NDSU UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

2017 2019

Biennial Highlights

www.ugpti.org

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 history of providing research, education, and outreach to support transportation in North Dakota. This report highlights efforts to date during the 2017-2019 biennium that focused on North Dakota issues and opportunities or 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 2017-2019 was $22.36 million, including $3,543,174 in General Fund dollars from the State of North Dakota of which $100,000 was designated for the road and bridge maintenance study. Those General Fund dollars are critical as a stable funding foundation. UGPTI leverages those funds as it pursues grant funding from federal agencies and other sources.

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.

Advisory Council members include:

Russ Hanson – Chair
Associated General Contractors of ND

Dale Bergman
Grand Forks Cities Area Transit

Blake Crosby
ND League of Cities

Julie Fedorchak
ND Public Service Commission

Neal Fisher
ND Wheat Commission

Mike Gerhart
ND Motor Carriers Association

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ND Corn Council

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ND Grain Growers Association

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ND Department of Commerce

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ND Grain Dealers Association

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ND Department of Transportation

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Terry Traynor
ND Association of Counties

Kyle Wanner
ND Aeronautics Commission

Dan Zink
Red River Valley & Western Railroad

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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.

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.

TRACKING ND WHEAT

North Dakota accounts for more than half of the durum produced in the United States and is first in the nation for production of hard red spring wheat. UGPTI compiles statistics and summarizes logistical trends associated with the movement of both these classes of wheat from elevator to domestic and export markets. Some recent highlights:

- The Pacific Northwest remained ahead of other destinations as a market for shipments of HRS wheat originating from North Dakota elevators in 2016-17, and it is an important gateway to Asian markets. Shipments to Wisconsin, Minnesota, and other Midwest destinations typically move beyond the gateway to U.S. domestic millers. The Pacific Northwest is a large U.S. grain port and important gateway to Asian markets.
- Shipments of durum show a continuing trend toward larger shuttle and unit train facilities. Destination data reveal that the largest share of durum from North Dakota elevators moved to Duluth in 2016-17, followed by other destinations in Wisconsin and Minnesota. The Duluth shipments are destined for export customers in Europe and North Africa.

AG TRANSPORTATION HANDBOOK IS A RESOURCE FOR PRODUCERS

The *North Dakota Agriculture Transportation Handbook*, published in 2017, covers state and federal statutes, rules, and exemptions for the agricultural industry. The easy-to-use and portable handbook was developed under the sponsorship of the Federal Highway Administration (FHWA), in cooperation with the ND Highway Patrol, ND Wheat Commission, ND Corn Council, and ND Farmers Union. 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 ND State Patrol was a key partner in reviewing content and using the handbook during enforcement and education activities.

COMMERCIAL VEHICLE SAFETY

NEW COMMERCIAL VEHICLE SAFETY CENTER ESTABLISHED

UGPTI is establishing a Commercial Vehicle Safety Center that will serve as a point of contact for universities, law enforcement, and driver licensing agencies seeking assistance to establish partnerships to improve commercial vehicle safety and commercial driver's license (CDL) compliance. This center will also disseminate information from existing projects and partnerships. The center is being developed as part of an "Improving Commercial Vehicle Safety and CDL Compliance through University Partnerships" project with the Federal Motor Carrier Safety Administration.

UGPTI HOSTS COMMERCIAL VEHICLE SAFETY AND CDL COMPLIANCE SUMMIT

About 130 professionals from licensing and transportation agencies, academia, and law enforcement from 15 western states attended the Commercial Vehicle Safety and CDL Compliance Summit held November 2018 in Denver, CO. This summit, organized and facilitated by UGPTI as part of its Commercial Vehicle Safety Center, was designed to help those professionals share information regarding partnerships, research projects, innovative processes, and best practices to improve commercial vehicle safety and CDL compliance. The summit included presentations on technology trends and applications, university research, federal issues and programs, collaboration between commercial driver's licensing agencies and courts, decriminalization of marijuana and impacts on commercial drivers, and safety planning.

LOCAL ROADS

GRAVEL UPDATES

UGPTI continues to work with local governments to improve North Dakota's 60,000 miles of gravel roads.

- Thanks to the efforts of UGPTI and local road leaders, a new Gravel Surfacing Special Provision was made available by the North Dakota Department of Transportation (NDDOT). The provision expands on gradation and material properties to include testing and quality assurance/quality control for gravel specified in road building and improvement contracts. Counties, townships, and cities rely on NDDOT provisions for writing specifications, and will use the provision in bidding out projects and gravel stock piles. The provision includes specifications for clay in gravel. The clay is essential for reducing washboarding, dust, float, and maintenance costs.
- The "Glue for Gravel Roads" class was offered to local road managers again in 2018. The class focuses on incorporating the appropriate amount of clay in existing gravel, application processes, and maintenance.
- Motor-grader operator training was held at more than a dozen sites across the state again in 2018. The two-day session included a full day of classroom training and a second day of hands-on training in the field. Operators learned to make full use of the computerized and automated controls available on most newer motor graders to reclaim aggregate, assure proper slope for drainage, smooth rough roads, and recondition shoulders. A key topic was knowing when and when not to blade roads for best results.

