Wyoming Technology Transfer Center

WY T²
LTAP/TTAP

Local Technical Assistance Program
Tribal Technical Assistance Program

UPCOMING WORKSHOPS

October

16th - Local Project Administration (LPA)

Casper College

29th - Constructing Concrete to withstand the Wyoming Environment / ACPA of CO & WY

Gillette College

30th - Constructing Concrete to withstand the Wyoming Environment / ACPA of CO & WY

Casper College

November

13th to 15th - WMTC Soils & Aggregate - Online

18th to 20 - WMTC Asphalt - Online

December

2nd to 4th - WMTC Portland Cement Concrete

Jan - June 2025 WMTC and Workshops please use the links to the right to visit our website

WORKSHOPS

Local Project Administration (LPA)

From the Desk of the Director

By: Khaled Ksaibati

It is almost the end of August and the summer is almost gone. I am sure that the summer has been very busy for all of you and soon you will begin thinking about training/certification during the upcoming winter season so that you are ready for your next summer activities. In this upcoming season, we will be providing various training and certification classes so make sure that you check our agenda.

The statewide sign program is in full swing and your deadline to submit requests for signs for the High Risk Rural Road Program is the end of August. As you are aware, we have provided all counties with crashes on all of their paved and gravel roads for the past ten years. The crash data should help you out in determining where to invest your energy and request regulatory signs. After we receive your requests, we will summarize them and send them to WYDOT. WYDOT will then provide the signs, posts, and hardware to install them. The Wyoming LTAP will do the inspection after all signs have been installed. Please submit your requests to us ASAP so that we can include them in the request.

On a different note, we requested information from all counties about the adoption of the new MUTCD and there has been no concern raised by any county so we will let WYDOT know about this.

Finally, I just came back from a trip to the US DOT Future of Transportation Summit which brought in transportation professionals and researchers from every corner of the US. The Summit was by invitation only and more information about it can be found at the following link: https://fot-summit.org/

Enjoy what is left of your summer.

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by Austin Woody

Unmanned Aerial Systems (Aerial Drones)

The term Unmanned Aerial Systems (UAS) describes the airborne segment of the drone world. UAS has recently exploded across many fields, including the construction and transportation industries. In recent years, drones have been proven to increase safety, save time, and decrease costs while enhancing the quality of work outputs in various tasks across the transportation field. Drones have become more accessible than ever through declining costs, advancements in user-friendliness, and increased versatility.
The Wyoming T2 Center launched a drone program in 2019 thanks to a generous grant from the Wyoming State Transportation Innovation Council and FHWA as part of the Every Day Counts initiative to "identify and deploy proven, yet underutilized innovations."   To this end, a staff member trained and certified as an FAA-certified drone operator purchased several UAS systems and software. This project aimed to increase awareness of drone applications and logistics through demonstrations and workshops delivered virtually and in person. Additionally, the Wyoming T2 Center compiled and published an entry-level UAS manual, which serves as a non-commercially oriented, one-stop-shop resource for transportation professionals interested in integrating UAS into their work tasks. The Wyoming T2 Center is continuing these efforts in UAS integration continue through a research project with the Transportation Avalanche Research Pool (TARP) group. The TARP group includes transportation agencies from Alaska, Colorado, California, Utah, Washington, and Wyoming who conduct avalanche control activities surrounding transportation corridors in mountainous regions. We are assisting the TARP group by compiling a synthesis study describing current efforts toward deploying UAS in avalanche forecasting and mitigation practices. As with other applications within transportation industries, UAS are proving to be a transformative technology within avalanche control practices.

Pavement Management System Update

By: Mohamed Yamany, PhD

Since 2014, the Wyoming County Commissioner Association (WCCA), Wyoming Department of Transportation (WYDOT), and the State Transportation Innovation Council (STIC) have supported a project to develop a comprehensive database for Pavement Management System (PMS) of county paved roads. Funding was obtained through CTIPS with matching funds from Wyoming LTAP to collect roadway inventory data, pavement condition data, and roadway thicknesses. Pavement condition data is organized every year for half of the state on an alternating basis between Western Wyoming (Big Horn, Fremont, Hot Springs, Lincoln, Park, Sublette, Sweetwater, Teton, Uinta and Washakie counties) and Eastern Wyoming (Albany, Campbell, Carbon, Converse, Crook, Goshen, Johnson, Laramie, Natrona, Niobrara, Platte, Sheridan and Weston counties).

