Country Roads & City Streets

WV Local Technical Assistance Program

Fall/Winter 2014 Benjamin M. Statler College of Engineering & Mineral Resources Vol. 29 No. 3

Journey Through the Monongahela National Forest

Ashley Collins and Kim Carr, WV LTAP; Jacob D'Angelo, US Forest Service.

Overview and History

The employees of the Monongahela National Forest manage the second largest network of roads in West Virginia stretching from Parsons to White Sulphur Springs. The Monongahela National Forest contains 920,383 acres of public land, with over 1,700 miles of road (over 700 miles of which are open, public roads) and 862 miles of scenic trails. Whether you are traveling to hunt, fish, camp, hike, bike, or just taking a relaxing drive to enjoy the beautiful fall colors and the cool, crisp mountain air, you will likely drive on Forest Service roads. The Monongahela National Forest is home to Spruce Knob, West Virginia's highest peak at 4,863 feet above sea level. Located on top is the Spruce Knob Tower, which provides breathtaking, 360 degree views. Other popular Monongahela National Forest destinations include Seneca Rocks, Canaan Valley, and Cranberry Glades.

The Monongahela National Forest began to take root with the passage of the 1911 Weeks Act signed by President William Howard Taft. According to the Forest Service's website, "this Act authorized the federal purchase of land for long-term watershed protection and natural

This photo depicts a scenic road in the Monongahela National Forest.

In This Issue

Country Roads & City Streets is typically published quarterly. The purpose of this newsletter is to provide information that is beneficial to decision makers, elected officials, and roadway construction, maintenance, and management personnel.

The material and opinions included in this newsletter are those of the West Virginia LTAP and do not necessarily reflect the views of the Federal Highway Administration or the West Virginia Department of Transportation. Every effort has been made to ensure the integrity and accuracy of both original and borrowed material; however, the West Virginia LTAP does not assume responsibility for any information that is found to be incorrect.

The West Virginia LTAP is part of the National Local Technical Assistance Program, which is funded by the Federal Highway Administration. West Virginia LTAP also receives funding from the West Virginia Department of Transportation.

Mission:

The mission of the WV LTAP is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers.

To help achieve this mission, training, demonstrations, personalized technical assistance, and resource materials are provided.

resource management following massive cutting of the eastern forests in the late 1800s and at the turn of the century." Four years later, the federal government gained 7,200 acres of land near Parsons, WV, which was called the Monongahela Purchase. In April 1920, this land was designated as the Monongahela National Forest. Since then, the Forest Service has obtained additional lands to make the Monongahela National Forest what it is today.

Road and Land Maintenance

The Forest Service categorizes its roads using a one to five system. A level one road is considered not drivable whereas a level five road is paved and marked at 45 miles-per-hour. Currently, less than 100 miles of Forest Service roads are paved, but this number is growing. Road construction projects are currently underway that include curve widening and culvert rebuilding.

Forest Service engineers are currently conducting a traffic sign retroreflectivity study for all traffic signs located on Monongahela National Forest roadways. Sign retroreflectivity is very important so motorists are able to easily see and read signs at night. This is especially important for unfamiliar, unprepared motorists on Forest roads. Currently, the Monongahela National Forest is the only forest in the United States undergoing a study of this sort.

One challenge the Forest Service faces is determining traffic volume on its roads, as there are often large day-to-day differences. One day may have a high volume of traffic, while the next day may have very low volume of traffic. This makes it difficult to determine traffic patterns using short duration counts. In an effort to quantify the variations, the Forest Service has recently installed two permanent traffic counting stations.

Winter Roads

During the winter months snow is not removed from most Forest Service roads. Heavy snow accumulation causes many Forest roads to be inaccessible. Roads in high elevations then become popular destinations for winter sport enthusiasts looking to go cross-country skiing or snowshoeing, and in the case of one road, snowmobiling.