BRIDGE 101

In November 2018, NDLTAP launched "Bridge 101," a training to help blade operators, truck drivers, road superintendents, and county, city, and township officials learn bridge basics. Participants who completed the course learned about the key elements of bridges and gained an understanding of scour surveys, alert codes, loading factors, maintenance best practices, load limits, signing requirements, bridge inspection, failure modes, and other topics. The day-long course included classroom training and an onsite bridge inspection. The new course was offered in Ellendale, Bottineau, Grand Forks, and Williston. Knowledge taken from the event will help local road staff improve maintenance and safety of local bridges and target bridge maintenance, repair, and replacement efforts. The training also helped NDDOT meet an FHWA recommendation to help county and city personnel improve their understanding of the National Bridge Inventory and how FHWA evaluates and classifies bridges.

WATCH FOR THE SIGNS

Over the past two years, UGPTI has launched an initiative to help local road agencies manage signs in their jurisdictions with an eye toward improving safety while cutting costs. A Signing 101 course was initiated in 2017 to introduce county, city, and township signing personnel to sign basics, sign installation, sign inventorying, sign condition assessment, and other key topics. A Signing 201 course was offered in 2018 with tips on sign ordering, additional information on inventory systems, training on sign layout, tips from sign professionals, and information on sign-handling equipment. Late in 2018, UGPTI launched an outreach program to local schools through county road superintendents. The Save our Signs poster contest boosted awareness among students across the state about the dangers of missing, damaged, or vandalized signs. The best of the posters was assembled into a 2019 calendar.

UGPTI HELPS ORGANIZE LOCAL ROAD DAY

More than 300 Walsh County residents attended the Walsh County Road Day, intended to highlight the hard work and capabilities of the Walsh County Highway Department. UGPTI staff worked with Sharon Lipsh, Walsh County Superintendent of Highways, to organize the event. Highlights included a backhoe rodeo contest, information booths, and equipment showcase. Guests included NDDOT Director Tom Sorel, and Major Tom Iverson of the ND Highway Patrol, who used the event to designate Park River as a Vision Zero Community—the first such designation in the state. Rich Sanders, president of the National Association of County Engineers, also spoke at the event.

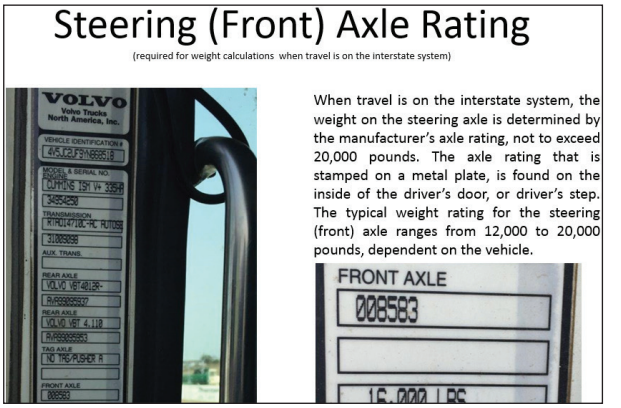
CHECKING CULVERTS UP CLOSE

Local road agencies are using UGPTI's Hydraulics Vehicle Inspection Explorer (HIVE) to get a gopher's eye view of their culverts. Based on a similar concept in use in Minnesota, UGPTI experts developed the device, which is basically an all-terrain, waterproof radio-controlled car equipped with a camera and a light. They helped NDDOT members see how this inexpensive piece of technology can be used to inspect culverts. Field testing revealed some needed improvements, so they have taken what they learned and improved the tool. It is now ready for use across the state by road agencies wanting a better look at the condition of their culverts. Check out the HIVE-eye-view in this video clip.

ASPHALT CONFERENCE HOSTED

A record crowd of more than 200 representatives from road agencies, contracting companies, highway departments, engineering companies, contractors, and suppliers attended the 2018 ND Asphalt Conference in April 2018 hosted by UGPTI. NDDOT Director Tom Sorel opened the conference, which focused on preserving state, county, and municipal investments in road infrastructure. Other expert presenters included Ben Worel, director of the MnRoad research facility near Albertville, MN; Wendall Meyer, FHWA; David Timm, director of the National Center for Asphalt Technology at Auburn University; as well as representatives from contracting companies, consultants, and municipalities. All provided insights into innovative pavement preservation approaches and techniques.

