result of these partnerships and the use of video conferencing technology, local agencies are able to access needed training at low cost and partners often see dramatic increases in attendance.

**DAMAGE ASSESSMENT.** In 2008-2009, North Dakota had one of its snowiest winters in history with subsequent serious flooding. NDLTAP worked with the NDDOT to estimate damage to the county and township roadway systems and with Disaster Emergency Services to provide training to their inspectors. In addition, staff frequently provided technical assistance to local agencies as they began to repair and rebuild their road infrastructures.

**READ MY SIGN.** New federal regulations are requiring local road agencies to test the retroreflectivity (the amount of light reflected compared to the amount of light shining on a surface) of their road signs and then replace or upgrade them if they do not meet minimum standards. NDLTAP worked with the American Public Works Association (APWA), North Dakota Association of County Engineers, North Dakota Township Officers Association, and the Multi-State Township Officers Association to share information on the new regulations. Staff also developed a computerized sign inventory program for local agencies to use in meeting the new requirements.

**ASPHALT UPDATES.** The Transportation Learning Network sponsored a series of training sessions focused on the use of asphalt. Topics included reclaimed asphalt pavement, Microsurfacing/slurry seals, cold in-place recycling, full depth reclamation and best practices in production. As paving costs have increased, highway engineers want to assure that asphalt pavements receive preservation treatments that will assure maximum service life.

**FLAGGER TRAINING.** NDLAP developed a flagger training module that will be viewed by all flaggers in North Dakota. The module includes a handbook and a presentation. Prior to the first day on the job, all flaggers must view the presentation and take a short quiz to ensure they know and follow the guidelines.

# RESEARCH

UGPTI research programs have roots that are more than 40 years deep. Originally focused on North Dakota commodity transportation, the Institute's research portfolio is now national in scope. The focus of that portfolio is on the mobility of people and freight in rural areas and communities and small cities.

## INTELLIGENT TRANSPORTATION SYSTEMS

**STATEWIDE AND REGIONAL ITS ARCHITECTURE UPDATES.** An ITS architecture provides a framework for supporting ITS deployment by defining services, developing system requirements, identifying information flows, coordinating agency roles, and integrating functions across jurisdictional lines. Having a current ITS architecture is a requirement for receiving federal funds for ITS projects. ATAC has been a resource for the NDDOT and ND MPOs for developing and maintaining their ITS architectures. The update process is needed to reflect new ITS priorities and strategies, account for expansion in ITS scope, and allow for evolution and incorporation of new ideas. The most recent ITS architecture updates have been performed for the Grand Forks-East Grand Forks MPO and the NDDOT.

**ITS ARCHITECTURE TRAINING.** Regional and statewide ITS architectures are meant to be actively used as tools for the deployment of ITS projects. Information in the ITS architecture, such as operational concepts and functional requirements, serve as starting points for key steps in the systems engineering process that is required for ITS projects. ATAC researchers recently developed and performed training for NDDOT and MPOs to familiarize staff with the architecture and its use, as well the systems engineering process. The training focused on using Turbo Architecture, a software application that supports the development of statewide, regional, and project architectures; and using the NDDOT Systems Engineering Checklist.

**ITS EQUIPMENT/PROJECT EVALUATIONS.** Transportation agencies install various types of equipment and systems to assist in their operations, maintenance, and planning activities. Typically, these agencies lack the time or resources to evaluate the effectiveness of these systems. ATAC researchers have assisted the NDDOT in evaluating non-intrusive traffic detection equipment and the two fixed automated spray technology (FAST) systems. These evaluations will assist the NDDOT and other transportation agencies by providing information related to the limitations and capabilities, as well as the cost effectiveness of these systems.

## TRAFFIC OPERATIONS

**I-94 EXIT 161 OPERATIONAL ANALYSIS.** Operational deficiencies along Centennial Road/Bismarck Expressway near I-94 (Bismarck, ND) have been developing in recent years. ATAC assisted the NDDOT in assessing the operational performance of the existing conditions and future planning horizons with various geometric and traffic control configurations. The major components of the analysis included determining the morning and afternoon peak-hour conditions for the 2009, 2024, 2035, and 2059 planning horizons. Key measures of effectiveness (MOE) from the analysis included network delay, intersection level of service (LOS), and queue length. The analysis recommended several short-term and long-term improvements to the corridor for improving traffic flow.

**FARGO-MOORHEAD INTERSTATE OPERATIONS STUDY (PHASE I).** Operational deficiencies along the freeway system within the Fargo-Moorhead metropolitan area have been developing at various areas. ATAC assisted the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) by assessing the peak-hour operational performance of the existing

conditions (2008), 2015, and 2025 planning horizons. The main effort of the study consisted of constructing a simulation model of all the freeway interchanges within the metropolitan area; calibrating the model to reflect the base conditions (2008); and using the model to estimate the operational conditions and more importantly identify the areas of deficiency for the future planning horizons. The results of this analysis will be used as a starting point for phase two of the project, which will identify various types of improvements that can be made to enhance freeway operations for the long term.