The Highland Scenic Highway is a two-lane, paved road stretching from Richwood to US Route 219 north of Marlinton, WV. The 23.5 mile section of the Highland Scenic Highway managed by the Forest Service does not receive any snow removal. Instead, it is the only road that is designated for use by snowmobiles during the winter season when

Recreational Activities

According to the Monongahela National Forest's website, approximately 96 million people visit each year. Many of these visitors are interested in the numerous recreational activities the Monongahela National Forest has to offer. Whether you are looking for a relaxing scenic hike or an intense day of rock climbing, there is something for everyone.

Some of the recreational activities you can plan for your visit to the Monongahela National Forest include mountain biking, camping, cabin rentals, fishing, and hiking. For a complete list and descriptions, go to www.fs.usda.gov/recmain/mnf/recreation.

snow depths prevent use by other vehicles. A large parking area was constructed on the east end of the highway at US 219 so users could park to unload their snowmobiles; snowmobiles must stay on the Highland Scenic Highway.

Keep in mind that all-terrain vehicles (ATVs) and utility task vehicles (UTVs) are not permitted on Forest roads or land; this rule applies year round.

Did you know?

The Dolly Sods Wilderness located in Grant, Randolph, and Tucker counties was once used for World War II military training, which began in August 1943. According to the Forest Service, "many of the artillery and motor shells shot into the area for practice still exist. In 1997, a highly trained crew surveyed the trail locations and known campsites for shells. All found shells were exploded on site. Many more may still exist and they are dangerous." The Forest Service reminds visitors to remain safe in these areas and, "stay on designated trails and camp at existing campsites." If you were ever to find an unexploded device, "do not touch, move or dig near or around the suspected ordnance. Identify the area on a map or by terrain feature. On the ground, from a distance away, you can point out the location by making an arrow using rocks or sticks, or hanging a bandana. Walk away from the direction you came and immediately call the Forest Service."

Contact the Forest Service

If you're looking for a friendly staff member to provide assistance or information, the Forest Service is there to help.

The Monongahela National Forest Service Headquarters is located in Elkins, WV and can be contacted by calling 304-636-1800. Ranger District Offices in WV are located in Bartow, Marlinton, Parsons, Petersburg, Richwood, and White Sulphur Springs. The contact information for these offices can be found at http://www.fs.usda.gov/detail/mnf/about-forest/offices.

A big thank you to the US Forest Service for assisting with this article and for providing the accompanying photographs.

The Monongahela National Forest is beautiful year round, but especially in the fall.

National Forest Service Road Maintenance Levels

Level 1

- Not designed for motor vehicles
- Not shown as a road on a motor vehicle use map
- Road entrance is physically covered or disguised
- Basic maintenance performed to prevent resource damage

Level 2

- Roads open for use by high-clearance vehicles
- Not suitable for passenger vehicles
- Drive is often uncomfortable
- Traffic is normally minor
- Log haul may occur
- Warning signs & traffic control devices generally not provided

Level 3

- Warning signs & traffic control devices provided
- Can be single-lane roads with turnouts
- Typically driven at low speeds
- Low to moderate traffic volume

Level 4

- Moderate degree of driving comfort
- Can drive at a moderate speed
- Moderate traffic volume
- Typically have an aggregate surface
- Warning signs and traffic control devices are provided

Level 5

- Normally are two-lane roads
- Typically paved, some may have an aggregate surface
- Smooth & comfortable driving experience
- High traffic volume
- Warning signs & traffic control devices provided
- Due to higher speeds and greater traffic volumes, level 5 roads receive the most maintenance.

