

T² Roads on the Range

Phone: 800-231-2815 Fax: 307-766-6784 www.uwyo.edu/wyt2 Email: wyt2c@uwyo.edu

Assessing the Cost-Effectiveness of Wyoming's CMAQ Unpaved Road Dust Suppression Program

Wyoming Technology Transfer Center



By Chris Chamberlin and Khaled Ksaibati

For a number of years, Wyoming counties have used congestion mitigation and air quality (CMAQ) funds to apply dust suppressants to their unpaved roads. These funds are intended to help reduce PM₁₀ emissions (particulate matter less than 10 µm in diameter). Particulate matter is one of the U.S. Environmental Protection Agency's six criteria pollutants affecting air quality. PM₁₀ is referred to as "inhalable coarse particles," such as those found near roadways. In the past, decisions as to where and how CMAQ funds are applied have been subjectively based on engineering judgment.



Objective

This study attempts to quantify the benefits and costs associated with the CMAQ program. Maintenance costs are generally reduced on treated roads since maintenance isn't needed as often and gravel isn't lost as quickly so it doesn't need to be replaced as often. In addition, treated roads generally provide the user with a higher quality road surface with less raveling, loose aggregate and washboards, all of which can contribute to a loss of vehicle control. Both these improvements in road surface quality and the improved visibility that arises from reductions in dust make unpaved roads safer when they are treated. The goal of this project is to determine the value of the reductions in fugitive dust emissions which are realized by using different dust suppressants and application methods in different situations. By determining the benefits realized in different situations, the results of this study will allow for cost-effective allocation of CMAQ funds in the future.

Research Methods:

The study utilizes field data and comprehensive statistical analysis to evaluate the effectiveness of various dust suppressants. This includes monitoring dust suppressant application, surfacing aggregate type, traffic, weather, roadway performance, and fugitive dust emissions to provide a comprehensive assessment of the effectiveness of the dust suppression efforts paid for with CMAQ funds.

Correlation Study

As a secondary objective of this study, a correlation between two dust measuring devices is being performed. The Colorado State University (CSU) Dustometer, and the HAZ-Dust EPAM-5000, are two monitoring devices that determine the dust concentrations released from unpaved roads. These two devices are similar in that they determine dust concentrations, but their procedure and collection techniques are very different.

The CSU Dustometer is attached to a vehicle and collects dust as the vehicle drives along an unpaved road. The

29th Annual Regional Local Road Conference

By Josh Jones

The regional local road conference is held once a year in Rapid City, SD during the third week of October. The conference began with opening remarks from the program manager of the South Dakota LTAP, Ken Skorseth. He thanked everybody involved with the conference and mentioned that the conference keeps growing and this year there was a record 385 people registered. This included attendees from 18 states, Canada and Washington, DC. Part of the reason for expanded reach is several NACE Board of Directors members attended. NACE held their quarterly board meeting in Rapid City along with the conference.

The first presentation addressed the effect that trucks with different numbers of axels have on roadways. Overloaded single axle trucks have some of the worst effects on the stability of roadways. Also spring thaw load restrictions were analyzed and the benefits that some South Dakota Counties have experienced from it. After lunch Ken Skorseth talked about the potential for Unmanned Aerial Vehicle (UAV)

assessment of local roads. The UAVs get a unique view of the roadway that vehicles on the ground cannot see. This included issues with drainage, gravel loss, and skewed roadway alignment. UAVs can also be used to survey roads when natural disasters make it hard to assess the area.



Next was a presentation from Aaron Birst, legal counsel from the North Dakota Association of Counties on bidding projects. He talked about different state and federal regulations that need to be followed, low bids don't have to always have to be selected and all the bids can be rejected if needs be. The last presentation of the day was Renee Railsback from the Colorado LTAP Center talking about preparing local agencies for natural disasters. Different strategies and trainings can help for developing a natural disaster management plan.

The second day began with a presentation from Alyssa Clemen a graduate research assistant working with the SD LTAP Center. Her research project looked at the effects different base and subgrade had on road conditions. The research project is ongoing and the findings will be presented next year. Drainage structure maintenance and repair was presented by Kenny Mounds on what causes drainage structure failure and the different strategies for repair and preventative maintenance.

