

NDSU UPPER GREAT PLAINS
TRANSPORTATION INSTITUTE

**2015
2017**

Biennial Highlights

www.ugpti.org



50 YEARS OF TRANSPORTATION INNOVATION

The Upper Great Plains Transportation Institute at North Dakota State University was created in 1967 to serve the people of North Dakota by examining freight rates and agricultural movements. In the 50 years since it was established, UGPTI has expanded significantly to include all modes of transportation and includes broad programs of research, education, and outreach.

SUPPORTING NORTH DAKOTA'S TRANSPORTATION NEEDS

UGPTI continues to build on its 50-year history of providing research, education, and outreach to support transportation in North Dakota. This report highlights efforts during the 2015-2017 biennium that focused on North Dakota issues and opportunities or that are likely to have a significant impact on North Dakota's citizens, businesses, and transportation system. This report covers topics as diverse as agricultural transportation, safety, transportation planning, and gravel roads.

The Institute's biennial budget for 2015-2017 was \$22.6 million, which included \$4,487,389 in General Fund dollars from the State of North Dakota. Those general fund dollars included \$750,000 in one-time funding for special projects, which included a study of the investment needs to maintain county roads and bridges.

With its focus on North Dakota, this report is not an exhaustive record of all the efforts of UGPTI's staff. Additional national and regional efforts include collaborative work with numerous universities and agencies. For more information or specific questions, visit www.ugpti.org or contact our office.

OUR MISSION

Providing innovative transportation research, education, and outreach that promote the safe and efficient movement of people and goods.

- Research. Conducting applied and advanced research in highway, transit, rail, air, and waterway transportation that addresses the critical issues of the state, region, and nation.
- Education. Educating the transportation workforce of tomorrow through multidisciplinary curricula that focus on transportation economics, management, infrastructure planning, mobility, and supply chain logistics.
- Outreach. Improving the skills and knowledge of the existing workforce through training, technical assistance, and the transfer of research results to practitioners.

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ADVISORY COUNCIL

UGPTI is advised and guided in part by an advisory council composed of representatives from various organizations, industries and agencies affecting or affected by transportation. Members represent government, municipalities, transit, contractors, agriculture, energy, business, trucking, railroads, and aeronautics. Membership of the advisory council is designated by North Dakota Century Code.

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For more detailed information on the projects highlighted in this report, visit ugpti.org. Open the online version of the report which will include links to additional information for most projects.

AG TRANSPORTATION



GRAIN AND OILSEED TRANSPORTATION STATISTICS ASSEMBLED

Since 1967, UGPTI has published an annual analysis of the patterns and methods of distributing grains and oilseeds from North Dakota. The analysis began in 1956 and was originally conducted by NDSU agricultural economists. The report provides a database for identifying trends in shipments of grains and oilseeds from the state. Data for the report are obtained from the “Grain Movement Report” submitted monthly by every elevator in the state to the ND Public Service Commission. Information is provided on hard red spring wheat, durum, barley, sunflower, soybeans, corn, canola, dry edible beans and dry edible peas. View the reports at <https://www.ugpti.org/resources/grain/reports.php?view=grain-and-oilseed>

ANNUAL NORTH DAKOTA ELEVATOR MARKETING REPORT PUBLISHED

The *Annual North Dakota Elevator Marketing Report* provides a benchmark for elevator managers in assessing performance and supplies a source for recognizing trends in the characteristics of North Dakota elevators. The report is prepared in cooperation with the North Dakota Wheat Commission and the North Dakota Public Service Commission. The statistics detailed in the report are a source of information for elevator managers and those interested in the North Dakota grain industry. In 2016-2017, North Dakota elevators had storage for 400,372,000 bushels. They shipped 956,294,000 bushels to end users. About 80,883,000 bushels were transhipped to other North Dakota elevators. For more data and statistics, visit: <https://www.ugpti.org/resources/reports/downloads/dp-298.pdf>

AG TRANSPORTATION HANDBOOK IS RESOURCE FOR PRODUCERS

The *Regional Agriculture Transportation Handbook*, published in 2015, is a convenient guide covering state and federal statutes, rules and exemptions for the agricultural industry. The handbook was developed under the sponsorship of the Federal Highway Administration, in cooperation with the Minnesota State Patrol, Montana Highway Patrol, North Dakota Highway Patrol, and South Dakota Highway Patrol. Topics include anhydrous ammonia, height and weight limits, hours of service, truck inspections, licensing and registration, special agricultural permits and provisions, and others. Information specific to each state was provided to assist producers who cross state borders in the course of their agricultural operations. Handbook printing was funded by the ND Wheat Commission, ND Corn Council and the ND Farmers Union. The state patrol was a key partner in reviewing content and using the handbook during enforcement and education activities. View the handbook at: <https://www.ugpti.org/resources/downloads/AgHandbook.pdf>

COMMERCIAL VEHICLE SAFETY



SOFTWARE TOOLS FOR COMMERCIAL VEHICLE SAFETY

UGPTI software experts developed and maintained software systems used by federal and state motor carrier safety specialists across the nation, as well as private industry professionals. The systems help ensure that vehicles are in safe condition and that their operators are properly licensed and qualified. Since 1996, UGPTI, in conjunction with the Federal Motor Carrier Safety Administration (FMCSA), has developed interrelated roadside, investigative, and analytical software programs in use nationwide. These systems are considered to be mission critical to the FMCSA, and are steadily updated and refined to reflect regulatory changes, enforcement policy changes, as well as computer technology changes. An example is the Aspen Driver/Vehicle Inspection Software used by most states and the FMCSA. Aspen runs on laptops and is used to collect inspection details and print the inspection report. It includes communication features to electronically transfer inspections to national information systems. Another example is the Inspection Selection System (ISS), the primary tool used on the roadside to screen commercial vehicles and determine the usefulness of conducting an inspection. For a full list of applications and descriptions, visit: <https://www.ugpti.org/research/projects.php?view=32>

DEVELOPMENT OF A WIRELESS ROADSIDE INSPECTION SYSTEM

In conjunction with the Analysis, Research, and Technology division of FMCSA and the Oak Ridge National Laboratory, UGPTI researchers worked to demonstrate the feasibility using secure wireless communications to assess the safety compliance of trucks and buses while they are traveling at highway speeds. The system would allow assessments of truck and bus drivers and vehicles up to 25 times more often than is possible using current approaches. The system would check commercial driver's license status verification, carrier out-of-service and operating authority verification, as well as conduct checks of vehicle lights, weight, and brakes. The program will evaluate the potential benefits to both the motor carrier industry and the government.