**GRAND FORKS – EAST GRAND FORK SCHOOL SAFETY STUDY.** ATAC continued its effort of improving school zone safety by conducting pedestrian safety and traffic circulation evaluations at three schools in Grand Forks and East Grand Forks: Lewis & Clark Elementary (Grand Forks, ND), West Elementary (Grand Forks, ND), and New Heights Elementary School (East Grand Forks, MN). The main objectives were to evaluate pedestrian safety and traffic circulation at each of the schools and provide short- and long-term improvement strategies. Areas of analysis included traffic control (pavement markings, signage), pedestrian activity, parking issues, and pick-up/drop-off areas. Each school's existing conditions were documented based on site visits, so recommendations could be made regarding any potential improvements. The study provided several short- and long-term engineering solutions for each school. In addition to these engineering enhancements at each of the schools, other aspects such as education and enforcement were discussed.

## METROPOLITAN TRANSPORTATION PLANNING

ATAC houses the regional travel demand models of the three metropolitan planning organizations in North Dakota. As such, ATAC provides, maintains, runs and updates these models to support transportation planning activities. The multi-year partnership is supported by the NDDOT, the Grand Forks-East Grand Forks Metropolitan Planning Organization, the Fargo-Moorhead Metropolitan Council of Governments, and the Bismarck-Mandan Metropolitan Planning Organization. During the 2008-2009 fiscal year, ATAC performed the following projects:

- Updated the Grand Forks – East Grand Forks MPOs Regional Travel Demand Model to account for modifications to the downtown area. These changes were performed to provide more realistic travel patterns in the downtown area, especially along Demers Ave. and the downtown Red River bridges.
- Updated the Fargo-Moorhead Metropolitan Council of Government's (Metro COG) Regional Travel Demand Model to account for modifications to the downtown area. These changes were performed to provide more realistic travel patterns in the downtown area, which will assist in the NP Ave./1st Ave. N. one-way pair study.
- Assisted Metro COG by providing traffic projections (2035) to support their long range transportation plan. These projections are used for road and traffic management planning.
- Completed an analysis to assist in the Fargo-Moorhead Interstate Operations Study (Phase I). Using the regional model, ATAC staff developed peak-hour trip tables, which were used in the microsimulation model.
- Used the Bismarck-Mandan MPO's Regional Travel Demand Model to generate traffic projections (2035) to support the long range transportation plan. These projections are used for road and traffic management planning.
- Completed an analysis to assist in the NDDOT I-94 Exit 161 Operational Study (Bismarck, ND). The regional model was used to estimate the average daily traffic for the 2024, 2035, and 2059 planning horizons.

## PUBLIC TRANSPORTATION

**NDINFO.ORG LAUNCHED.** UGPTI worked with NDDOT to develop an on-line transportation service directory that enables individuals to access information about available transit services across the state of North Dakota. The effort is intended to improve mobility by providing easier access to passenger transportation service information. A website was developed that included information about transportation service providers, maps and an itinerary builder.

**BIODIESEL USE IN FARGO-MOORHEAD MAT BUSES.** UGPTI teamed with the Fargo-Moorhead Metropolitan Area Transit (MAT) to determine how beneficial biodiesels really are. MAT has been using biodiesel mixed fuels in its buses for more than a year and is examining how the effects biodiesel has had on its bus fleet and the Fargo-Moorhead community. SURTC researcher Del Peterson examined the direct effects of the F-M MAT using biodiesel mixed fuels. He interviewed MAT and city officials to identify changes they have seen since the switch to biodiesel from both a bus fleet and public relations perspective. The study found that the switch to biodiesel has been a success. Minimal maintenance problems have occurred, and marketing of their biodiesel use has resulted in considerable positive exposure throughout the community. There was little or no decrease in fuel efficiency. The study also revealed the high costs of maintaining "cutaway" buses and indicated that MAT maintenance staff has done an excellent job of controlling costs.

**GAS PRICES AND EFFECTS ON BUS RIDERSHIP.** A 10 percent increase in gas prices can lead up to a 5 percent increase in transit ridership according to a study by researcher Jeremy Mattson, but so far, other factors, such as service changes, can influence ridership even more. The increase in ridership brought about by the higher gas prices is not enough to cover the increased fuel expenses for transit agencies, he says. Travel behavior has generally not been too responsive to changes in gasoline prices, but as prices continue spiraling upward, motorists could become more responsive to the higher costs. Mattson's study analyzes data for small urban and rural transit systems in the region.

**WHAT'S THE BEST FIT?** Agencies that provide transit in small urban and rural areas are being encouraged to coordinate their services. In some areas, all transit has been consolidated with one agency. Some agencies serve one community or county while others serve an entire region. Researcher Dave Ripplinger is trying to determine ways in which transit services can be organized to work best in certain communities or circumstances. "Properly organizing services is a way to most efficiently meet widely varied mobility needs of rural areas," he says. He is looking at costs of various organizational structures and studying the economies of scale, scope, density and capacity of transit agencies. He is using the information to develop a planning framework for policy makers and regional administrators.

**RURAL TRAVEL DEMAND BY MODE.** Researchers are surveying residents in North Dakota and northwest and west central Minnesota to learn more about how they choose modes of transportation including: automobile, bus, train, transit, van, and air. They are gathering information on how often respondents use each of these modes for trips of 30 to 500 miles. The researchers will ask questions related to gas prices, travel distances, travel times, fares, service frequencies and the need for transfers. They will also gather demographic information and information on personal attitudes and preferences. "With that information, we can estimate the likelihood that people would choose a given mode of transportation based on the price of gas, travel distance, personal characteristics and attitudes, service frequencies, and other factors," noted researcher Jeremy Mattson. "The results will provide some information regarding the need for different forms of transportation and how resources should be allocated to improve the intercity transportation system in the region."