The conference is always very informative of the challenges facing local roads in the upper plains and we hope to see some more Wyomingites next year. From the evaluation sheets a few things stood out, the technical presentation on Truck Axles was the most interesting topic listed by the attendees. The top two requested topics from the evaluation were gravel roads and culverts/small structures. Managing people and the right-of-way tied for the third most requested topic for next year. Every effort will be made next year to accommodate the requested topics.



CMAQ, *continued from p. 1*

result is the concentration of dust released from a road in grams per mile (g/mile). The Haz-Dust unit is a stationary unit that is set on the side of an unpaved road and the concentration of dust in the air is continuously recorded in milligram per cubic meter (mg/m³).

The difference in collection techniques makes the comparison between the two devices a little challenging. This study will attempt to correlate the grams per mile concentration recorded with the Dustometer to the milligrams per cubic meter concentration recorded with the Haz-Dust unit. In addition to finding a correlation, this study will determine if one device is preferred over the other in terms of accuracy of collection and usefulness of resulting data.



CSU Dustometer



HAZ-Dust EPAM-5000

Research Needs

In order to effectively assess dust suppressant effectiveness, data must be collected both before and after suppressants are applied. Therefore, it is very important to coordinate with counties to determine when treatments are planned, so that data can be collected on roads before they are treated. Counties using CMAQ funds to treat roads will be contacted in January, 2015 and asked to provide information on their proposed schedule for treatment. Once the counties schedules have been determined, a plan for data collection can be made.

Information requested from counties will include:

- Expected schedule for suppressant application
- Suppressant type being used (CaCl or MgCl)
- Application rate for suppressant
- If available, road surface aggregate information
- If available, traffic counts for roads

Expected Outcomes:

This study will provide basic information needed to use dust suppressants and CMAQ funds as efficiently as possible. When combined with knowledge about traffic characteristics and surfacing aggregate types, the most cost-effective use of dust suppressants and CMAQ funds will be established. This will benefit not only those deciding how to allocate CMAQ funds but also county officials deciding where they will get the most value out of the money when they allocate dust suppression funding.

Signs Retroreflectivity

Agencies had until June 14, 2014, to implement and continue to use an assessment or management method that is designed to maintain regulatory and warning sign retroreflectivity at or above the minimum levels in Table 2A-3 of the 2009 MUTCD.



Agencies need to replace any sign they identify as not meeting the established minimum retroreflectivity levels. Agencies' schedules for replacing signs are based on resources and relative priorities rather than specific compliance dates.

Traffic signs provide important information to road users. To be effective, traffic sign visibility must be maintained during daytime and nighttime conditions. In addition to Section 2A.08, the MUTCD addresses sign visibility in several other places, including Sections 1A.03, 1A.04, 1A.05, 2A.06, 2A.07, and 2A.22. These sections address factors such as uniformity, design, placement, operation, and maintenance.

The Standard in Section 2A.08 requires agencies to use a maintenance method that is designed to maintain traffic signs at or above minimum levels of retroreflectivity. The MUTCD does not imply that an agency must measure the retroreflectivity of every sign. Rather, the MUTCD summarizes five methods that agencies can use to maintain traffic sign retroreflectivity at or above the minimum levels. The methods recommended in the MUTCD are broken into two categories: management methods and assessment methods. Assessment methods involve sending personnel out to examine and assess the retroreflective performance of signs. Some agencies may find this approach to be more labor intensive and turn to management methods as an alternative. Management methods may require less field work (or none at all

in some cases) but may also result in replacing some signs that still have useful life left in terms of retroreflectivity. The five different methods are described below:

A. **Visual Nighttime Inspection**—The retroreflectivity of an existing sign is assessed by a trained sign inspector conducting a visual inspection from a moving vehicle during nighttime conditions. Signs that are visually identified by the inspector to have retroreflectivity below the minimum levels should be replaced.



Signs Retroreflectivity, *continued*

- B. **Measured Sign Retroreflectivity**—Sign retroreflectivity is measured using a retroreflectometer. Signs with retroreflectivity below the minimum levels should be replaced.
- C. **Expected Sign Life**—When signs are installed, the installation date is labeled or recorded so that the age of a sign is known. The age of the sign is compared to the expected sign life. The expected sign life is based on the experience of sign retroreflectivity degradation in a geographic area compared to the minimum levels. Signs older than the expected life should be replaced.
- D. **Blanket Replacement**—All signs in an area/corridor, or of a given type, should be replaced at specified intervals. This eliminates the need to assess retroreflectivity or track the life of individual signs. The replacement interval is based on the expected sign life, compared to the minimum levels, for the shortest-life material used on the affected signs.
- E. **Control Signs**—Replacement of signs in the field is based on the performance of a sample of control signs. The control signs might be a small sample located in a maintenance yard or a sample of signs in the field. The control signs are monitored to determine the end of retroreflective life for the associated signs. All field signs represented by the control sample should be replaced before the retroreflectivity levels of the control sample reach the minimum levels.
- F. **Other Methods**—Other methods developed based on engineering studies can be used.