TRUCK WEIGHT CALCULATOR REMAINS POPULAR

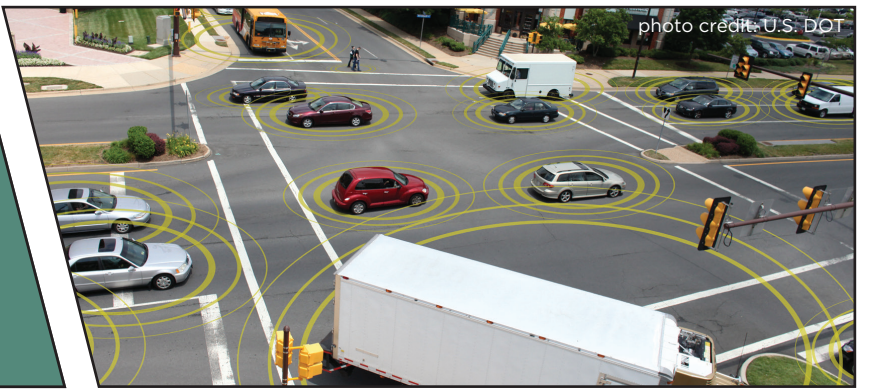


Truckers, farmers, trucking companies and law enforcement continue to rely on UGPTI's convenient ND Truck Weight Calculator. UGPTI researchers developed the online tool to simplify the sometimes complex process of determining maximum legal weight on any set of axles on a vehicle or vehicle combination. The 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 was updated to work with changes to weight limits approved in the last session of the ND Legislature. The calculator generates quick output with printable data and features simple picture explanations for intuitive use. A Minnesota version of the calculator has also been developed that is specific to that state's laws and regulations. Having versions available for both North Dakota and Minnesota is particularly helpful to those who operate trucks in both states as they are now able to configure their trucks to be legal in either state.

GRIT UPGRADED TO HELP COUNTIES MANAGE ROADS

UGPTI experts continued to update and enhance the Geographic Roadway Inventory Tool (GRIT), which is now in use by every North Dakota county. GRIT 2.0 has improved capabilities for viewing map information and for data entry. UGPTI originally developed the tool to allow local agencies to inventory their existing roadway systems. That information was used to accurately complete the 2015 local road legislative needs study. 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 and condition, load restrictions, future construction plans, and active construction status.

NEW TECHNOLOGY APPLICATIONS



SMART INFRASTRUCTURE TO SUPPORT AUTONOMOUS VEHICLES

UGPTI researchers are developing an infrastructure safety support system that will allow autonomous vehicles and human drivers to operate safely side by side. In the system, vehicle-to-infrastructure (V2I) enabled sensor networks are embedded into the transportation infrastructure to provide autonomous vehicles and human drivers with inputs to improve their decision making when obvious decisions may not be possible. Potential impacts could be significantly fewer crashes and lost lives. The system will be an essential part of a "smart city," which integrates diverse sets of information and communication technologies to monitor asset condition, security, safety, service quality, and operational efficiencies, often in real time. Studies anticipate that autonomous vehicles will significantly improve transport efficiencies, reduce crashes, provide smoother rides, decrease congestion, and simultaneously increase traffic flow through speed harmonization and reduced demand for roadway capacity. The USDOT expects that autonomous vehicles could eliminate more than 90% of crashes, depending on their level of adoption. However, driverless vehicles will share the roads with human-operated vehicles for a long time. Subsequently, autonomous vehicles of various levels of automation will continue to rely on human inputs. Thus, one of the biggest challenges facing smart cities is achieving fully harmonized vehicle operation in mixed driver scenarios.

RAILROAD INFRASTRUCTURE AND VEHICLE EVALATION TECHNOLOGY (RIVET)

Researchers are developing an autonomous track geometry monitoring system to screen the rail network for faults during normal train operations. The approach uses low-cost sensors on board revenue service trains to identify anomalies and irregularities, which will help the industry allocate finite and expensive inspection resources more efficiently. The research focuses on developing the signal processing and machine learning algorithms and models that will transform the on-board sensor data into track geometry equivalents. The research team will also develop a reporting and mapping system to provide decision-makers with a data visualization tool. The expected outcomes will be educational benefits, workforce development, and technology transfer to advance the state-of-the-art in railroad infrastructure condition monitoring, leading to substantial efficiency gains and safety enhancements. This could improve safety and potentially save railroads billions of dollars by locating and characterizing faults before they cause derailments.

The researchers are also developing a method for evaluating the benefits and costs of the system to help railroads and regulatory agencies weigh the advantages of implementation. Benefits will include improved inspection efficiency, reduced track closures, and decreased risk of derailments. Costs will include equipment purchases, cloud computing and other subscription fees, and implementation expenses.