**TRANSIT'S ROLE IN SMALL URBAN SPRAWL.** Urban sprawl has become a growing concern across the country. However, researcher Del Peterson is exploring an area that has received little attention: the effects of sprawl on small urban areas. The research project is funded by the USDOT's University Transportation Centers program. Peterson hopes that this project will provide concrete ways for small urban areas to address sprawl. The project will include small urban communities in SURTC's service region. Transit agencies are being surveyed to provide data about the current adaptations transit has made to accommodate sprawl. The research will help identify steps that need to be taken by small urban transit providers to include the sprawl areas in their transit plan. The initial study will aid in the development of case studies which will be to gain insight into the small urban sprawl and the effects on surrounding areas.

**STUDY IDENTIFIES DISPARITY IN PORTION OF INCOME SPENT ON FUEL.** A study on the relative impact that rising fuel prices have on Native Americans supports calls for alternative transportation options, particularly transit, in areas with high Native American populations. "Given the lack of transportation options other than personal vehicles, the distances involved and the low incomes in these counties, we found that people in Native American counties spend a significantly higher portion of their income on transportation," researcher Jon Mielke said. "In one county, residents spent up to 30 percent of their income on vehicle fuel. Although the percentage has declined with fuel prices, the differences between urban, high-income counties and rural, low-income counties are still there, and the problem will become more acute when higher fuel prices return," Mielke said. The information was presented to the American Public Transportation Association and to the National Tribal Transportation Conference.

**STUDENT ATTITUDES AND USE OF TRANSIT.** Researcher David Ripplinger continued to survey NDSU students on their attitudes toward transit and their use of campus and municipal transit services. The same group of students has been surveyed each of the past four years to monitor any changes in attitudes or behavior regarding transit. "The survey will allow us to be much more confident in determining why students do or don't use transit," Ripplinger says. In addition, the information will be useful as NDSU and other campuses look at enhancing and marketing transit services.

**RESEARCH IDENTIFIES TECHNOLOGY FOR COORDINATION PROJECT.** Technology will play a key role in an effort among transportation providers in southwest North Dakota to coordinate their transportation resources. Researcher David Ripplinger is assessing available technology and assembling a list of system requirements. The work is part of an effort, called the Roughrider Travel Management Coordination Center, to implement an innovative, community transportation system in the region that features improved coordination and use of intelligent transportation systems (ITS). The goal of the project is to improve the efficiency of transportation systems in the region including K-12 student transportation, public transit systems, and human service transportation providers. "The purpose of the center is to serve as the technological hub of a regional, coordinated transportation system that meets the mobility needs of individuals in southwest North Dakota," Ripplinger says. "It would act as a mobility brokerage, matching riders with the appropriate service, and as an information clearinghouse, providing timely, accurate information." The project working group includes members from the ND Department of Transportation and the ND Department of Public Instruction, as well as the Dickinson Public School District, the Dickinson City Council, and Elder Care, the local public transit provider.

**NEW TOOL FOR MEASURING TRANSIT SUCCESS.** Because of a lack of uniform data collected from rural and small urban transit agencies, those agencies have been unable to make comparisons among themselves that would help them measure performance. The most recent federal transportation bill mandated the collection of select service and financial figures from all recipients of federal funds for transit service in rural and small urban areas. The resulting resource is

the Rural National Transit Database. Researchers applied statistical analysis techniques to the data and found that the database will be useful as a consistent, uniform national dataset. The research proposes a means for selecting peer agencies for comparison and suggests additional data that could be collected that would make comparisons more valuable for transit agencies assessing performance and agencies charged with overseeing expenditures on transit.

**RFID FOR SMALL TRANSIT AGENCIES.** Researcher Jim Miller is studying applications for Radio Frequency Identification Tags (RFID) in small urban and rural transit agencies. In the pilot project in Pierre, SD, passengers will use RFID-based passenger ID cards in demand-response systems to allow positive identification of persons that cannot give accurate information to drivers (very young children, persons with cognitive disabilities), and to allow for more innovative fare payment options. Partners in the project include River Cities Public Transit, South Dakota Department of Transportation, Shah Software, Greyhawk Technologies, and Alien Technology.

**ASSESSING TRANSPORTATION NEEDS OF PEOPLE WITH DISABILITIES.** Researchers will develop a statewide snap-shot of needed community transportation for adults with disabilities in North Dakota and establish a method for gathering this information on a recurring basis. The effort may also provide a method that could be used in other states.

**SURVEY ASSESSES MOBILITY NEEDS AND AGING.** Researchers analyzed the results from the transportation section of a survey conducted by the AARP to learn about mobility and other concerns of the members in North Dakota. Researchers wanted to learn how informed and satisfied older adults are with their transportation options, how often they make different types of trips, if they desire more trips, and if lack of transportation limits the trips they make, what improvements they would like to see made for them to stay in their neighborhood as they age, and what problems they encounter when using public transportation. The survey shows that most AARP members in North Dakota continue to drive and they are more satisfied than dissatisfied with their transportation options. Although many drive, public transportation is important for certain segments of the population; and transportation becomes more of a limiting factor as individuals age.