These recommended methods are described in detail in a full report entitled “Methods for Maintaining Traffic Sign Retroreflectivity,” available at www.fhwa.dot.gov/retro. The Standard promotes safety while providing sufficient flexibility for agencies to choose one or more maintenance methods that best match their specific conditions. This Standard does NOT imply all signs need to be replaced. The intent is to identify and replace signs that no longer meet the needs of nighttime drivers.

Although guide signs are included in the minimum retroreflectivity levels table, there is not a specified compliance date for guide signs (including street name signs) to be addressed by an agency’s method. Guide signs are to be added to an agency’s management or assessment method as resources allow.

The MUTCD language recognizes that there may be some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time. Reasons for this include vandalism, weather, or damage due to a crash. As long as the agency is using one of the methods (with appropriate procedures) to maintain their signs, they are considered to be in compliance with this Standard. If you have any questions regarding setting up a sign management program, please contact the Wyoming T²/LTAP Center.



Retroreflectometer Loan Program

The Wyoming T²/LTAP Center has two Retroreflectometers that are available for loan and are on a first-come first-serve basis. If any local agencies are interested please contact the Wyoming T²/LTAP Center by phone (307) 766-6743 or by email at wyt2c@uwyo.edu

WYT²/LTAP Sign Program

By Bart Evans



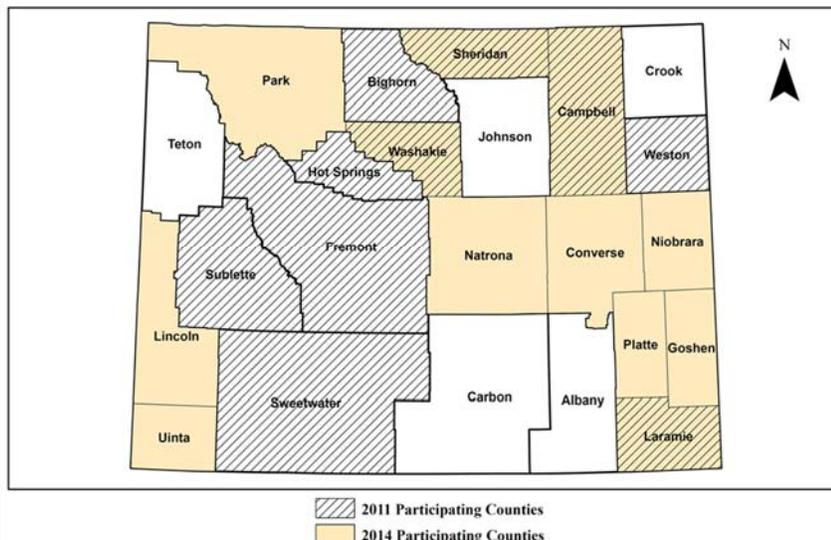
The WYT²/LTAP Center, WYDOT, and FHWA have been working with counties around the state to help improve the safety on rural roads. In an effort to continue safety improvements which would reduce fatal and incapacitating injury crashes, two rounds of a statewide sign program have been implemented.

The statewide sign program provides advance warning signs for high risk rural roads where signs have not previously existed or where enhancement would be beneficial. Counties identifies the number of signs and posts needed on eligible high risk roads and submit their requests to the WYT²/LTAP Center. The center then compiles all the requests and passes them to WYDOT. WYDOT is now in the process of purchasing the signs and posts for round two and they will be delivered to the Counties in the spring of 2015. The counties are responsible for the installation of the signs within one year of delivery. As shown in Table 1, 1,812 signs were delivered to 10 counties. These signs have been installed on 136 county roads. In the current round of sign program, 1,712 signs will be installed in 12 counties on 122 high risk roads. This program has been a success and it shows how the coordination among various agencies will benefit the driving public in the state of Wyoming.