Device shows at a glance if wheels are loose

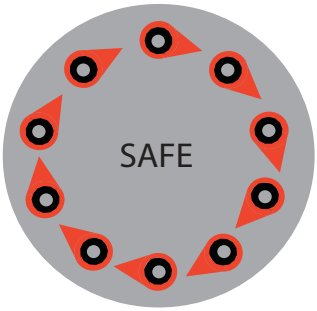
Pam Snopl, Minnesota LTAP, University of Minnesota

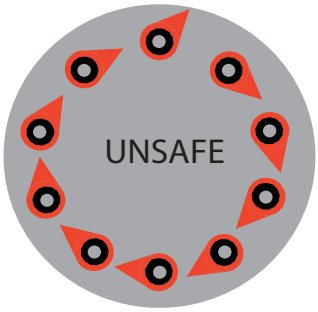
A wobbly wheel on a big truck is a dangerous thing. It isn't always easy, however, to see when lug nuts are coming loose. The Polk County Highway Department has put a simple plastic device on all its trucks that shows at a glance when a lug nut is loosening.

The device, formed from bright plastic that stands out visually, is a ring that fits tightly around the nut. A mechanic installs the devices so that the pointed ends form a simple pattern. A driver doing an inspection should be able to tell if a nut is loose, because the pattern will be broken.

Several companies make versions of the devices. Polk County uses an orange "loose nut indicator" available from redovalparts.com.

"Loose tires can kill," says Brad Driscoll, mechanic in the Polk County Highway Department. "We're pleased to add these devices to our fleet. It only takes about five minutes to install them per wheel. And when drivers do their morning inspection, it makes it easier and quicker to make sure the lug nuts are tight."





Special thanks to the MN LTAP for permission to reprint this information.

Snow and Ice Control Workshop

Last year's winter was definitely one to remember with constant snowfall and cold temperatures in our region. The Snow and Ice Control Workshop is the largest event hosted by the WV LTAP to help our state agencies and municipalities prepare for winter. This year's workshop was held on September 24 in Summersville, WV.

For next year's workshop, the WV LTAP plans to bring the focus back to winter maintenance basics. If you have specific topics you would like to see covered, equipment and products you would like to see demonstrated, or if you have a suggestion for a session presenter, please let us know. Email your comments to wvltap@mail.wvu.edu or feel free to call any of the WV LTAP staff.

Chicken and Dumplings Recipe

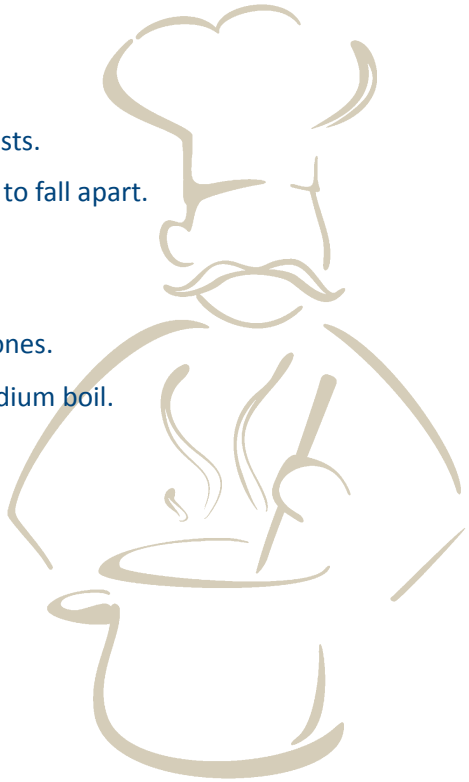
Compliments of Anna Ruth Vance

With the weather getting colder, nothing is more comforting than a steamy bowl of homemade chicken and dumplings. This particular recipe is a family favorite of WV LTAP staff member, Ashley Collins. Thank you to Anna Ruth Vance for sharing and we hope each of you enjoy this recipe as much as Ashley does.

Broth Ingredients:

2 chicken breasts with bones and skin on

Salt & pepper to taste



Broth Directions:

- Add enough water to cover the chicken breasts.
- Power boil chicken until it is done and starts to fall apart.
- Remove chicken from broth and let cool.
- Remove bones from chicken and set aside.
- Strain the broth to remove any remaining bones.
- Add 1 to 2 cups of water and return to a medium boil.