ANALYSIS OF SUSPENDED CDL HOLDERS

In an effort to improve commercial driver's license enforcement, UGPTI researchers worked with the Federal Motor Carrier Safety Administration and two research consulting companies to assess the percentage of suspended CDL holders not detected at roadside inspections and the percentage of CDL holders suspended for safety reasons versus those suspended for non-safety reasons. They examined three months of 2015 inspection data from the Federal Motor Carrier Administration, which included 553,456 unique driver's license numbers. These driver's license numbers were submitted to the Commercial Driver's License Information System (CDLIS) to obtain the driver history of convictions and withdrawals. That information was compared with the outcomes of roadside inspections. More than 2,800 drivers were operating with an invalid CDL (suspended, revoked, or otherwise withdrawn) at the time of inspection, according to CDLIS. Results show that the percentage of suspended CDL holders who are not detected at roadside inspections can range from 89% to 96% on a national level. Further review of information revealed that of all the drivers suspended, revoked, or whose CDLs were otherwise withdrawn and were inspected, 88% had lost their CDLs for safety reasons. The findings point to serious safety concerns. Whether due to data lost between adjudication and disqualification for drivers charged and convicted for significant offenses, or systemic failures in detection of disqualified drivers at roadside inspection, the outcomes are the same; commercial drivers who should not be permitted to operate are driving.

GRAVEL ROADS



GRAVEL ROAD WARRIORS ARMED WITH KNOWLEDGE

North Dakota's 60,000 miles of gravel roads are getting a makeover thanks to diligent efforts of county and township employees, "gravel road warriors," who are learning new techniques and technology from UGPTI outreach.

In the past 100 years, the network of county and township roads has grown from less than 20 miles to a complex grid that serves industry and agriculture. Many of those roads were constructed when single-axle 1½- and 2-ton trucks carried grain to the local elevator. Today, those roads may carry oil drilling rigs and semi-loads of corn, beans, and wheat.

UGPTI launched a multi-pronged approach to helping counties and townships improve gravel roads. The primary focus areas have been:

- Making sure gravel roads have the proper slope (about 4% is optimum) to shed water. Water infiltration is a major cause of road deterioration and failure.
- Teaching specifications for purchasing and improving gravel on roads. Quality gravel makes a quality road. Ensuring that gravel has some clay content will improve gravel structure and assure that gravel stays where it is supposed to.
- Eliminating "pretend grading." This is blading a road when it should not be done. Roads should only be bladed when conditions warrant it, not on a schedule of once a month or once every two weeks.
- Improving motor grader operation. Smoothing rough roads, establishing slope, reconditioning shoulders, and reclaiming gravel from ditches are key operations

McHenry County Commissioner Bryan Bruner has been to several UGPTI training events and is working with blade operators in his county to implement recommendations. "They've has shown us that blading when it's dry pulverizes the material and all that pulverized material just turns to dust. It's cheaper in the long run to avoid blading when we don't need it."

MOTOR GRADER OPERATOR TRAINING IMPROVES ROADS

UGPTI offered motor grader operator classes across the state to provide hands-on training in familiar equipment and under local conditions. Last summer, UGPTI held a motor grader operator training session in Barnes County. The two-day session included a full day of classroom training and a second day of hands-on training in the field. Later in the summer, the instructor returned to the county to work with operators on problem areas. “Within a few days, I had a call from one of the townships that we do blading for, to compliment our operator on the job he was doing on intersections,” Road Superintendent Kerry Johnson noted. “That’s immediate feedback on the value of that training.”

In addition, more than 100 motor grader operators, county road supervisors, and county commissioners attended the Motor Grader Operator Bootcamp in April 2017. They represented 31 of North Dakota's 53 counties. The two-day event at the Burleigh County Highway Department shop included demonstrations and maintenance workshops. Nearby gravel roads provided ample opportunities for hands-on operator training and equipment demonstrations.

Operators attended sessions on interacting with the public, equipment maintenance, new products, and proper operating techniques. A key part of the event was hands-on training in state-of-the-art equipment designed to show operators how to use automated controls to obtain the best results from blading operations. County road supervisors and commissioners attended training, which ranged from setting specifications for gravel purchases to best management practices for gravel road maintenance and equipment management. Attendees received a reflective safety vest with “Gravel Road Warrior” emblazoned on the back.

GLUE FOR GRAVEL ROADS CLASS SHOWS CLAY IS ESSENTIAL

A new class, “Glue for Gravel Roads” was offered in Billings, Morton, and Ramsey counties this summer. The class focuses on incorporating the appropriate amount of clay in existing gravel, application processes, and maintenance. Not having clay as glue in gravel results in washboarding, dust, float, safety hazards, and increased maintenance costs.



NEW TECHNOLOGY APPLICATIONS



AN INTELLIGENT APPROACH TO EVALUATING TRACK CONDITION

UGPTI researchers are developing a railroad track conditioning monitoring system that uses low-cost sensors on moving trains to identify areas of track that may need maintenance or repair. Railroads spend billions of dollars on infrastructure maintenance and condition monitoring each year, employing relatively slow and expensive methods using human inspectors and automated inspection vehicles to search for possible defects. UGPTI research is developing a method of using low-cost sensors aboard regular rolling stock to screen the infrastructure for faults automatically and continuously. Initial data collection was done with a smartphone that had all required sensors. The researchers developed a smartphone application that autonomously collects and uploads data from hi-rail vehicles, geometry cars, locomotives, and end-of-train cars with a goal of identifying the best approaches for developing a lower-cost version of the sensor system. The researchers also developed and refined signal processing and mathematical models that will transform the on-board sensor data into track geometry information. The research team are also developing a reporting and mapping system to provide decision-makers with a data visualization tool. The system could potentially save railroads billions of dollars and many lives by locating and characterizing faults before they cause derailments.