PATENT ISSUED TO NDSU/UND FOR UAV TECHNOLOGY

NDSU/UGPTI and the University of North Dakota received a patent in 2018 for technology that integrates energy-storing capacitors into the body or other large components of manned and unmanned aircraft systems, known as UAS. The capacitor technology, which will supplement batteries, will allow for greater range, longer endurance, and enhanced UAS reliability. Although similar to a battery, a capacitor stores an electric charge while a battery generates an electric charge from a chemical reaction.

PUBLIC TRANSPORTATION/ SHARED MOBILITY

TRANSIT, LIVABILITY, AND THE ND OIL BOOM

Researchers studied the impact of oil boom and bust cycles on transit ridership for individuals living in the oil patch in western North Dakota. They found that, although the recent oil bust has caused considerable concern in the oil region, the population and transit ridership are considerably larger today than they were in 2008. For example, transit ridership nearly doubled from 2008 to 2016, largely due to the expanding local economy.

The researchers also looked at how variables such as income, land use, population, and local operating investments affect livability. Transit livability index measures showed large increases from 2008 to 2012, followed by overall corrections from 2013 to 2016. Transit fleet size has failed to increase with population growth, and pedestrian safety has become a concern. Simulations found that shifts from auto to transit would result in millions of dollars of fuel savings. Various models of either fixed-route or flex-route busing should be considered by transit agencies and local policy makers for the larger communities of Williston and Dickinson, while more rural providers need to update their fleets to meet demand. Policy makers should also consider that the majority of local rural transit riders are elderly; therefore, quality vehicles with updated suspensions are needed to provide comfortable rides for their aging clientele. Because of recent cutbacks in state and local funding, agencies should also strive to better coordinate services while continuing to provide rides to county population centers that offer the goods and services many rural residents require.

AUTOMATED TRANSIT FOR RURAL AREAS

Transit automation technologies could potentially enhance the mobility and quality of life of residents and significantly improve livability in small urban and rural areas by providing access to transportation services in a more cost effective-manner. With little congestion, automated transit could be more practical in smaller communities. UGPTI researchers are examining what levels of transit automation technologies are currently available and are under development. They are gathering input from transit agencies, planners, and state DOTs to learn the requirements and challenges for implementing autonomous transit vehicles in small urban and rural areas. The results from the study will be a useful resource for any transit agency and/or small urban/ rural transit agency to understand the insights of US transit experts regarding upcoming technology advances in the transit industry. The study results will also serve as a valuable resource for vehicle manufacturers to better design their burgeoning automated transit vehicle technologies that can effectively meet the needs of transit agencies and, ultimately, transit riders.

MAKING CONNECTIONS BETWEEN TRANSIT AND RURAL LIVABILITY

UGPTI researchers conducted a national survey to study how transit influences livability in rural areas of the United States. Public transportation in rural areas provides critical lifeline services to transit dependent people, connecting them to healthcare services, educational institutions, employment, and other important activities. While there are many factors that influence the livability of a rural community, transit is believed to be an important contributor. However, this subject is poorly understood and there is a need to better understand its significance toward rural livability. UGPTI and the Texas Transportation Institute conducted multiple case studies across the country to evaluate the connections between transit and livability in rural communities by studying the opinions of community residents, transit users, and transit stakeholders. Specifically, UGPTI conducted two case studies in Dickinson and Valley City. While transit was not among the top factors, survey respondents in those cities expressed considerable support for funding and providing transit services. Residents in both cities said transit should be provided in their communities for seniors, people with disabilities, those who choose not to drive, and those who cannot afford to drive. Transit riders in both cities indicated that transit is very important to their quality of life, and stakeholders from both communities said transit is a critical lifeline for people who are elderly and/or have a disability, individuals with no vehicle, and those who cannot drive.

The two institutes are now augmenting previous work on rural livability and transit by designing and conducting a national survey to gather statistically significant public opinion to provide a greater, big picture understanding of how transit influences livability in rural areas of United States.

EXAMINING SHARED USE MOBILITY IN RURAL AREAS

Shared-use mobility is defined as transportation services that are shared among users, and may include public transit, taxis, limos, bike-sharing, car-sharing, ridesharing, ride-sourcing/ride-splitting, micro transit services, scooter sharing, shuttle services, neighborhood jitneys, and commercial delivery vehicles providing flexible movement of goods. While most of the popular technology-enabled shared use mobility agencies are not available in rural areas, some creative practices are being implemented and experimented with in rural areas. UGPTI researchers are identifying and analyzing these practices to determine if they can augment traditional rural transit service. Lessons learned from partnerships in larger urban settings could be instructive for rural transit agencies and state departments of transportation wanting to establish new partnerships with ride-sourcing companies and implement other shared use mobility practices to supplement and complement transit services in rural areas. It is also important to learn how agencies can ensure public transit partnerships with ride-sourcing agencies and other shared use mobility practices will ensure Americans with Disabilities Act compliance and service accessibility for persons with disabilities, seniors, and low-income individuals. Researchers will develop a best practices tool kit of selected shared use mobility practices, services, or programs that are applicable to rural settings. The tool kits can provide detailed guidance on the role that government, departments of transportation, rural transit agencies, transportation planning agencies, and/or state economic development or small business development agencies will need to play to advance those strategies in rural settings.