**PUBLIC TRANSPORTATION AND ACCESS TO HEALTH CARE.** Access to transportation is a critically important aspect of health care use. UGPTI research will examine how access to public transportation influences access to health care in North Dakota. The issue is particularly important in North Dakota where people travel long distances to reach health care facilities and the population is characterized by a growing proportion of elderly. Researchers will survey individuals to gather data on how distance from health care providers impacts individuals' ability to access health care services and how access to public transit can improve their ability to obtain health care. The study will identify areas that have a demand for more public transportation and will investigate ways in which transportation services could be enhanced.

**EVALUATING COSTS TO RIDE OR RELOCATE.** Many aging individuals prefer to age in their homes and home communities while critics of public transportation argue that the cost of providing transportation to facilitate this desire is too steep. Researchers are quantifying the cost of riding transit in rural areas of North Dakota versus relocating to larger communities. They are reviewing existing information associated with transit costs and the cost of moving to an assisted living center or a nursing home. Finally the research will quantify the cost of riding transit versus relocating to the eight largest communities in North Dakota: Fargo, Bismarck, Grand Forks, Minot, Dickinson, Jamestown, Williston, and Devils Lake. "Our research will help determine tradeoffs between riding and relocating and develop a framework to show at what point it is more beneficial to relocate versus ride," says researcher Del Peterson.

## AGRICULTURAL RESEARCH

**NORTH DAKOTA GRAIN MOVEMENT TRACKED.** The Agricultural and Industrial Freight Center summarizes grain movement reports from each elevator in North Dakota to describe the distribution patterns and shipment characteristics including destination, mode (rail or truck), origin, time, and commodity. Annual reports and monthly updates are used to encourage competition within the grain industry and to identify research needs and market trends.

**RAIL UPDATES.** The UGPTI provides the USDA with updated market and service information for the rail section of the weekly Grain Transportation Report.

**WORK ZONE STUDY.** The focus of this research was to meet the growing need for accurate and practical methods to support traffic analysis in work zones. Road construction and maintenance activities have become a common feature for many U.S. roads over the last few years due to aging infrastructure. This research examined the application of two classes of traffic analysis models, macroscopic sketch analysis (QuickZone) and microscopic traffic simulation (Dynasim and VISSIM), to evaluate the traffic impacts caused by work zone activities. The research evaluated the application of these tools to an urban interstate work zone. Specifically, this research examined the following: 1) how the use of traffic analysis models relates to federal requirements about considering traffic impacts of major construction projects, 2) the accuracy of model results in comparison to real-world conditions, and 3) modeling effort and data required.

# FEATURES

## ADVANCED TRAFFIC ANALYSIS CENTER:
### Researchers Evaluate Automated Anti-Icing Systems

Thousands of dollars are saved and the number of crashes is being cut by half or more because of two bridge anti-icing systems installed in Fargo and near Buxton, according to a study by UGPTI's Advanced Traffic Analysis Center (ATAC).

Frost, ice and snow cause dangerous driving conditions in North Dakota, especially on bridge decks where cold air flowing underneath the structure can freeze moisture more easily than on roadways. For this reason, the North Dakota Department of Transportation (NDDOT) installed fixed automated spray technology systems (or FAST systems) at a bridge with a high crash rate on I-29 near Buxton, ND, in 2002 and on the I-94 Red River Bridge connecting North Dakota and Minnesota in 2005. The systems were marketed as a way to improve roadway safety and reduce maintenance costs, even though no formal study had demonstrated the claim prior to the two systems installations.

With the support of the NDDOT, ATAC studied how the systems work, how the systems are performing, and their costs versus benefits. The information from the study will help the NDDOT evaluate future systems within North Dakota, according to ATAC director Shawn Birst.

"There was significant interest in the results because the NDDOT had delayed future installations until the study was complete," Birst added.

The data provided proof that the FAST systems have helped reduce crashes on the bridges significantly. Prior to installation, the Buxton Bridge was consistently ranked in the state's top 5 Interstate crash sites. Now the bridge is no longer included in the list and has experienced a 66 percent reduction in crashes. The statistics also show the number of crashes on the Red River Bridge was cut in half since the system's installation.

Other key points of the study included:

- **System Capabilities:** The Fargo District, which oversees both systems, said both systems have operated as expected in terms of spraying at the right time and applying the proper amount of chemicals. It is estimated that the systems are at least 95 percent reliable and are particularly useful in treating frost conditions prevalent during the early morning hours in fall and spring.
- **System Limitations:** The FAST systems have evident limitations. When the wind is greater than 15 mph the systems are not used because high crosswinds can cause snow drifting across the roadway, which may stick to pavement that is wet from anti-icing chemicals. The system is also not used when the pavement temperature drops below 12F. Although the manufacture's claim the anti-icing chemical (Cryotech CF7) is effective to temperatures below -20F, the amount of chemical required for the low-temperature situations would be significant and, if enough was not used, traffic safety could be compromised.
- **Benefit/Cost:** The benefit-cost analysis was favorable for both sites. The major benefit is the amount of money saved from the reduction in crashes and annual maintenance costs, while the costs included the installations of the systems, anti-icing chemicals and system maintenance. Nonetheless, the benefits are expected to outweigh the cost 4.3 to 1 and $1,257,869 will be saved over a 20 year period at the Buxton Bridge. At the Red River Bridge, a net benefit of $675,184 is expected, with a benefit-cost ratio of 1.3 to 1.