Overall, the findings of this project are summarized in three main elements: reports for each county, a statewide report, and a comprehensive database published in ArcGIS online hosted by the WYT2/LTAP center. Written reports are compiled, printed, and provided to country road and bridge supervisors and county commissioners. These reports summarize pavement conditions from the most recent data collection cycle and condition data from previous years and county roads across the state. A comprehensive database for all counties and data from earlier years is published online by the WYT2/LTAP center.

This data reporting serves various functions for local road system managers and elected officials. Tracking changes in pavement condition parameters from year to year can be used to inform officials of current and future maintenance needs as well as prioritization of maintenance needs. Impacts from changes in traffic patterns or industrial development can be tracked and quantified through pavement condition data. Specific condition parameters such as crack type, severity, and extent can be used to calculate and plan material needs for maintenance activities such as crack sealing.

Our pavement management system reporting continues in 2023, with data collection underway in Western Wyoming. Also, in 2023, our efforts have expanded to include paved road systems managed by the City of Jackson Hole and the Wind River Indian Reservation Intertribal Department of Transportation.

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In 2024, the center for transformative infrastructure preservation and sustainability (CTIP) supported funding a project aimed at developing a PMS specifically designed for county roads in Wyoming. The objective of this project is to prioritize maintenance and rehabilitation (M&R) activities for pavement segments. This prioritization is based on pavement quality rating (PQR) and road characteristics, including land use, traffic volume, speed limit, connectivity to state roads, and number of lanes. This project also aims to collect data on the various alternatives and costs of M&R in different counties. This data will be utilized to select the cost-effective M&R alternatives and then accurately calculate the financial needs for maintaining county paved roads in the state of Wyoming.

This project collects and integrates data regarding the following road characteristics: land use, traffic volume, speed limit, connectivity to state roads, and number of lanes. It gathers the Parcels shapefiles for Wyoming counties and subsequently classifies county roads into industrial, residential, recreational, agricultural roads based on their location, using the ArcGIS software. Moreover, it employes the Highway shapefile for Wyoming state roads to categorize county roads into two groups: those that are connected to state roads and those that are not. This project utilizes the traffic volume estimated for the low-volume roads by the Wyoming Technology Transfer Center (WYT2/LTAP) to determine the approximate traffic volume on county roads. Additional features such as speed limit and number of lanes of county roads are not available. Therefore, each county road is visually observed through the 3D Walkthrough feature on Google Maps to determine the number of lanes and the posted speed limit of each road segment.

Furthermore, this research project will develop a decision tree that is specifically tailored for the purpose of selecting the cost-effective treatments for Wyoming county roads. The selection of the most cost-effective M&R treatments will be based on pavement PQR, cracking, surface roughness, and rutting.

This research project develops a hybrid priority ranking system to rank pavement segments based on the combination of pavement PQR and road characteristics. The relative significance of pavement condition in relation to road characteristics as well as the relative importance of different road characteristics were assessed using a questionnaire survey. This integration will ensure that the selection of pavement segments for M&R will be based on pavement condition and decision-maker perspectives, leading to a reduction in the difference between the as-planned and as-built maintenance activities. This will also facilitate the accurate assessment of future financial needs for county roads.

In conclusion, a comprehensive PMS will be provided for Wyoming counties, which will incorporate historical pavement condition data, road characteristics, M&R treatment alternatives and costs, which should be updated annually or whenever new data becomes accessible. In addition, the PMS will include decision trees for effective treatment selection, and a prioritization framework for scheduling M&R treatments, and financial requirement assessment. This PMS will aid Wyoming counties in making cost-effective and efficient decisions, and ultimately maintaining their roads in a state of good repair, while utilizing the limited resources effectively.