USING IN-PAVEMENT SENSORS TO MONITOR ROAD ROUGHNESS

By analyzing data from in-pavement sensors, UGPTI researchers have shown it is possible to build smart roads with embedded strain sensors that can also report roughness levels continuously, without requiring special probe vehicles. Currently, transportation agencies use a variety of methods to evaluate the condition of pavements, ranging from in-pavement sensors to ride quality characterizations that require specially instrumented probe vehicles. These methods are expensive and require extensive labor and specialized training. The UGPTI research developed a sensing approach that extends the capability of in-pavement sensors beyond their ability to measure just loading and condition parameters. Specifically, the approach links the output of durable in-pavement strain sensors to common roughness indices. However, to maintain their accuracy throughout the life cycle of the pavement, models that use their output must be calibrated periodically. Therefore, this research also developed a localized roughness measurement method based on connected vehicle sensing to calibrate the models. Field experiments validated that the relative roughness indices of the two methods agreed within 3.3%. For more information, read the final research report: www.ugpti.org/resources/reports/details.php?id=843

FRAMEWORK DEVELOPED FOR REMOTE SENSING OF MULTIMODAL TRANSPORTATION SYSTEMS

Hyperspectral imaging, capable of capturing information in wavelengths beyond those humans are able to see, coupled with unmanned aircraft systems offer many potential applications for observing, managing, and maintaining transportation infrastructure. UGPTI researchers developed a framework for capturing hyperspectral images and to classify the images. The framework and models enable new approaches to plan, analyze, and assess the performance of multimodal transportation systems. In this early work, researchers described how the framework could enhance models used for roadway congestion forecasting, railway condition monitoring, and pipeline risk management. They also described how the framework and models could be used for the rapid detection of hazardous spills. Companies and agencies that utilize the framework and models to implement hyperspectral remote sensing platforms will benefit from greater situational awareness to make informed decisions in transportation systems development, operations, and maintenance. Learn more at: www.ugpti.org/resources/reports/details.php?id=853



PUBLIC TRANSPORTATION/ SHARED MOBILITY



STUDY EVALUATES BENEFITS OF BIKE SHARING IN FARGO

A study by UGPTI found that Great Rides Bike Share improved livability in Fargo by providing multiple transportation choices and promoting public health with increased bicycling and walking activity. The program also provides transportation options that allow users to access a larger coverage area compared with using MATBUS service alone. Researchers conducted three online surveys: two sent exclusively to NDSU students and another to both NDSU students and others who use the bike share program. The first survey was conducted before the launch of Great Rides Bike Share and the other two after the launch. Surveys were conducted to understand the NDSU students' and bike share users' perceptions of the new bike share program in their community, before and after travel behavior, modal shifts, and preferences for additional bike share locations. The program has proven to be highly successful in its first two years. A significant number of NDSU students chose bike share as a primary or secondary mode of transportation. Bus ridership decreased following the introduction of the bike share program. An analysis of the data indicated that bike share did have a negative impact on bus ridership, but other factors were more important contributors to the decline in bus use. View the study at <https://www.ugpti.org/resources/reports/downloads/sur1c17-005-executive-summary.pdf>

AGING IN PLACE IN SMALL URBAN AND RURAL COMMUNITIES

Research by UGPTI suggests that policy makers should consider the potential cost savings from enabling residents to aging in place. Older adults and their families can potentially save thousands of dollars annually by remaining at home and utilizing home health and public transportation services. Policies that increase the availability and accessibility of public transportation should be considered, as these will increase the likelihood of older adults aging in place and utilizing important amenities within their local communities. Without available transportation, many seniors are forced to relocate well before they either want or need to, because of poor access to local services. Policies that will increase the availability and reduce the cost of home health aide services should be considered as well. By making these services more readily available and less costly, seniors can maintain active lifestyles and forgo the substantial cost of relocating as long as possible. Those changes will also reduce the need for subsidies to support older adults living in senior living facilities. Because 90% of older adults want to age in place while 80% plan to live out their lives in their current homes, the emotional cost of moving before it is entirely necessary should also be considered. Costs for individuals to remain in their homes will vary from community to community and will depend on the current state of public transportation and needs in each community. View the full report at www.ugpti.org/resources/reports/downloads/sur1c17-006-executive-summary.pdf

ESTIMATING RURAL DEMAND FOR INTERCITY BUS SERVICE

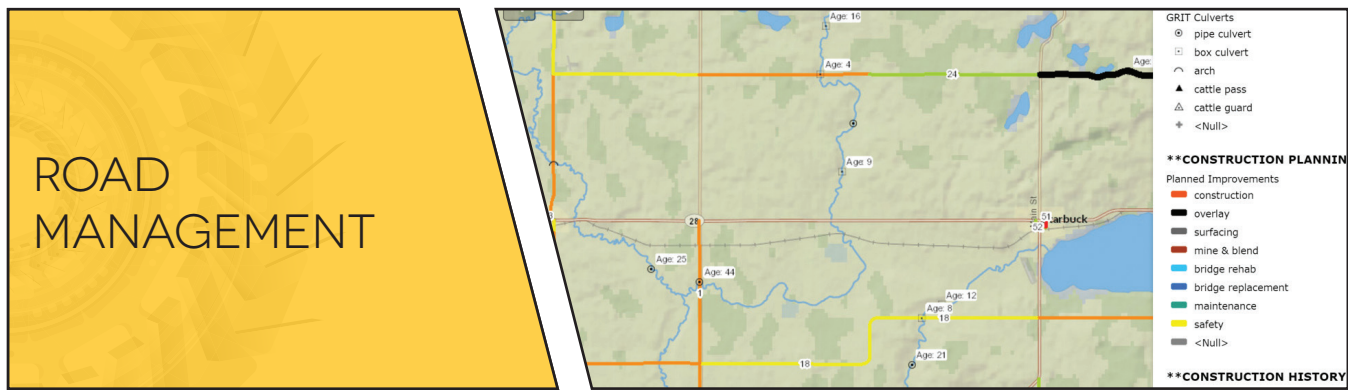
UGPTI research shows adults aged 70 or older are much less likely to travel by air, and given that driving rates tend to decrease for older adults, demand for intercity bus could increase as the elderly population continues to increase. The results did not specifically show that older adults are more likely to choose intercity bus, compared with younger adults, but it did show that people with disabilities are much more likely to choose bus or rail. Given that disability rates increase significantly with age, an aging population would lead to increased demand for intercity bus or rail services. The analysis of attitudes and mode choice provides some insight



into how intercity bus services are perceived by the public and how they could be marketed. Bus services tend to be perceived as less stressful than automobile or air services and safer than the automobile. Intercity bus companies could market their services to those more concerned about having a safe and stress-free trip, those who want to make a more productive use of their time when traveling, or those who like to visit with others when traveling. Results also suggest intercity bus service is perceived as less predictable and less clean than traveling by automobile, whether warranted or not, and that individuals would be more likely to travel by bus if they were made to feel like they are similar to other bus users. Read the full report at: www.ugpti.org/resources/reports/downloads/2016-12-estimating-demand-for-intercity-bus-services-executive-summary.pdf