Although the FAST systems work well overall, Birst still recommends the NDDOT individually study potential sites before implementing FAST systems. In addition, he emphasized that training on proper operating and maintenance procedures from the systems' vendor, Energy Absorption Systems Inc, is very important to the success of the system, especially during the first year.

## BIENNIAL STRATEGIC FREIGHT ANALYSIS CENTER:
### Working to Enhance North Dakota's Freight Transportation System

The Strategic Freight Analysis Center works closely with the North Dakota Department of Transportation to identify current issues of interest in freight transportation. The Center has in the past analyzed intermodal shipping, truck size and weight issues and in the last and current studies is analyzing the flow of freight on the state highways. Economic vitality relies on an efficient transportation system. Evaluating traffic and freight flows helps the NDDOT in planning for construction and maintenance projects. Data is key in planning for an efficient freight transportation system in North Dakota.

In 2009, the NDDOT contracted with the UGPTI's Biennial Strategic Freight Analysis Center to study the origin and destination of freight moving on North Dakota's highway system. The study will provide information to the NDDOT that may help North Dakota develop an improved freight transportation system that strengthens economic productivity.

This analysis, along with other data continuously gathered by the DOT and others, will complement previous studies conducted by the center and will provide clarity about the movement of freight on North Dakota's highways. This analysis will focus on primary data while the previous biennium presented mostly secondary data from several sources. Last biennium, the analysis was two parts, with the first part focusing on North Dakota's connection to the rest of the world, and the second part focusing on what happened within the state. The first part completed in 2007, developed

information regarding freight flows that originate, terminate and pass through North Dakota and identified major freight corridors and facilities. In 2008, the second part of the report was completed, analyzing economic trends and changes in North Dakota freight volumes and flows.

An accurate picture of localized highway freight movement can help NDDOT prioritize highway development and maintenance and will fill gaps that exist in data about how the state integrates with regional, national and global freight systems. Currently, the center is reviewing literature, and will use a variety of methods to gather data. This will include using NDDOT average daily truck traffic calculations, surveys and interviews. Data gathered from NDDOT safety inspections is ideal for estimating freight flows. It provides a good sampling of truck information about origin and destination and the routing decisions by motor carriers as they move through the state.

Key data from the last biennium of the study included:

- Intrastate Shipments: The majority of freight movement happens within the state's borders. Data shows that in 2006, over 108 million tons were moved between locations in North Dakota. This number accounts for almost 62 percent of the shipments sent within the state and 77 percent of the shipments received.
- Origination Shipments: The top states that received freight from North Dakota are Minnesota, South Dakota, Wisconsin, New York and Kentucky. The amount of shipments sent from the state in 2006 was over 176 million tons, with over a third sent to outside states.
- Terminated Shipments: North Dakota's top suppliers are Montana, Minnesota, Illinois, South Dakota and Wisconsin. In 2006, the state received shipments equaling over 140 million tons, with about 20 percent of the total shipments coming from other states.
- Foreign Shipments: The greatest volume of international trade is with our North American neighbors, Canada and Mexico. Canada is North Dakota's number one international trading partner, accounting for almost 50% of North Dakota's foreign trade. In 2006 the partners exchanged almost $2.2 billion worth of goods, and North Dakota exports to Canada were $690 million and imports were an estimated $1.5 billion. In 2006, North Dakota exported $6.4 million of goods to Mexico and imported $42.5 million of product.
- Freight Products: Agriculture is the most common product transported to and from the state. The top products shipped in 2006 were coal or petroleum, cereal grains, crude petroleum, other prepared crops, fats and oils.

The origin/destination study is expected to be completed in December 2011.

## SMALL URBAN & RURAL TRANSIT CENTER:
### Rural Transit Management Training has National Interest

National demand is growing for a course designed by UGPTI's Small Urban & Rural Transit Center to train rural transit managers.

Since the three-day course was launched almost two years ago, it has become popular with several state transportation departments. The course has been presented at the national conference of the Community Transportation Association of America. The schedule is booked until June 2010 with a waiting list of attendees. Colorado, Iowa, Oregon, Minnesota and Texas have scheduled courses and many other states have expressed interest.

After Bruce Fuchs, North Dakota Transit Program Administrator for the NDDOT, attended Principles of Transit Management in July 2009, he said that it provided great resources for transit managers and covered a variety of transit topics in depth.

"I believe that this a course that all transit operators could benefit from taking regardless of their years of experience," Fuchs said.

The workshop, originally titled "Introduction to Transit Management," was designed to train transit managers who had been in the field less than five years, but after testing the course in Alaska it became clear it was beneficial regardless of the managers' experience.

Carol Wright, SURTC's associate director for training and outreach, credits the workshop's success to its ability to reach an audience that was previously underserved. "Most individuals who become transit managers of rural or small urban transit systems do not start out planning and training to prepare themselves for these positions," Wright points out. "Often they have fallen into the position through a series of events."