NATIONWIDE STUDY TO QUANTIFY COST OF AGING IN RURAL PLACES VS. MOVING

Building on previous UGPTI research in North Dakota suggesting that policy makers should consider the potential cost savings from enabling residents to age in place, UGPTI researchers conducted a nationwide study to quantify the cost of using public transit while living in small urban areas versus relocating to larger communities. The previous research showed that 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 and 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.

RURAL TRANSIT FACT BOOK PUBLISHED

The *Rural Transit Fact Book* published by UGPTI provides information on transit service availability and cost to help the transit industry in the United States provide efficient and effective service to meet rural community mobility needs. Financial and operating statistics are used by agency managers, local decision makers, state directors, the Federal Transit Administration (FTA), and lawmakers to assist in policy making, planning, managing operations, and evaluating performance.

Published by UGPTI since 2011, the *Rural Transit Fact Book* is a national resource for statistics and information on rural transit in America. This publication includes rural demographic and travel behavior data as well as financial and operating statistics for transit agencies. In addition to national level data, statistics are presented by state, FTA region, tribe, and mode, as well as other agency characteristics. Data for the report are obtained from the Rural National Transit Database (NTD) as well as from the American Community Survey, American Housing Survey, and National Household Travel Survey.

MODEL WILL HELP TRANSIT AGENCIES PLAN

UGPTI researchers developed a mathematical model to help transit agencies predict the service life of their vehicles to improve planning and assure that fleets are able to provide safe and reliable service to riders. With limited funding, being able to predict the service life of vehicles and prioritize financial expenditures for new vehicles is important for transit agencies. Unfortunately, there are few accurate tools to help transit managers with this task. The model developed by UGPTI gives them the ability analyze an entire fleet or a single vehicle which will help them identify prioritize spending on vehicles most in need of replacement. That's particularly helpful when budgets are tight. In addition, the model could be used by state agencies and the Federal Transit Administration to evaluate the overall condition of revenue vehicles in a state or in the nation. That insight gives agencies the ability to examine or implement policies that impact local agencies' ability to purchase vehicles.

SAFETY

ONGOING ASSESSMENT OF 24/7 SOBRIETY PROGRAM SAFETY

UGPTI provides an ongoing assessment 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. UGPTI has developed a process to combine administrative records from NDDOT and the ND Bureau of Criminal Investigation to measure the impacts of the program in terms of traffic safety outcomes and reduced recidivism. In the most recent assessment, researchers found:

- Crashes, non-DUI-related citations, and DUI-related citations were all significantly reduced in the 60-, 365-, and 730-day intervals following program enrollment.
- House Bill 1302, which established longer enrollment periods in the program for repeat offenders, has had a clear deterrent effect on DUI-related citations. Compared with participants who were required to be in the program for 60 days, those mandated to the program for a minimum of 365 days received DUI-related citations at a rate that is approximately half of their counterparts in the 365 and 730 days following initial arrest.
- Participants entering the program for the second or subsequent time were most likely to recidivate and have a DUI citation following program enrollment. If possible, these individuals should be targeted with additional treatment and intervention efforts.

As the 24/7 Sobriety Program has evolved, the UGPTI has continued to provide sustained empirical analysis that can be used for continual program improvement. Early assessments of the 24/7 program were used in policy decisions and in support of the program being accepted as a NHTSA-approved countermeasure. This NHTSA compliance was critical in meeting program requirements for safety and infrastructure program funding.

STATEWIDE SEAT BELT STUDY

Since 2010, the North Dakota seat belt use study, which is based on national standards, has provided 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. During June 2018, trained observers collected seat belt use of 19,383 drivers and 5,007 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. The final estimate for seat belt use was 82.5%. Highlights include the following:

- Driver seat belt use was 80.3%, while passenger use was 83.3% statewide.
- Overall, seat belt use was higher in the east, at 85%, compared with 77% for the west.
- Occupants of cars, SUVs, and vans demonstrated relatively high seat belt use of 82%, 87.5% and 85.8%, respectively. Truck occupants were belted at a lower rate of 74.6%.
- Female occupants show much higher rates of seat belt use, 87.3%, compared with males at 76.9%
- Seat belt use was highest on primary roads, 88.8%, followed by local roads, 79.7%, and secondary roads, 74.5%.