COUNTY	# SIGNS	# POSTS	# ROADS
Big Horn	471	444	22
Campbell	494	404	33
Fremont	123	123	6
Hot Springs	50	49	8
Laramie	76	76	19
Sheridan	63	56	10
Sublette	7	7	4
Sweetwater	250	220	31
Washakie	34	22	3
Weston	244	194	12
TOTAL	1812	1595	136

COUNTY	# Signs	# POSTS	# ROADS
Campbell	2	2	2
Converse	291	279	22
Goshen	242	202	9
Laramie	320	106	21
Lincoln	69	63	9
Natrona	267	90	12
Niobrara	114	114	7
Park	142	142	12
Platte	51	51	13
Sheridan	37	29	1
Uinta	65	36	5
Washakie	112	112	9
Total	1712	1226	122

COUNTIES PARTICIPATING IN THE STATEWIDE SIGN PROGRAM



Resources for Winter Training

The Wyoming Technology Transfer Center offers a comprehensive library of transportation literature. Below are DVD selections from our library concerned with the encroaching winter season. Please contact us at the center if you would like to check out any of these DVDs. For a comprehensive list, you can check our website.

- M7372 - DVD - *Field Guide to Testing Deicing Chemicals (Clear Roads)*: A walk through of the different types of field testing that can be done to evaluate deicing chemicals and guidance on what data should be collected.
- M7372 - DVD - *Snow and Ice Control, Winter Formula (Ohio DOT)*: Describes the basic elements used for snow and ice control. This includes an overview of materials, equipment and weather forecasting.
- ST7360 - DVD – *Driving Safely In Winter Conditions (Wumbus)*: Instructs the viewer how to recognize hazards in winter conditions and avoid auto accidents. Focuses in all types of inclement weather associated with the winter season.
- DC7234 - DVD - *Snow and Ice Removal from Pavement Using Stored Earth Heat (Federal Highway Administration)*: Explores the technical feasibility of using earth heat in combination with heat pipes for deicing and removing snow. Describes the analytical models constructed to describe earth heated pavement systems.
- M7217 - DVD - *Winter Operations and Snow Plow/Spreader Operation (PennDOT)*: The first section evaluates PennDOT's methods of operation to mitigate the effects snowy and icy roads have on transportation systems. The later section highlights proper and effective snow plow and spreader operation.
- M7264 - DVD - *Topics in winter maintenance (UtahDOT)*: Covers various topics with sections White Gold, Plow Power, Straight Blade Snow Plows, Highway Sanders, and Highway Sanders Calibrations.
- M7331 - DVD - *The New Generation of Snow and Ice Control: Anti-icing and RWIS (FHWA)*: This video explores both the use of anti-icing chemicals and specialized road weather information systems (RWIS), the new generation of snow and ice control.
 - M7337 - DVD - *Using Snow Plows on Motorgraders (FHWA)*: Provides instruction on the attachment of various types of plows to motorgraders and general operator guidelines. Demonstrates pre-start inspection, plowing techniques, correct downward blade pressure and plowing speed.
 - DVD – *Gravel Roads: Maintenance and Design Manual (SD LTAP)*: This manual was developed with a major emphasis on the maintenance of gravel roads, including some basic design elements. The purpose of the manual is to provide clear and helpful information for doing a better job of maintaining gravel roads. The manual is designed for the benefit of elected officials, managers, and grader operators who are responsible for designing and maintaining gravel roads.



Wyoming T² Center
University of Wyoming
1000 E. University Ave., Dept. 3295
Laramie, WY 82071

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20th Annual Transportation and Safety Congress

April 7-9, 2015

Parkway Plaza

Casper, WY

Pre-session workshops on April 7th will include LPA Certification, Work Zone Safety, ATSSA Flagger Certification (limit 15 people), and Steel Bridges. Information and registration forms will be sent out in February 2015.

The Wyoming T² Newsletter is produced by the Wyoming Technology Transfer Center at the University of Wyoming. The T² Center is financially supported by the Federal Highway Administration, Wyoming Department of Transportation, University of Wyoming, and the Cities and Counties of the State of Wyoming. Any opinions, findings, conclusions, or recommendations presented in the T² Newsletter are those of the authors and do not necessarily reflect the views of the supporting organizations. Any products mentioned are for informational purposes only and should not be considered as product endorsements.