"In a big city you'll have different people running finances, human resources and other departments," Wrights says. "If you're a director of a smaller agency, those are all your hats."

The course provides managers with a base of information and resources to assist them in navigating through a maze of transit management responsibilities. For those who have managed transit programs for a short time, the course provides exposure to key elements of management and transit program assessment that they previously may not have taken the time to address.

*Principles of Transit Management* is broken into individual modules including:

- Human Resource Management
- Financial Management
- Administration
- Operation & Service Design
- Procurement
- Vehicle & Facility Maintenance
- Safety, Security and Emergency Management
- Drug & Alcohol Program Compliance

Each workshop is open to 25 people and typically runs eight hours per day for three days. When requested, SURTC will revise the program to focus more heavily on certain areas or will do a day-long workshop for large groups on a particular module.

To engage participants, the trainers use a variety of techniques including videos, group discussions and polls. Polls are conducted using TurningPoint Technology, a responder device which allows each participant to answer questions anonymously. The device sends a signal to the trainer's computer, allowing them to instantly show the class the results. This helps focus the discussion and fosters an open dialogue between participants, Wright notes. "When it's anonymous, people are honest with their answers and it keeps everyone involved in the process."

Perhaps the workshop's biggest asset is the 600-page training and resources manual participants can take back to the office with them.

The manual features:

- A section on each of the eight modules.
- Checklists designed to assist transit managers in evaluating their current operations
- Reference materials, including: a complete transit glossary, sample policies and forms, and links to other resources, etc.
- CDs which provide copies of all forms, the tools necessary for drug and alcohol recordkeeping, a customizable employee handbook, and information on the rules and responsibilities of the Board of Directors.

Wright is currently developing an Advanced Transit Management workshop and manual.

## AGRICULTURAL AND INDUSTRIAL FREIGHT CENTER:
### Economics of ND Corn Transportation

Grain elevators in North Dakota have two options for grain transportation – trucking or the railroads – and cost plays an important role in determining which form of transportation will be used.

However, several other elevator and shipment characteristics play an important role in how grain is moved within and across state lines. Those characteristics determine whether an elevator can take advantage of shuttle rates, whether additional shipments are needed and determine the nature of services available.

UGPTI's Mountain-Plains Consortium is working on a project that examines the competition to transport grain between trucks and railways. The study focuses on providing an estimate of the elasticity of demand for truck and rail transportation from North Dakota to major corn markets. Elasticity of demand is a measure of how responsive demand is to changes in price.

While previous studies have focused on the supply and demand of small grain transportation, the study, expected to be completed by spring 2010, focuses on transportation of corn. An increased demand for corn as an input for ethanol production has contributed to the growth in corn production in the state over the past decade.

A key point of the study is whether or not fuel prices effect the cost of transportation services. Whether rates are affected depends on how shippers respond to changes in rates, notes lead researcher Alan Dybing. If demand is relatively unaffected by rate changes, fuel price increases are passed on to transportation buyers through increased prices, but if demand fluctuates when rates rise and fall buyers will not carry the burden of an increased rate because the truck and rail industry will absorb more of the cost to maintain volume.

Dybing notes that distance plays an important role in what mode is selected for transportation. Trucks generally have a competitive edge for short distances, while rail can provide lower rates for long distances, he says. By identifying optimal combinations of railroad and truck services the study will pinpoint North Dakota elevators minimum cost of transporting quantities of corn to a range of destinations.

The study will utilize a derived demand model to estimate the demand for corn transportation from North Dakota to Minneapolis, the Pacific Northwest and the Gulf of Mexico. It will be based on data spanning from 1998 to 2008.

Data is being collected from the following sources:

- The North Dakota Public Service Commission– The commission's grain movement database will serve as the primary data source. Additional data will be obtained to assess the impact of storage capacity, rail capacity and other service characteristics on mode usage.
- The Canadian Pacific and BNSF Railway rate data
- A survey of North Dakota elevator managers on truck rates and additional shipment characteristics.

## MOUNTAIN-PLAINS CONSORTIUM:
### Project to Improve Indian Reservation Road (IRR) Planning

UGPTI's Mountain-Plains Consortium is providing road planners for the nation's Indian reservations with tools for assessing and planning road systems.

Researchers are creating software to convert existing data to a format compatible with the analytical tools used by state and federal agencies to evaluate roads. The software is in the testing stage and expected to be completed by winter 2010.

"The goal for the Indian reservations is to provide the best transportation possible," noted lead researcher Doug Benson. "This work is the first step toward using sophisticated analysis tools used by state and national transportation agencies, and taking it and applying it to the Indian transportation agency."

Indian reservations in the United States have a road network of about 50,000 miles. About half of the miles are under the jurisdiction of state, federal and local highway agencies, while the rest, the Indian Reservation Roads network, is controlled the U.S. Bureau of Indian Affairs.

Researchers are working to convert the IRR data to more closely match the Highway Performance Monitoring System (HPMS), a database used nationally by transportation agencies to track specific information, including road safety statistics, road surfaces and dimensions, road conditions and daily traffic rates.