EVALUATING TRANSIT RIDE QUALITY

Perceptions of ride quality may limit bus transit ridership. UGPTI researchers developed a low-cost method of measuring ride quality that used sensors in a typical smart phone to collect data, which were then processed and analyzed to account for the stop-and-go nature of transit travel. The method distinguished between vibrations induced from road unevenness and operator behavior. With cooperation from Fargo's MATBUS, the researchers validated the accuracy of the method by conducting surveys to characterize the perceived roughness intensities from buses traveling routes of distinctly different roughness levels. The surveys found that smooth rides mattered to most passengers, and that rough rides could even lead to some loss of ridership. The research could give transit agencies a tool to develop strategies and routes that improve ride quality. The final report from the project can be found at www.nctr.usf.edu/2016/08/characterization-of-transit-ride-quality/



GRIT HELPS COUNTIES MANAGE ROADWAY ASSETS

To accurately complete the 2015 local road legislative needs study, a tool needed to be developed by UGPTI to allow local agencies to inventory their existing roadway systems. UGPTI specialists developed and provided training for the Geographic Roadway Inventory Tool (GRIT); subsequently, every county in North Dakota completed its data entry in time for the needs study to be completed. Additional inventory items were added to allow local governments to manage and plan for most of their transportation assets. GRIT automatically ties this information to online web maps, allowing decision makers or others to view on a color-coded map items such as pavement age, condition, load restrictions, future construction plans, and active construction status.

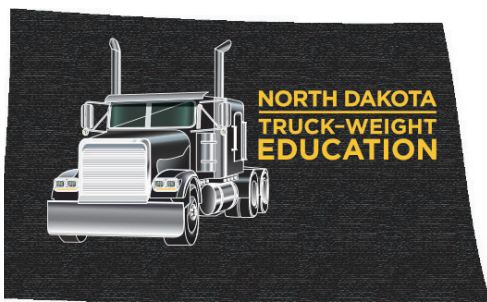
INTERSECTION VIDEO-BASED TRAFFIC DATA COLLECTION

More than 50 intersections in Grand Forks are collecting traffic volume information from the existing traffic detection video cameras, thanks to collaborative efforts between the city and UGPTI. A web-based application was developed to collect and report this traffic information, providing full turning movement count information at each intersection 24/7 for 365 days a year. This approach to collecting traffic data is more accurate and more reliable than other ways of collecting the information. Because the system uses existing traffic cameras, it is less expensive. Traffic and planning experts use the data to develop plans for highway expansions and improvements and to develop strategies managing traffic during events that result in high traffic levels.

SMART ROAD DECISIONS WITH SURFACE SELECTION TOOL

UGPTI experts developed a road surface selection tool to help local governments make decisions about how to resurface their roads. The online tool helps local road experts analyze various low-volume road treatments and maintenance costs to determine, based on actual road life-cycle costs, which treatment is the most cost effective. Example treatments include bituminous overlay, asphalt surface treatment, gravel, gravel with dust control, and base stabilization. By selecting the right treatment at the right traffic volume range, local governments can save millions over a 20-year period.

TRUCK SIZE AND WEIGHT TRAINING OFFERED



UGPTI staff launched truck weight training courses in 2013, which continued into 2016 at dozens of locations across the state. The courses helped drivers and trucking companies comply with truck weight regulations designed to maintain safety and protect highways. The program promoted voluntary truck-weight compliance to reduce damage to public roads and highways from overweight vehicles. The goal was to provide information and explanations to attendees on how to haul the most legal weight without violating truck-weight laws. Attendees learned how to configure trucks with proper axle spacing and tire sizes. The

program was funded by NDDOT and conducted in collaboration with the ND Highway Patrol. Participants included the construction and oil industries, equipment haulers, and agriculture producers, as well as officials and employees from local and state governments.

To simplify the sometimes complex process of determining maximum legal weight on any set of axles on a vehicle or vehicle combination, UGPTI researchers developed the ND Truck Weight Calculator. The convenient online calculator helps the motor carrier industry, agricultural producers, and others determine how to comply with legal gross and axle weight limits in North Dakota. The calculator will show the carrier what a vehicle or vehicle combination can legally weigh based on axle configuration, number of axles, number of tires per axle, and the distance between axles and tire width. The free calculator is specific to North Dakota with clickable options for selecting state highways and interstates. The calculator generates quick output with printable data and features simple picture explanations for intuitive use.

UGPTI HOSTS ARRA FIELD DEMOS

UGPTI and Cass County hosted two national In-Place Recycling & Reclaiming seminars, conducted by the Asphalt Recycling and Reclaiming Association (ARRA), in Cass County in August 2016 and in Dickinson in June 2017. The events featured a full day of learning followed by a day of live demonstrations. Participants from across the region gathered to learn how to stabilize bases and roadway sections, essentially learning how to resurrect failing roadway segments. In-place reclamation methods save money, resources, and time. The long-term benefits of enhancing roadway foundations allow road agencies to focus road investments on surface issues, creating better and safer roadways.

SAFETY



24/7 DRIVER INTERVENTION ANALYSIS

UGPTI researchers analyzed the effectiveness of North Dakota's 24/7 Sobriety Program to help policy makers assess how the program is working and if modifications to the program might improve results.

On average, North Dakota law enforcement agencies arrest between 5,000 and 7,000 drivers for DUI each year. North Dakota ranks among states with the highest per capita impaired driving arrest and conviction rates. The state is also among the top 10 states with the highest rates of alcohol-related motor vehicle fatal crashes.