CELL PHONE USE ON ND HIGHWAYS

Texting and talking on cell phones was higher than the national average in a 2018 UGPTI study. In conjunction with a statewide seat belt survey, trained observers saw 3% of drivers talking on cell phones and another 1.4% manipulating a handheld device for a total of 4.4%. The national average is 3.3%. More than 19,000 drivers were observed in Barnes, Benson, Cass, Grand Forks, Griggs, Richland, Stutsman and Traill counties in eastern North Dakota, and Burke, Burleigh, McKenzie, Morton, Mountrail, Stark, Ward, and Williams in western North Dakota. The number of drivers talking on cell phones ranged from 6.1% in McKenzie County to less than 1% in Stutsman County. Device manipulation ranged from a high of 7.5% in McKenzie County to 0.1% in Ward County. Results of the study will help NDDOT assess levels of distracted driving in the state and target programs for improving highway safety.

TRUCK CRASH FACTS ASSEMBLED

Between 2007 and 2017, non-truck injury crashes in North Dakota decreased 7%, while crashes with truck involvement increased 60%. However, the number of truck crashes began to decrease after 2014, according to crash statistics assembled by UGPTI researchers. The size difference between 80,000-lb. trucks and 4,000-lb. passenger vehicles, along with other characteristics such as acceleration and deceleration times and turning radiuses, heighten crash risks. Truck-involved serious injury outcome incidence is 1.6 times higher compared with injury crashes where no trucks were involved. That makes it important to monitor levels and effects of increased safety-related interactions between trucks and cars. The crash data were assembled in support of NDDOT's State Highway Safety Plan and its Vision Zero safety initiative. Other highlights include:

- Care required was the most commonly issued citation in all crash categories, but considerably higher in single versus multi-vehicle truck crashes, 76% and 28%, respectively.
- Failure to yield held a 19% share in multi-vehicle truck crashes compared with 13% in other vehicle crashes.
- Speed, along with traveling too fast for conditions, and improper evasive action combined for 23% of contributing factors in single truck crashes and 16% of the multi-vehicle truck crashes.
- Weather was the largest contributing factor in all crash categories whether single, multi-vehicle, or other vehicles.
- Of the injury crashes involving trucks, 68% were multi-vehicle. Angle and rear-end crashes made up 76% of this group of injury crashes; 40% occurred at intersections or were intersection related; 26% occurred on hills and/or curves; and 53% were non-junction crashes.
- Rollovers were the most harmful event in 37% of single-vehicle truck crashes.
- Serious injury crashes peaked mid-week then declined on the weekend. Approximately two-thirds - 62% - of crashes occurred during the second half of the calendar year.
- There was a continued prevalence of truck-involved injury crashes in the oil region. Although the number of serious injury truck crashes in the region has declined, McKenzie, Williams, and Mountrail accounted for 42% of truck-involved fatal and injury crashes in the state.

STATEWIDE TRAFFIC SURVEY

The statewide driver survey, conducted every year since 2009, provides baseline metrics for the NDDOT Safety Division and others to use in understanding the 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. Results show that many North Dakota drivers have adopted safe driving practices, but it is apparent that additional efforts are needed to improve safety on the state's roads. Two specific recommendations can be made when examining trends that have taken place over the last eight years of administering the survey.

- Results clearly show that rural residents are less likely to use safety belts than their urban counterparts. Improvement in this area must be made to reduce rates of fatalities and serious injuries during crash events among rural North Dakotans.
- Younger drivers (18-to-34-year-olds) have less exposure to key safety campaigns and traffic messages than all other driver groups. They also hold viewpoints that are drastically different than their older counterparts and regularly engage in dangerous behind-the-wheel practices. It may be worthwhile to make the 18-to-34-year-old target group more aware of traffic safety tools via focused safety campaigns and optimized advertisement placement. The Code for the Road campaign, which has become part of the Vision Zero, NDDOT's safety initiative, is one such program that appears to be making a positive impact on young drivers, particularly males.

STATISTICAL MODELING TO IMPROVE HIGHWAY–RAIL GRADE CROSSING SAFETY

Accurately identifying the factors that contribute to accident likelihood will result in improved crash probability predictions and provide direction for improving highway-rail grade crossing designs and policies that will reduce crashes. UGPTI researchers explored various statistical models that could be used to identify those factors. They found that data mining models can serve as alternative tools for performing crash forecasting and do so with relatively accurate forecasting power and a strong ability to model non-linear relationships. This research is a first step toward developing a user-friendly tool that agencies can use to conduct analyses of highway-rail grade crossings so they can allocate limited resources to improvements that will have the greatest potential for reducing crashes.