The data from HPMS is used in the Highway Economic Requirements System – State Version, one of the major analytical tools used by highway planners to evaluate the remaining life of roads, to prioritize repair and reconstruction projects, to assess safety concerns and to develop plans for road and highway investment.

"The software program should help reservation road planners with investment analysis. For example: If we put $500,000 into a road, the system should evaluate the improvements we'll get from that investment," Benson said. The asset management capabilities provided by these tools is critical to a road network that meets needs in a cost-effective manner, Benson noted.

# NORTH DAKOTA TECHNICAL ASSISTANCE PROGRAM/ TRANSPORTATION LEARNING NETWORK:
## Addressing Rural Road Safety through Partnerships

With crash rates, injuries and deaths much higher per vehicle mile traveled on rural roads than urban roads, the North Dakota Local Technical Assistance Program (NDLTAP) helped sponsor a Rural Roads Safety Solutions Workshop in November. To give local road professionals tools to address the problem, NDLTAP teamed with the Northland Chapter of the American Traffic Safety Services Association (ATSSA), the Minnesota Department of Transportation and the Minnesota Local Technical Assistance Program on the project.

According to the Federal Highway Administration, the majority of highway fatalities take place on rural roads. Rural roads account for approximately 40 percent of the vehicle miles traveled in the U.S., but almost 57 percent of fatalities. According to recent data, 23,260 people were killed in rural crashes in 2007 and the fatality rate for rural crashes is more than twice the fatality rate in urban crashes.

"ATSSA was looking for a way to get information out and we offered the ability to reach an audience that deals directly with rural roads," notes Dave Levi, NDLTAP program manager. Participants in the event included more than 100 county and state transportation officials and transportation consultants who work with those officials. Many participated via video conferencing over the Transportation Learning Network as well as the Minnesota Department of Transportation's video network. The workshop was broadcast to 34 sites in Minnesota, Montana, North Dakota, South Dakota and Wyoming.

Using the video networks was critical so that those who are most often responsible for rural road safety could attend. "Time away from the county or city as well as travel expense is a limiting factor for many of these individuals," Levi said. "The video networks provided a cost-effective way for them to participate in the workshop."

The workshop included an overview of rural road safety problems and an overview of 15 critical strategies as identified in the Minnesota Strategic Highway Safety Plan and the Minnesota Comprehensive Safety Program. Presenters also identified specific strategies that engineers could employ to improve rural road safety. In addition, the workshop included a "Putting Safety into Practice" session that focused on funding, stakeholder involvement, creating a culture of safety, local policy solutions and case studies.

While some high-tech solutions were discussed, many of the safety improvements identified were low-tech, relatively low-cost strategies, Levi noted. "Traffic control devices and signage was a major topic," he said. "The Manual of Uniform Traffic Control Devices provides instruction, but the problem is, not everybody reads and applies the manual in the same way, so when you cross a county line, hazards such as intersections and curves may not be signed in the same way." Levi noted that local budgets can also have an impact on the use of road signs.

Inconsistent sign usage is particularly a problem at night when curves, intersections and other hazards are less visible and on township roads where budget considerations may limit sign use, maintenance and upgrades. "Consistency in signage across counties would be a big step forward," Levi said.

Other strategies discussed include improvements to pavement markings, lighting, sightlines, rumble strips, shoulders, turn lanes and general maintenance. "Many times, simple low-cost solutions are the best approach to reducing rural accidents and fatalities," Levi said.

## DEPARTMENT OF TRANSPORTATION SUPPORT CENTER:
### Driver Behavior Simulation

Providing safer transportation systems is a prime objective of the NDDOT and the ND Highway Patrol. Enhancing safety to the traveling public is addressed through three primary efforts: education, enforcement and engineering. The NDDOT promotes driver safety through engineering and education. According to the NDDOT crash data, almost 10 percent of all crashes between 2001 and 2007 involved drivers aged 75 and older. These drivers account for only about 8 percent of the driver population. The over representation of older drivers in crashes is of special concern given population trends in the state.

Simulators offer a controlled, yet reality-based, environment for conducting driver research. Measures such as reaction time, pulse rate, stopping time, vehicle handling skills, and head motion provide important information about driver reaction to alternative driving scenarios. The simulator makes it possible to test reactions to situations that may be potentially hazardous if attempted in an on-road evaluation.

"Drivers of all ages depend on highway signing for guidance and traffic control'" notes Kurt Johnson, director of the Department of Transportation Support Center (DOTSC). "Placement of signs along the roadside is done under the guidance of the Manual on Uniform Traffic Control Devices (MUTCD). Within North Dakota there are literally thousands of roadside signs. The challenge is to design and place them at optimal locations for all drivers."

One method to investigate differences in sign observations between younger and older drivers is by testing different scenarios on a driving simulator. DOTSC and the UGPTI's Rural Transportation Safety and Security Center initiated a research project through the Mountain-Plains Consortium in collaboration with NDSU's Center for Visual Neuroscience to test driver response to rural intersection guidance. The project will investigate light level, sign distance from intersections and the presence of advance warning signs. Two pools of drivers will run through 36 different combinations of signage. At this time the computer generated scenarios are near completion and the actual testing is about to commence.