Collision warning and collision avoidance system for Snowplows

Imran Reza, Suresh Muknahallipatna, and Khaled Ksaibati

The reduced adhesion and traction of the road surface due to snow and ice present a significant risk to road users. The reduced speed and capacity on the road resulting from this situation can have a detrimental effect on vehicle maneuverability. This, in turn, may cause drivers to fail to react to incidents on time, potentially resulting in skidding or collisions with other objects [Haq.(1,2)]. In the United States, snowy, slushy, or icy
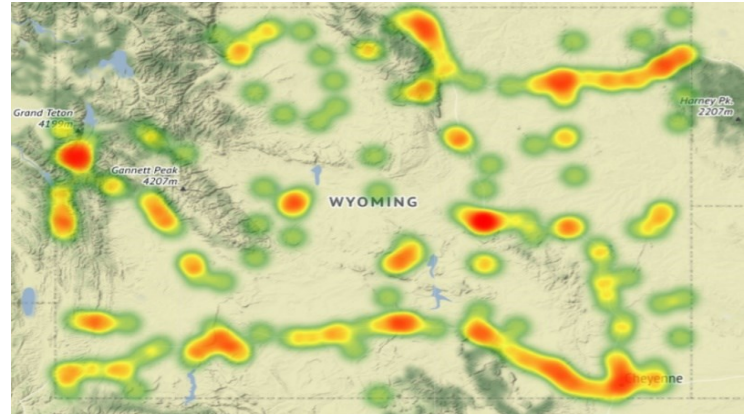

Figure 1: Heatmap of Snowplow crash locations in Wyoming Road Networks

pavement accounts for 24% of weather-related vehicle crashes yearly; however, 15% occur during snowfall (2). More than 1,300 lives are lost, and over 116,800 are injured every year in vehicle crashes involving slushy, icy, or snow-covered pavement [Haq (3)]. The safe operation of snow plowing is crucial for maintaining ideal road surface conditions to ensure safe travel during and after a snowstorm [Haq (5-7)].

The risk of a collision involving snowplow trucks is often neglected in winter maintenance operations. A snowplow-related crash has the potential to result in extensive property damage, as well as severe injuries or even fatalities. Additionally, the loss of just one Snowplow can substantially affect the efficiency of snow clearance operations, leading to delays in clearing the roads. The slower speeds adopted during snow plowing and deicing operations create a significant safety concern regarding rear-end collisions between other vehicles and snowplows [Haq (8)].

To mitigate these concerns, state Departments of Transportation (DOTs) have conducted trials using different approaches to enhance safety during routine winter road maintenance. and space for braking.

Figure 2: Snowplow Truck collision near Rawlins on Interstate 80

An effective strategy involves periodically disseminating safety education and conducting outreach initiatives to improve driving behavior on roads covered with ice or snow, especially near snowplows. Travelers are recommended to refrain from abrupt acceleration and deceleration and allocate extra time

A large number of snowplows are usually out during the winter season, maintaining the roads by clearing the snow and putting down materials to facilitate traffic movement. While operating snowplows in adverse weather, motorists often end up with rear-end crashes for poor visibility due to the disturbance of the snow. This is evidenced by the February 2021 snowstorm, which resulted in 10 snowplow rear strikes within five days, as shown in Figure 2 (The Trucker, 2021)

Our study, based on a total of 442 snowplow-related crash records from 2010 to 2020 with the involvement of 837 vehicles and 1,084 injuries, revealed that other vehicle drivers were found more responsible than snowplow drivers to contribute to more severe injuries when colliding with snowplow trucks. This study suggests implementing more focused specialized training programs on navigating beside a snowplow on a challenging road with limited visibility. During the examination of vehicle characteristics, it was observed that vehicles with estimated speeds exceeding 60 mph were found to be associated with more severe injuries. More severe snowplow-related crashes occurred in challenging roadway geometry (i.e., horizontal curve and downhill segment) and during adverse weather conditions.