SUPPORT TO NDDOT


photo credit: NDDOT

PROMOTING INNOVATION WITH NDDOT

From 2016 through 2017, UGPTI worked with NDDOT on its TRansportation Innovation Program (TRIP) to solicit innovative transportation ideas for review. In four solicitations per year, about 100 ideas were submitted, from which NDDOT selected 34 ideas for advancement. Contractors, consultants, suppliers, associations, tribes, colleges and universities, local jurisdictions, and NDDOT staff were eligible to submit ideas. UGPTI coordinated the development of the solicitation and review process. UGPTI prepared summation and executive decision documents for 12 solicitation events. At times, UGPTI hosted webinars for proposers to explain their proposals to the TRIP review committee and other NDDOT subject matter experts. Project examples included application of a seal coat after milling, but before placement of asphalt intended to reduce reflective cracking on ND Highway 22; using a proprietary product and process to stabilize subgrade on ND Highway 57 west of Fort Totten; self-service driver's license kiosks; digital driver's license applications; and asset management software that can interactively show how various investment strategies affect overall system performance.

UNMANNED AERIAL SYSTEMS STAKEHOLDER MEETING HELD

UGPTI facilitated a one-day stakeholder meeting of potential UAS users and developers in December 2017. The session brought together more than 40 government and private sector representatives to brainstorm ideas that NDDOT could use to submit a request for state waiver to research UAS visual line of sight and flight over people prohibitions. The pilot program was called the Unmanned Aircraft Systems Integration Pilot Program. NDDOT later submitted a grant request and was successful in being designated as a pilot state for UAS testing and FAA procedural development.

NDDOT TRANSPORTATION FINANCE AND POLICY SYMPOSIUM HOSTED

UGPTI coordinated, facilitated, and moderated a one-day symposium on transportation funding in March 2018. Over the course of 10 development meetings, UGPTI worked with NDDOT staff to identify national-, regional-, and state-level presenters. UGPTI developed foundation documents, presentations, and handouts for the event. Following the symposium, UGPTI created a draft summation document for NDDOT completion. All conference material is currently residing on the NDDOT webpage. The symposium has been seminal in funding proposals to be considered by the 2019 ND legislature.

TRAFFIC OPERATIONS

GRAND FORKS TRAFFIC DATA COLLECTION STUDIES

Since 2014, UGPTI has facilitated the use of existing video cameras at scores of intersections in Grand Forks to collect traffic data. This series of projects has been instrumental in essentially having 24/7/365 traffic counts available at more than 60 locations. This translates to nearly 250 lane locations that may be considered permanent count stations. The data from these intersections have been used in various applications, including planning and forecasting (travel demand modeling), traffic operations, and safety (e.g., traffic signal phasing and timing design, progression design, and needs studies). According to the City of Grand Forks, each 12-hour count, if done otherwise, would have cost about $750 with additional savings in personnel time. An upcoming project (slated to begin January 2019) would allow NDDOT, Fargo, and West Fargo to have intersection data collection capabilities similar to those of Grand Forks. These traffic data allow local, regional, and state agencies to better plan, manage, and design transportation facilities.

WALKABILITY STUDIES

UGPTI completed walkability studies for the Cavalier County Health District and the Grand Forks-East Grand Forks Metropolitan Planning Organization. The study completed in Grand Forks-East Grand Forks was part of a larger neighborhood-wide study where traffic safety issues were identified and countermeasures recommended. An innovative solution to install mini-roundabouts was recommended to address multiple issues at once. The Cavalier County study, conducted in Langdon, identified concerns related to walking in the community of Langdon. The assessment included the Langdon Area High School and the Langdon Elementary School. UGPTI experts found several issues and made recommendations to local agencies for improvement.

TRAFFIC OPERATIONS ROUNDTABLE MEETINGS HOSTED

UGPTI organizes and facilitates the biannual North Dakota Traffic Operations Roundtable Meeting. The meeting has been twice each year for 14 years. UGPTI arranges for guest speakers on topics that are timely and of interest to the group. Topics typically focus on traffic operations challenges being faced by agencies and communities represented by attendees. Representatives from the Federal Highway Administration, NDDOT, metropolitan planning organizations, various cities, universities, and consulting engineering companies typically attend. Attendees share valuable experiences and information and earn professional development hour credits to maintain their licensure.

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 permit the respective transportation agencies to identify potential future transportation needs in order to efficiently use program funds, develop corridor plans and long-range transportation plans, meet transportation performance management requirements, and inform the public. The overall objective is to develop an unbiased/neutral transportation planning modeling resource suited for small- and medium-sized urban areas. UGPTI updated models for all three MPOs in 2018. In addition to the MPOs, the program also supports travel demand model research and data to other cities and NDDOT as requested.

INTELLIGENT TRANSPORTATION SYSTEMS PLANNING

With support from NDDOT, UGPTI updated the statewide ITS plan, which 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. Developing and utilizing an up-to-date ITS architecture is an FHWA requirement for receiving federal funding for ITS projects. This update ensures that North Dakota is in compliance.