## RURAL TRANSPORTATION SAFETY AND SECURITY CENTER:
### Study Shows Rural Drivers use Seat Belts about Half the Time or Less

Less than half of drivers in rural North Dakota use their seat belts, according to a pilot study conducted by North Dakota State University researchers with the Upper Great Plains Transportation Institute.

During the study, trained observers at 149 sites in rural communities and on rural highways across the state observed drivers to determine if they were wearing seat belts. In the 6,919 observations, 44 percent of drivers used seat belts. Seatbelt use was most prevalent in the Northeastern part of the state at 49 percent while western and southern regions of the state had observed seatbelt use at 34 and 31 percent respectively. On rural highways, average seatbelt use was higher, at 56 percent, than in rural towns where the use rate was 33 percent.

"Rural injury and fatality crash rates are significantly higher than those in more urban areas," notes Kimberly Vachal, director of the Upper Great Plains Transportation Institute's Rural Transportation Safety and Security Center. "Road improvements and vehicle technology offer some promise of reducing crash risks for drivers and passengers, but and increased use of seat belts offers immediate and low-cost injury protection."

The study was designed to provide insight on use of seat belts in rural areas of North Dakota. All of the observations were made at least 20 miles from the nearest Interstate Highway to try to capture an accurate snapshot of seat belt use in rural areas. The observations were conducted to coincide with high visibility enforcement activities conducted in some counties in May. The researchers saw a 30 percent increase in seat belt use after the activities.

"This pilot study will provide a baseline for future studies to assess enforcement, education and other activities targeted at increasing seat belt use," Vachal says. "Targeting time and effort on methods that work best for increasing seat belt use will have a direct impact on reduced fatalities and injuries on Norht Dakota's rural road system."

Of the drivers observed, 4,478 were male and were using seat belts less often than female drivers. Male drivers were wearing seat belts 40 percent of the time while females were wearing theirs 54 percent of the time. Seat belt use also varied by the kind of passenger vehicle being observed. Driver seat belt use in cars was 47 percent while it was 34.5 percent for pickup truck drivers. Sport utility vehicle and van drivers were wearing their seatbelts 50 percent and 64 percent of the time, respectively.

The researchers also collected more than 1,000 observations of passenger seat belt use. In those observations, 51 percent were wearing seatbelts. Female passengers used seat belts 60 percent of the time while male passengers used seatbelts only 26 percent of the time. Driver and passenger seatbelt use was closely related. When a passenger was present, both the passenger and driver were wearing seat belts 44 percent of the time and passenger and driver were not wearing seat belts 43 percent of the time.

## TRANSPORTATION SAFETY SYSTEMS CENTER:
### A Smarter Way to Measure Motor Carrier Safety

Federal and state motor carrier safety is getting smarter thanks, in part, to an updated commercial vehicle and driver selection algorithm being developed by UGPTI's Transportation Safety System Center (TSSC).

The Federal Motor Carrier Safety Administration is updating its business processes for enforcement and compliance activities. This new comprehensive safety analysis program, called CSA 2010, covers a full spectrum of safety issues from how data are collected, evaluated and shared to how enforcement officials can intervene most effectively and efficiently to improve safety on our roads. A key part of that updated program is the commercial vehicle and driver selection algorithm updated by the UGPTI's Transportation Safety Systems Center.

The algorithm, called the Inspection Selection System for 2010 (ISS 2010), will use the new data measures developed for the CSA 2010 program. The ISS is the primary tool used by FMCSA and state commercial vehicle enforcement personnel to screen commercial motor vehicles and drivers for inspection.

“This algorithm, in alignment with CSA 2010, will have a much greater focus on the behaviors of a company,” TSSC Director Brenda Lantz says.

In the past, the algorithm and FMCSA actions focused primarily on four broad categories to identify problem carriers. CSA 2010 and the updated ISS are based on seven Behavior Analysis Safety Improvement Categories. The new algorithm takes into account violations under the following categories:

- Unsafe driving
- Fatigued driving
- Driver fitness
- Controlled substance and alcohol
- Vehicle Maintenance
- Cargo Related
- Crashes

Previously, FMCSA was only reaching a limited number of carriers via full compliance reviews, but CSA 2010, supported by the updated ISS, will allow for early and additional intervention methods, such as warning letters, on-site focused reviews, or off-site reviews.

Lantz notes the staff with TSSC are evaluating the updated ISS to ensure that it has retained its strengths and that the program functions as expected to support the FMCSA’s new compliance analysis program.

In recent correspondence, Steve Kleszczynski, FMCSA Division Administrator for Colorado, complimented the work of the center. “FMCSA relies heavily on NDSU’s technical expertise and the programs and systems they provide and maintain to help us in our daily mission to reduce fatal crashes involving commercial motor vehicles.”

Many of us were around when we used three-ply carbon type paper to conduct our investigations. Finding a commercial driver with a suspended license was rare, producing a professional report was difficult, and issuing a uniform fine was non-existent.

“Today with the help of NDSU we utilize systems (developed by the TSSC) such as CaseRite, CAPRI, UFA, Aspen, ISS, and the CDLIS Access to carry out FMCSA’s goals in a professional manner. The new Mobile Client will continue to help our efficiency into the future.”

“The partnership between NDSU and FMCSA has been long and valued.” Kleszczynski said.

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