Dumpling Ingredients:

2 $^{1}/_{2}$ cups self-rising flour

$^{1}/_{3}$ cup oil

2 to 3 tablespoons butter

$^{3}/_{4}$ cup buttermilk

1 teaspoon salt

1 to 2 tablespoons of hot water

Additional flour for kneading

Dumpling Directions:

- Mix all of the ingredients together in a large bowl. The final dough mixture should be slightly sticky. Add additional buttermilk or water if needed.
- Put down a layer of flour and spread the dough out. Roll thin and cut in small squares.
- Drop dumplings into boiling broth slowly until broth just covers the dumplings. Cook at a steady boil and don't stir unless needed. Attempt to slosh the pan from side to side and use a spoon to keep the dumplings from sticking to side and bottom of the pan. Boill for about 20-30 minutes.
- Return de-boned chicken to broth and cook an additional 10 minutes.
- Let cool for a few minutes, then serve.

Center Staff & Contact Information

WV LTAP
West Virginia University
PO Box 6103
Engineering Sciences Building
Room 553
Morgantown, WV 26506
Phone: (304) 293-9924
Fax: (304) 293-7109
E-mail: wvltap@mail.wvu.edu
Website: wvltap.wvu.edu

Staff

Dr. John Zaniewski
Director
(304) 293-9955
John.Zaniewski@mail.wvu.edu

Kim Carr
Program Coordinator
(304) 293-9924
Kim.Carr@mail.wvu.edu

Andrew Morgan, P.E.
Program Coordinator
(304) 293-9939
Andrew.Morgan@mail.wvu.edu

Sabrina DeVall
Editor & Technical Writer
(304) 293-9930
Sabrina.DeVall@mail.wvu.edu

Ashley Collins
Student Office Assistant
(304) 293-9930
AColli15@mix.wvu.edu

Dr. Ron Eck, P.E.
Senior Advisor
(304) 293-9931
Ronald.Eck@mail.wvu.edu

Q&A With our Newest Advisory Board Members

The WV LTAP is very excited to announce our newest additions to the WV LTAP Advisory Board. We value the time, advice, and support by our members who all have one goal in mind: To help guide the mission of the WV LTAP so it continues to be a great program and resource for anyone involved with designing, managing, and maintaining roads and streets. We extend a huge welcome to our newest members and a huge Thank You to our entire board and our WV LTAP customers!

Jacob D'Angelo

As a Forest Service engineer, what are your main responsibilities?

I'm blessed to get to manage an extremely talented group of engineers, engineering technicians, and equipment operators that, as a team, do a tremendous job designing, constructing, and maintaining Forest infrastructure - including roads, bridges, facilities, dams, water and wastewater, etc. My other duties include coordinating, planning, budgeting, and programming the engineering program on the Forest.

Why did you decide to accept the invitation to join the WV LTAP Advisory Board?

To have the chance to learn from the other board members, as well as the other agencies and municipalities across West Virginia, and to share any of the lessons I've learned along the way.

What skills and knowledge can you bring to benefit the advisory board?

Having worked for the WVDOH and WVU while in college, and now the Forest Service for nearly 13 years, my work experience ranges from interstate construction to maintaining low volume local roads, aggregate and asphalt surfacing, signing and retroreflectivity, timber harvest, traffic counting, pedestrian safety, etc. I also enjoy being involved in developing and maintaining partnerships with other agencies and groups to complete projects on and off of the Forest.

What are some of your hobbies or interests outside of work?

My wife and I are raising two wonderful children; farming (owner and operator of D'Angelo's Mountain Farm and Orchard); coaching youth soccer and basketball; tournament bass fishing throughout the state; member of the Tygart's Valley Lions Club, the Quality Deer Management Association, and the WV Farm Bureau.