TRAVEL TIME DATA FROM BLUETOOTH SENSORS

Vehicle travel times can be captured by placing Bluetooth readers on the roadside. The readers interact with vehicles that have an active Bluetooth device, and the system records travel times for unique vehicles between two Bluetooth checkpoints. UGPTI researchers are assisting NDDOT in the placement and setup of Bluetooth sensors to maximize data accuracy, analyze the data and plan for their archiving, and assess the suitability of the data for display on the state's traveler information map. Travel time data help transportation agencies measure system performance and enhance trip planning for travelers.

MEASURING WINTER MAINTENANCE PERFORMANCE

For transportation agencies to continually improve their operations they must be able to measure performance. UGPTI is assisting NDDOT by performing a systems engineering analysis to establish winter maintenance performance measures for the state. The analysis will involve examining data needs for the system (e.g., speed, travel time, pavement friction), determining suitable performance measures and how they will be calculated, and developing a concept of operations and requirements of the system. This analysis will serve as a basis for implementing a future winter maintenance performance measurement system, which can be used to identify areas for improvement and to optimize allocations of time and equipment.

TRANSPORTATION WORKFORCE SUPPORT

HANDS ON LEARNING FOR STUDENT ENGINEERS

UGPTI's engineering intern program instructs engineering students in the methods and protocols for developing NDDOT engineering roadway designs. It also familiarizes students with the roles and responsibilities for transportation engineers and how they fit into a transportation organization. Typically, 12 civil engineering students are hired to work under the guidance of an NDDOT engineer and function as one of four NDDOT design squads fully developing projects to the bid-letting stage.

STUDENTS LEARN WHILE PROVIDING IT ASSISTANCE TO NDDOT

Information technology interns with UGPTI gain hands-on experience in transportation-related information technology support and application development as they assist NDDOT with meeting its information technology needs. Students also develop web-based and mobile applications to support the business practices of NDDOT and the transportation industry. Current and past projects include applications for conference registration, training certification management, materials division support for lab reports and technician certification, weigh-in-motion graph and TDEA support, development of a traffic data reporting portal, surface selection tool, truck weight calculator, local government roadway inventory tools, speed data reporting tools for performance measures, safety tools such as dynamic curve warnings, freight corridor planning tool, and a travel time reliability performance measure tool.

TRUCK SUMMITS DRAW BIG CROWDS

More than 100 county truck and equipment operators from across the state learned proper loading and operating techniques and safety essentials at two truck summits held in September 2018 in Barnes and Dunn counties. The events, organized by NDLTAP, featured hands-on training by equipment specialists, safety experts, and law enforcement. The events were based on the premise that county employees can lead the way in assuring road and workplace safety and compliance with road weight regulations if they receive proper training.

TRAINING FOR IMPROVED TRANSIT

Transit professionals in rural and small urban areas have come to count on UGPTI for training on topics such as transit management (beginning and advanced) business continuity, emergency management, financial management, hiring and retaining great employees, intelligent transportation systems, safety and risk management. In 2018, staff conducted transit-related training in 10 states in addition to North Dakota and Washington, DC, with nearly 3,300 hours of training for more than 1,000 individuals.

Training at the Dakota Transit Association annual conference reached more than 80 transit employees from North Dakota and South Dakota with sessions on workplace ethics and vehicle maintenance. A training on improving workplace culture was also offered in Fargo. Participants consistently report that the training helps them improve agency and employee performance, helping transit agencies to operate more efficiently while providing improved service to those who rely on them for mobility.

PROVIDING LEARNING OPPORTUNITIES IN FOUR STATES

In the first year of the 2017-2019 biennium, UGPTI delivered 58 technology transfer events to nearly 3,600 attendees (mostly state DOT and local agency highway workers) across four states via its Transportation Learning Network (TLN). At times, there were more than 200 learners in over 35 sites connected to an event. The highest attended event was a session on legal aspects of traffic control on highway work zones. Other popular events included trainings on snow fences, chain saw operation, traffic control, sheet piling and cofferdam design, construction site storm water pollution prevention planning, and pavement striping. In the first half of the 2018-19 presentation period, TLN delivered 27 of its planned 60 events. A unique event was the Pavement Preservation Peer Review, which hosted over 100 pavement practitioners from state, county, and city entities across Montana, North Dakota, South Dakota, and Wyoming. The attendees shared their best practices and learned from each other ways to improve pavement preservation through better crack sealing, seal coats, and other pavement treatments.

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 DOTs, with NDDOT as the lead state. TLN allows many DOT staff members to experience a myriad of topics without the burden of traveling long distances.

To deliver the TLN mission, UGPTI maintains a video conference bridge and broadcasts subject matter with expert presentations to the four states. UGPTI staff members also coordinate webinar services for desktop delivery when appropriate. Technical staff members 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 archives recordings of most of the presentations on its learning management system. TLN also archives 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 office 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.