To reduce rear-end snowplow truck-related crashes and lower the severity of the injuries caused by the crashes, LTTP of the University of Wyoming is developing a rear-end collision avoidance system for the snowplows. A prototype including multiple sensors is in the testing phase before it is initiated for
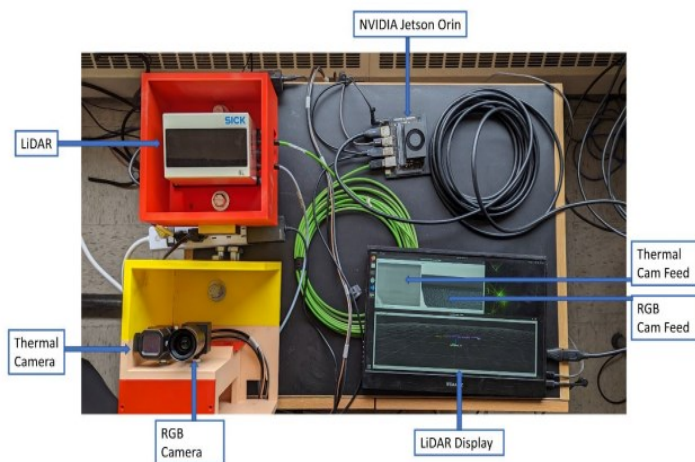

Figure 3: Snowplow collision avoidance prototype

Figure 4: Display inside the Snowplow cabin for multiple sensor/camera-based vehicle detection.

Obstacle detection and collision avoidance systems typically use LiDAR and RGB cameras as primary perceptual sensors. However, heavy snow can occlude objects by reducing visibility for optical sensors, specifically in deployment on snowplows, which operate primarily in poor conditions. We introduced a thermal infrared camera to the sensor fusion to curtail the increasing number of snowplow collisions. The main focus is on the perception of vehicles in IR images using image processing and deep learning approaches with the objective of vehicle detection and distance measurement.

The whole system is expected to work in multiple successive steps. The Collision avoidance system will activate if a vehicle enters within a designated distance behind the Snowplow truck. Once a vehicle is within this designated area, the LED lights become more prominent and brighter than the standard lights on the back. If this did not alert the trailing vehicle behind the Snowplow truck and it continued to get closer, a warning light with a rear-facing air horn would sound to alert the trailing vehicles. Next, the developed collision and warning system would allow the plow operator to move away from the travel lane and avoid a collision by developing the minimum acceptable following distance and adequate perception reaction time.

The proposed warning systems will be initially implemented in 2 to 3 snowplow trucks operated during plowing activities in the winter season. The potential feedback from the operators during the field test will be used to further enhance the system by addressing the key issues and challenges of using the technology before a full-blown implementation. The developed Collision and Warning system for the Snowplow is expected to help WYDOT and policymakers take necessary actions to reduce snowplow-involved crashes in Wyoming by targeting appropriate strategies and proper resource allocation.

Wyoming Grant Assistance Program (WYGAP)

The Wyoming State Budget Department / Grants Management Office has launched a number of tools and services to help Wyoming local government with the many aspects of applying for, and managing, federal grants.

1) **Grants Management Office** - The Grants Management Office (GMO) supports Wyoming local governments and communities through a broad range of grants management activities across the grant lifecycle, including needs identification and planning, project scoping, funding opportunity identification, stakeholder coordination, grant application development, and post-award grant management support.

2) **Grants Connection Hub** - The Wyoming Grants Connect Hub is a one-stop-shop interactive dashboard and grant data repository that allows users to find information on state and federal grant funding programs available to Wyoming communities. This is to provide ultimate transparency on the availability of opportunities, whether they are federal or state funded.

3) **Grant Assistance Program** - The Wyoming Grant Assistance Program **(WYGAP)** is a technical assistance program that provides local governments, non-profits, and small businesses with support to identify, pursue, and manage grants that support local priorities.

Local communities often face significant barriers in their ability to navigate the grants process, including:
- Lack of staff resources
- Lack of knowledge or experience in grants
- Lack of clearly identified needs that result in grant-ready projects

WYGAP is designed to provide support to local communities in overcoming these barriers while building lasting local capacity to pursue and secure federal and state grant funding and implement grant programs in compliance with all regulations.

WYGAP - Technical Assistance Services

WYGAP provides the following technical assistance services for local communities:
- Trainings, webinars, and office hours
- General/exploratory assistance
- Needs identification and planning
- Project scoping and review
- Funding opportunity identification
- Stakeholder coordination
- Grant application development
- Post-award support
- Federal fund match information

Click Here For More Information On Programs

Click Here To Request Assistance