Damien Davis

As the City of Morgantown's Interim City Engineer and Public Works Director, what are your main responsibilities?

My main task is to keep this department moving forward. When Terry [Hough] retired that left a large gap to fill due to the many projects she had been working on. I am trying to keep these projects moving and not let anything fall behind. Also there is the day to day operation of the public works department.

Why did you decide to accept the invitation to join the WV LTAP Advisory Board?

I have been interested in the LTAP program since my first job as Assistant City Engineer in Harrisburg, PA . My boss, Joe Link, was on the PA LTAP Board. During my time in Harrisburg, I sat in on most of the meetings and attended many events sponsored by the PA LTAP Board. For a beginning engineer it was a wealth of knowledge and I learned a lot.

What skills and knowledge can you bring to benefit the advisory board?

From my time as the Asst. City Engineer in Harrisburg, PA to being the County Engineer in Jefferson County West Virginia to now, I have 11 years of experience working in government at different levels. In those 11 years, I've been a part of large projects, small projects, and everything in between.

What are some of your hobbies or interests outside of work?

My main hobbies outside of work are my three children. Also, I've been teaching myself how to play the guitar and annoy my wife playing the same five songs over and over again.

Q&A With our Newest Advisory Board Members Continued

In our Summer 2014 edition of this newsletter, we advertised for an opening on the WV LTAP's Advisory Board. This opening was for a two-year term with an individual representing a municipality with a population of 10,000 or less. We are pleased to announce that Chris Starkey from Philippi, WV was chosen to fill this slot and we look forward to his input.

WV LTAP Advisory Board and LTAP staff group photo during a tour of the Bechtel Summit Reserve. L to R: Marvin Murphy, Jacob D'Angelo, Ashley Collins, Bill Lanham, Terry Hough, John Zaniewski, Ron Eck, Mike DeMary, Andrew Morgan, Kim Carr, **Chris Starkey,** Ron Tenney, Damien Davis, Steve Cole, Donny Williams, and Burt Buckhannon

What is your role for the City of Philippi.

I am the Department Coordinator, or what would be known in many agencies as a Public Works Director, for the City of Philippi. We are a community with a population of around 2,900 and the City of Philippi operates our own power, cable system (FTTH), water treatment, and sewer treatment facilities.

Why did you decide to accept the invitation to join the WV LTAP Advisory Board?

I am interested in learning from other communities that may have similar challenges that we [City of Philippi] face and discussing solutions with peers. I believe that I can offer some insight into the challenges we face daily, and also offer my cooperative spirit of learning and networking. I am dedicated to the process of improving my community, my workforce, and myself.

How long have you been employed by the City of Philippi and what role or roles did you have prior to becoming the Department Coordinator.

I have been employed by the City of Philippi since 2002. My role here started as Recreation Director until the launch of our new FTTH project in 2004/2005 when I began training to be a cable technician and fiber splicer. In 2006/2007 I began cross training in the electrical department as a lineman. I have worked in every department that the city has in multiple circumstances.

What are some of your hobbies or interests outside of work?

My interests outside of work include spending time with family and traveling when possible. I am very involved in the Emmaus Community Ministry and helping throughout my community in as many ways that I possibly can. I am blessed to have a job that allows me the opportunity to be involved in my community.

Information On WV LTAP Training

In addition to providing training on a set schedule, the WV LTAP also provides a majority of our training on a per request basis. Our instructors are available to come to your location to conduct training, whether this is in a garage, conference room, or other facility. Also, the majority of our classes are offered free of charge.

We do ask for a minimum of ten attendees, but you can invite others from neighboring municipalities, WVDOH districts, or other agencies to meet the minimum requirement. The WV LTAP staff is also available to help you recruit class attendees and advertise the training. Details on available classes and other services and programs offered through the WV LTAP can be found on our website at **wvltap.wvu.edu.** Please contact Kim at kim.carr@mail.wvu edu or 304-293-9924 to schedule training or to discuss your training needs.