UGPTI's research examined four questions:

- Is there a before-and-after deterrent effect when examining program entrants?
- Is there a difference in crash and citation rates for enrolled participants factoring for mandates in House Bill 1302, which mandated longer enrollment periods for repeat DUI offenders?
- Can a model be developed to assist practitioners in identifying enrollees most likely to relapse?
- Is there a difference in crash, citation, and recidivism rates controlling for those who did/did not enroll in the program?

Results indicate the program generally has positive deterrent effects. With regard to abstaining from impaired driving – the focal point of the study – just 1.6% of entries received a DUI citation during program enrollment. Another 96.1% did not commit such a violation at any point after successfully completing the program.

The 24/7 Sobriety Program is an intervention strategy mandating that impaired driving offenders remain sober as a condition of bond or pre-trial release. The goal is to monitor the most at-risk offenders in North Dakota and require that these individuals remain sober to keep roadways safe from hazardous drivers. As a component of the program, offenders are required to submit to twice-a-day blood alcohol concentration tests, ankle bracelet monitoring, drug patches, or urinalysis as a monitoring technique. If a program participant fails to remain sober, the individual is sent directly to jail. In 2013, House Bill 1302, which mandated longer enrollment periods for repeat DUI offenders, went into effect.

STATEWIDE TRAFFIC SURVEY

The statewide driver survey provides baseline metrics for the NDDOT Safety Division and others to use in understanding perceptions and self-reported behaviors related to traffic safety. The survey asked drivers questions about a set of nationally agreed upon priorities, including seat belts, impaired driving, and speeding. Additional questions were included to better understand views on programs and attitudes pertinent to North Dakota drivers. Analysis was based on 2,116 responses. Highlights include:



- 74.4% of respondents reported they “always” wear seat belts with another 19.5% reporting usage as “nearly always.” The 1.5% who reported they “rarely” or “never” wear them was the lowest in the seven-year survey history.
- Among respondents who drink alcohol, 31.5% reported driving a vehicle during the past two months within two hours of drinking one or two drinks, and 7% reported driving after drinking three or more drinks. These rates increased compared with 29% and 7%, respectively, in the previous year’s survey.
- The proportion of respondents who report “never” texting while driving decreased on average since 2011 to about 42%. About half of North Dakota drivers use their cell phone for talking while driving on a daily/weekly basis.
- Drivers living in the 12 urban counties in North Dakota are more likely to use a seat belt and less likely to talk on the cell phone while driving.

The report also includes information that shows behaviors, traffic safety message exposure, and views for young male and female drivers (age 18-34) is significantly different when compared with other drivers. View the full report at www.ugpti.org/resources/reports/details.php?id=882&program=rtssc

IMPROVING TRIBAL CRASH DATA

UGPTI safety researchers are collaborating with tribes in North Dakota to understand how crash reporting can be practically and systematically implemented on Indian reservations and how to pilot this system.

According to the Centers for Disease Control and Prevention, motor vehicle crashes are the leading cause of American Indian unintentional injury for ages 1 to 44. A national study of fatal crashes in 1975 and 2002 showed fatal crashes per year on Indian reservations increased 52.5%; nationally, fatal crashes declined 2.2%. Unfortunately, reservations typically lack comprehensive and reliable crash reporting systems. As sovereign nations, they have a formal relationship with the federal government and not the state. Therefore, they do not participate in state crash reporting systems required for towns and counties and that form the foundation for analysis related to resource and policy decisions.

Researchers examined tribal-state relations, inventoried current process/practices, and gauged tribal law enforcement resources/capacity through interviews with tribal, county, state, and federal stakeholders for the five federally recognized tribes in North Dakota: Mandan, Hidatsa, & Arikara Tribe (Three Affiliated Tribes), Spirit Lake Tribe, Standing Rock Sioux Tribe, Turtle Mountain Band of Chippewa Indians, and Sisseton-Wahpeton Oyate Tribe. Next they will conduct a case study which will include a crash data system pilot with at least one tribe that agrees to collaborate in designing and testing a practical, critical-field crash reporting system tailored to meet tribal needs, including data security and accessibility. The research should result in improved tribal crash reporting that benefits stakeholders in decisions regarding resource allocations and policies that contribute to tribal public safety and community well-being.

STATEWIDE SEAT BELT STUDY

The North Dakota seat belt use study provides statistically reliable data that safety specialists and policy makers can use for planning programs and policies to boost seat belt use and improve highway safety. The study is based on national standards and, during June 2017, trained observers collected seat belt use of 19,784 drivers and 4,822 right front seat passengers in vehicles with a gross vehicle weight up to 10,000 lbs. Data were collected at 320 sites across 16 counties. Final estimate for seat belt use was 79.3%. Highlights include the following:



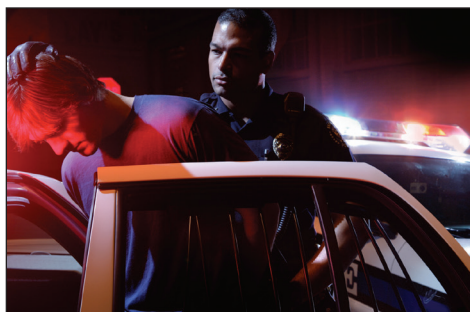
- Driver seat belt use was 77%, while passenger use was 82.5% statewide.
- Overall, seat belt use was higher in the east, at 82.2%, compared with 74.7% for the west.
- Occupants of SUVs and vans demonstrated relatively high seat belt use, 85.4% and 84.6%, respectively. Truck occupants were belted at a lower rate of 71%.
- Female occupants show much higher rates of seat belt use, 86.1%, compared with males at 73.5%
- Seat belt use was highest on primary roads, 86.2%, followed by local roads, 78.2%, and secondary roads, 71.7%.

ASSESSING SEAT BELT USE AT FORT BERTHOLD

A study of seatbelt use on the Fort Berthold Indian Reservation shows some seat belt use rates were positively impacted by a media campaign and heightened public awareness surrounding implementation of a primary seatbelt law on the reservation. UGPTI researchers worked with tribal traffic safety officials to identify 10 sites for observing seatbelt use during December 2015 in the midst of a radio, newspaper, and social media campaign designed to increase awareness of the law (which took effect in January 2016) and the need for seat belt use. A second survey was conducted in March 2016. The second survey showed that initial gains were being eroded and that sustaining seat belt use rates will require ongoing education and enforcement efforts. Gains were sustained among male drivers and passengers in cars and vehicles on highways while rates declined in town. The results will be useful in planning seat belt interventions, such as enforcement and public awareness campaigns on reservations.

FOLLOWING THE IMPAIRED DRIVING PAPER TRAIL

UGPTI researchers studied how impaired-driving records are created, held, and shared from a police arrest through the court system. The state's DUI driving record system includes law enforcement, driver licensing, court, compliance, and treatment/rehabilitation. The researchers found that multiple systems, hard copy records, and multiple incompatible databases make the development of a comprehensive case management system expensive and difficult. The study did establish a shared understanding of the process to participating agencies and revealed ways to improve data quality and facilitate linkages.



TRANSPORTATION PLANNING



TRAVEL DEMAND MODELING FOR ND CITIES

Experts developed and updated travel demand models for each of the three Metropolitan Planning Organizations in North Dakota: Bismarck, Fargo, and Grand Forks. These tools allow transportation agencies to identify potential future transportation needs well before they become reality, and provide essential traffic forecasting information to engineers, planners, and decision makers to ensure that critical infrastructure decisions made today will account for the travel demands of the future.

INTELLIGENT TRANSPORTATION SYSTEMS PLANNING

With support from NDDOT, UGPTI updated the statewide ITS plan that guides the deployment of computing and communications technologies that enhance the safety and efficiency of the transportation system. The ITS plan and architecture allow for integration and interoperability, using a systemized methodology to increase the success rate of these projects while reducing costs. Example deployment areas include traveler information, winter maintenance, safety and security, and data management.

ASSESSMENT OF TRUCK SIZE AND WEIGHT HARMONIZATION

Under the direction of the North Dakota Legislature (HB 1012), NDDOT and the UGPTI studied the impacts and potential implications in North Dakota of harmonizing truck size and weight regulations with states in the Western States Transportation Alliance. These regarded standard commercial truck envelope limits of 129,000 lbs. in gross vehicle combination weight, or 110 feet in overall length, or a 100-foot cargo carrying length of a truck-tractor semitrailer and full trailer. The objectives of the study were to:

- Conduct a comprehensive analysis of currently legal truck configurations in North Dakota,
- Analyze the effects of potential changes to current configurations and/or legal weight limits, including the use of double trailer combinations and tridem axle and spread axle tractor-semi trailer combinations.

A public outreach effort was coordinated with major industry group representatives and stakeholders throughout the state. Several major industry groups were also represented on the executive steering committee.

Based on results of the study, the Legislature established a primary network that allows a vehicle combination hauling a divisible load to exceed 105,500 lbs. up to 129,000 lbs. gross vehicle weight. All axle weights must be legal and no single trailer may exceed 53 feet. The network includes all of Interstate 29, all of Interstate 94, US Highway 2 from Montana to Minnesota, US Highway 52 from Saskatchewan to Minot, US Highway 83 from South Dakota to Interstate 94 at Sterling, US Highway 83 from Bismarck to Minot, and US Highway 85 from South Dakota to the US Highway 2 junction in Williston. An annual permit costing \$700 is required.

Selected estimated impacts of harmonization included economic benefits for trucking within North Dakota from \$140 million to \$285 million per year and a reduction in the number of trucks on the roadways. This reduction in travel would reduce diesel fuel tax generation at the state level from \$2.9 to \$5.1 million. Impacts on pavement were estimated to be \$2.8 to \$3.6 million annually. Bridge analysis due to increased truck weights yielded as much as \$2.26 billion in statewide bridge replacement needs, with approximately \$716 million occurring on the state system. Review the final report at: www.ugpti.org/downloads/truck-harmonization/2017-01-Truck-Harmonization-Study-Final-Report.pdf

ESTIMATING URBAN ROAD AND BRIDGE NEEDS

A UGPTI analysis of urban roads in North Dakota indicated that \$601 million in paved road investments and maintenance will be required over the next 20 years. Another \$43.2 million in bridge investments and maintenance will be required during that period, the study found. The analysis was completed at the request of NDDOT and the North Dakota League of Cities. In this study, researchers estimated infrastructure needs using the most current traffic estimates and roadway inventory and condition data available. Only the 14 largest cities were studied, and only those streets designated as collector and higher within corporate limits were studied. For more detailed information, read the full report: <https://www.ugpti.org/downloads/urban-road-needs/2016-urban-needs-study-draft.pdf>

COUNTY AND TOWNSHIP ROAD NEEDS ESTIMATED AT \$8.8 MILLION

Counties and townships in North Dakota will need to invest more than \$8.8 billion to maintain roads and bridges over the next 20 years, according to a study of infrastructure needs conducted by UGPTI researchers. Of this estimate, 40% relates to projected needs in the oil and gas producing counties of western North Dakota. The study was conducted in response to the North Dakota Legislature's request for a study of the transportation infrastructure needs of all county and township roads in the state. Other highlights of the study included the following:

- Unpaved road funding needs comprise approximately 67% of the total.
- If averaged over the next 20 years, the annualized infrastructure need is equivalent to \$440 million per year.
- Predicted statewide unpaved infrastructure needs range from \$5.86 billion to \$6.21 billion for the next 20 years. Approximately 43% of these needs can be traced to the 17 oil and gas producing counties.
- From \$2.19 to 2.27 billion in paved road investment and maintenance expenditures will be needed during the next 20 years. Roughly 38% of these expenditures will be needed in the oil and gas producing counties of western North Dakota. Much of the investment will be needed during the first few biennia as a result of backlogs in road improvements, especially in the eastern half of the state.
- About \$449 million will be needed for bridge investments and maintenance needs for counties and townships.

Infrastructure needs were estimated using the most current production forecasts, traffic estimates, and roadway inventory and condition data available. Agricultural and oil-related traffic are modeled in detail at the sub-county level. Oil-related traffic is predicted for individual spacing units; whereas, agricultural production is estimated at the township level. While the focus is on agricultural and oil-related activities, other movements (such as farm inputs and shipments of manufactured goods) are included in the analysis. View the full report at: <https://www.ugpti.org/resources/reports/downloads/2016-11-infrastructure-needs.pdf>

INVESTMENT NEEDS OF STATE HIGHWAY SYSTEM

More than \$11 billion in investments will be required to maintain North Dakota's system of state highways and bridges, according to a study conducted by UGPTI for NDDOT. The study, completed in 2016, was done based on the key assumption that improvements would be made at the optimum time, which would result in the least cost per mile. Lower-than-needed funds typically result in delaying lower-cost options, resulting in more expensive reconstruction.

UGPTI REVITALIZES TRIBAL OUTREACH

UGPTI is revitalizing its long-standing tribal outreach effort. Collaboration with tribes is an important part of UGPTI's outreach mission, and staff will continue to work in this area and pursue opportunities to expand collaborative work. The mission of the tribal outreach effort is to improve safe transportation of people and goods on tribal reservations to enhance livability, community and cultural values through increased accessibility to employment, workforce development opportunities, education, healthcare, and housing. Outreach is focused on the following:

- Identifying funding opportunities
- Providing grant writing assistance
- Providing training (workforce development, youth, education, technology)
- Extending program/resource assistance
- Seeking partnership/collaborative opportunities
- Establishing an outreach task force
- Publishing a monthly newsletter



The Tribal Transportation Outreach Task Force comprises representatives from the region's American Indian tribes, as well as federal, state, local, and non-profit groups with a vested interest in transportation, safety, and overall tribal livability.

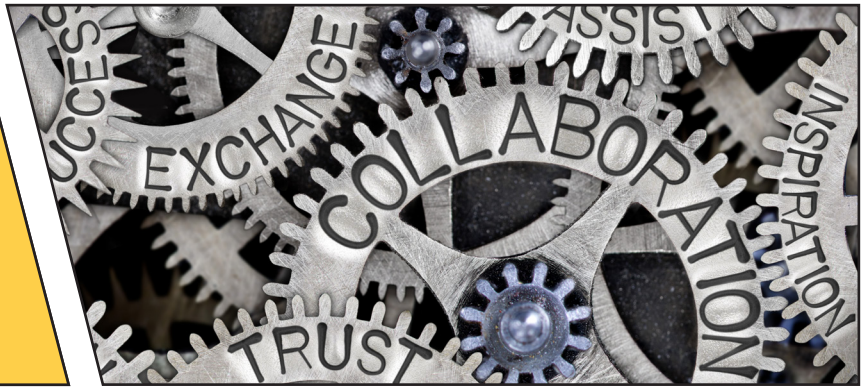


PROVIDING LEARNING OPPORTUNITIES IN FOUR STATES

Over the 2015-2017 biennium, UGPTI delivered 105 live technology transfer events to more than 7,500 attendees (mostly state DOT and local agency highway workers) across the four states via its Transportation Learning Network (TLN). TLN is a partnership that includes Montana DOT, North Dakota DOT, South Dakota DOT, Wyoming DOT, and the Mountain-Plains Consortium (MPC) universities. This unique arrangement has stood the test of time and placed the region in the forefront of delivering distance-based technology transfer and education. The learning partnership identifies, coordinates, markets, disseminates and shares transportation-based research, technology and training. The network is financed through pooled funding from the four state DOT's, with North Dakota DOT as the lead state. Because of travel distances within the four member states, many DOT staff would not be exposed to the myriad of topics presented if not for TLN.

To deliver the TLN mission, UGPTI maintains a video conference bridge and broadcasts subject matter expert presentations to the four states. At times there are over 35 sites connected with event attendance as high as 200 learners. The highest attended event was a safety training on preventing run-overs and back-overs. UGPTI staff also coordinate webinar services for desktop delivery when appropriate. Technical staff identify possible presentation topics for the four states to prioritize and then find subject matter experts to present high-quality presentations over the network. In addition, TLN warehouses recordings of most of the presentations on its learning management system. TLN also warehouses more than 100 self-paced learning modules on transportation technical topics. Staff within the TLN pooled group can access the recordings and learning modules 24/7 from their desktops or from their homes.

UGPTI RESEARCH AND OUTREACH PROGRAMS



UGPTI offers research and outreach focused on specific areas through its various programs. Staff in these programs collaborate to address emerging challenges and opportunities.

Advanced Traffic Analysis Center (ATAC) collects and analyzes traffic data to support decision makers who plan, operate and fund transportation systems at the local, regional, and state level. Primary areas of work include intelligent transportation systems, traffic operations, and metropolitan transportation planning and travel demand modeling. Contact: Bradley Wentz, (701) 231-7230, www.atacenter.org • Email: bradley.wentz@ndsu.edu

Agriculture, Energy and Industrial Freight Center conducts economic inquiry, marketing studies, and policy analysis, to improve the competitiveness of the region's producers and businesses. Contact: Kimberly Vachal, (701) 231-6425, • Email: kimberly.vachal@ndsu.edu

Center for Surface Mobility Applications and Real-time Simulation environments (SMARTSe) applies advancements in sensing, wireless communications, mobile computing, data science, and cybersecurity to advance multi-modal and intermodal transportation system efficiencies, responsiveness, reliability, sustainability, safety, and security. Contact: Raj Bridgelall, (408) 607-3214, www.ugpti.org/smartse/ • Email: raj.bridgelall@ndsu.edu

DOT Support Center (DOTSC) provides engineering design assistance and transportation information technology support to transportation managers to ensure the safe and efficient movement of people and goods. Undergraduate engineering students in the center work under the direction of DOT engineers to prepare plans, estimates, and studies for real world projects. Computer science students provide IT support and assist staff in the development of applications such as a local road surface selection tool, the online ND Truck Weight Calculator, and the Geographic Roadway Inventory Tool (GRIT). Contact: Bradley Wentz, (701) 231-7230, www.ugpti.org/dotsc/ • Email: bradley.wentz@ndsu.edu

Mountain-Plains Consortium (MPC) conducts research, education, and technology transfer related to transportation challenges and opportunities in the Upper Great Plains and Intermountain West. NDSU, via UGPTI, is the lead university in this eight-university consortium. MPC is a competitively selected University Transportation Center sponsored by the USDOT. Contact: Denver Tolliver (701) 231-7190, www.mountain-plains.org • Email: denver.tolliver@ndsu.edu

ND Local Technical Assistance Program (NDLTAP) fosters safe, efficient, environmentally sound and cost effective highway, road, and street systems by exchanging technology with local units of government and the transportation community through training, technical assistance, and information services. Key areas for hands-on, online, and distance training include safety, gravel road management, construction topics, rural road maintenance, and asset management. Contact: Dale Heglund, (701) 328-9857, www.ndltap.org • Email: dale.heglund@ndsu.edu

Rural Transportation Safety and Security Center (RTSSC) promotes and enhances the region's transportation safety and security through research, education, and outreach. Staff conduct safety analyses to evaluate and guide local, state, and federal initiatives. Research tracks trends in road safety factors such as impaired drivers, youthful drivers, and occupant protection. Contact: Kimberly Vachal, (701) 231-6425, www.ugpti.org/rtssc/ • Email: kimberly.vachal@ndsu.edu

Small Urban and Rural Transit Center (SURTC) provides research, training, and outreach to assist small urban and rural transit systems. The efforts have a special focus on planning, operations, and technologies with an emphasis on “smart solutions.” Key areas for training include leadership and management. Recent research has focused on transit’s role in aging in place, estimating demand for intercity bus services, bike share impacts on transit, and transit needs in rural communities. Contact: Jill Hough, (701) 231-8082, www.surtc.org • Email: jill.hough@ndsu.edu

Transportation Learning Network (TLN) supports safe and efficient transportation through a network of people and technology that serves members by enhancing communication, workforce development, education, professional development, technology transfer, and research. Efforts focus on assuring that DOT employees and others in the transportation workforce are prepared to implement new technology, work safer, and complete technical tasks accurately and efficiently. TLN is a collaborative effort of MPC universities and participating DOTs. Contact: Tim Horner, (701) 328-9859, www.translearning.org • Email: timothy.horner@ndsu.edu

Motor carrier safety research is a long-standing focus area at UGPTI. Research efforts concentrate on analysis to identify unsafe commercial vehicles, drivers, and companies; and methods to easily provide this information to state and federal safety enforcement specialists. Enforcement personnel use this information to prioritize commercial vehicles and drivers for inspection, and for educational outreach programs to ultimately improve safety on our roadways for everyone. Contact: Brenda Lantz, (303) 871-7773, www.ugpti.org/research/projects.php?topic=3 • Email: brenda.lantz@ndsu.edu

UGPTI FOCUS AREAS

Rural traffic analysis uses detailed rural travel demand models to forecast traffic volumes on North Dakota’s road network, helping estimate the impact to state, county, and local roads due to energy development, changing ag production and marketing practices, and other factors that influence transportation patterns. Contact: Alan Dybing, (701) 231-5988 • Email: alan.dybing@ndsu.edu

Tribal Outreach focuses on improving safe transportation of people and goods on tribal reservations to enhance livability, community, and cultural values through increased accessibility to employment, workforce development opportunities, education, healthcare, and housing. Contact: (701) 231-7767 • Email: tribaltransportation@ugpti.org



The transportation industry needs professionals with the advanced education to meet the transportation challenges of the 21st century. A graduate degree in transportation and logistics helps students stand out above others when they begin their careers or are advancing their careers in the industry. Transportation and Logistics graduate programs at NDSU will enhance students' knowledge, skills, and opportunities for a successful career in the transportation industry.

The Department of Transportation, Logistics and Finance is accredited through the College of Business by the Association to Advance Collegiate Schools of Business, which places it in the top 5 percent of business schools worldwide.

NDSU's high-quality graduate programs prepare students for a wide variety of careers in the transportation industry. The programs include:

Doctorate in Transportation and Logistics. In this program, students develop advanced knowledge and research skills in the rapidly growing fields of transportation and logistics. Students may select from the following areas of concentration: (1) logistics and supply chain systems, (2) transportation economics and regulation, (3) transportation infrastructure and capacity planning, (4) transportation data science, and (5) transportation science and technology.


Master of Managerial Logistics. This online master's program targets aspiring logisticians, industry professionals, and service members who want to meet the logistical challenges of the 21st century. Graduates gain expertise that will help them with career advancement in the supply chain management industry. Students gain competencies in supply chain management, change management, enterprise resource planning, remote sensing and adaptive logistics planning, joint total asset management, logistics and security through innovative technologies, transportation analysis and planning, crisis analysis and logistical response, and transportation security analysis.

Transportation and Urban Systems. Graduates of this online program will lead transportation agencies and municipalities in improving livability in communities by integrating transportation with other components of the urban environment. They will apply new technologies and techniques in planning, operations and security. Students explore: (1) urban transportation systems; (2) relationships between transportation, land use, environment, emergency response, and logistical delivery systems; (3) coordinated planning, operations, and security; and (4) the spatial dimensions of urban systems.

The Master of Science (MS) in Transportation and Urban Systems online curriculum is built around the topics of: public transportation systems, geographic information systems, freight transportation and logistical delivery systems, urban geography and land use, the environmental impacts of transportation systems, transportation systems security, and the sustainability of transportation and urban systems. The MS degree requires a thesis and is intended for students with strong research interests.

The Master of Transportation and Urban Studies (MTUS) is an online non-thesis degree primarily intended for professional planners and engineers. Students in this program have more opportunities for synthesis of practice and additional course work, with less emphasis on research.

The Certificate in Transportation and Urban Systems is an online opportunity for practicing professionals who wish to gain additional knowledge in the emerging fields of transportation and urban systems. Students select from on-line courses, including: Transportation Systems Security, Transportation Planning and Environmental Compliance, Transportation System Modeling, Urban Transportation Systems Analysis, Context Sensitive Solutions, Transportation Systems Laboratory, Intelligent Transportation Solutions, and Public Transportation.



NDSU does not discriminate in its programs and activities on the basis of age, color, gender expression/identity, genetic information, marital status, national origin, participation in lawful off-campus activity, physical or mental disability, pregnancy, public assistance status, race, religion, sex, sexual orientation, spousal relationship to current employee, or veteran status, as applicable. Direct inquiries to: Vice Provost, Title IX/ADA Coordinator, Old Main 201, 701-231-7708, ndsueoaa@ndsu.edu.