WV LTAP's 2015 Build a Better Mousetrap Competition

Recognizing Innovative Inventions and Improvements

Have You Built a Better Mousetrap?

BigStockPhoto.com Image

Have you or one of your coworkers recently built an innovative gadget? Or have you developed an improved way/process to accomplish an everyday task? If either of these apply, you've built a better mousetrap, and now is the time to show off a project your public works agency is proud of in the WV LTAP's Build a Better Mousetrap Competition.

Your entry can be anything from the development of tools or gadgets to equipment modifications to processes that increase safety, reduce costs, improve efficiency, or improve the quality of transportation.

If you have something you think would qualify for this competition, submit your entries by Tuesday, May 5, 2015. Entries will be judged by WV LTAP Advisory Board Members using the criteria of cost savings, benefits to the community and/or agency, ingenuity, transferability to others, and effectiveness. Winners will be recognized in this newsletter and receive a prize. The purpose of these competitions is to collect and disseminate real world examples of best practices, tips from the field, and assist in the transfer of technology.

WV LTAP staff members are also available to help with your write-up or to take photos. We know that you and your crews are doing phenomenal things, on limited budgets, but with unlimited imagination and foresight. Help us share your challenges and solutions with other agencies!

The winning entry will be submitted into the National LTAP Build a Better Mousetrap Competition. Winners of the national competition will be announced at the annual LTAP/TTAP national conference this summer. All entries at the national level will be posted on the LTAP/TTAP program website and compiled into an electronic booklet, with the winners receiving a recognition prize and bragging rights!

To enter the competition, complete the entry form on the following page and mail it to the WV LTAP or visit the WV LTAP website at wvltap.wvu.edu to download the entry form. Competition deadline is Tuesday, May 5, 2015.

If you have questions or need an application, please email Kim Carr at kim.carr@mail.wvu.edu or call 304-293-9924.

Judging Criteria

The competition is judged on the criteria listed below within the framework of a five-point rating scale. The winner is the entry that has the highest number of overall points.

Judging Criteria	Five-Point Rating Scale
Cost Savings	5 = Excellent
Benefits to the Community	4 = Very Good
Ingenuity	3 = Good
Transferability to Others	2 = Fair
Effectiveness	1 = Poor

2015 WV LTAP Build a Better Mousetrap Competition Entry Form

Photographs are strongly encouraged but are not mandatory. You may use more than one page per entry. This form can also be downloaded from the main page of wvltap.wvu.edu.

Entry Title: _____

Problem Statement: _____

Discussion of Solution: _____

Labor, Equipment, Materials Used: _____

Material Cost: _____

Savings/Benefits to the Community: _____

Agency Name _____

Contact Person _____

Contact Phone _____ **Contact Email** _____

Contact Mailing Address _____

_____

Please return your completed form by Tuesday May 5, 2015 to Kim Carr.
WV LTAP • PO Box 6103 • Morgantown, WV 26506
Email: kim.carr@mail.wvu.edu or Fax: 304-293-7109
Questions? Please call Kim at 304-293-9924.

WV LTAP's 2014 Work Zone Sign Package Winners

The West Virginia Local Technical Assistance Program awarded the 2014 work zone sign packages to ten different agencies around West Virginia. Congratulations to the City of Chester, Gilmer County Public Service District, City of Kenova, City of Mannington, Town of Middlebourne, Moundsville Water Board, Town of Rainelle, City of Romney, Town of Rowlesburg, and the Town of Sophia Street Department!

Each package included 18 portable work zone signs, four type II barricades, 16 cones, two stop/slow paddles, four class III safety vests, six sign stands, four drums, and two whistles. The value of each is approximately $3,000. If used properly and with the appropriate training, this package is helping make work zones safer for workers, motorists, bicyclists, and pedestrians. This package can also help to improve work zone safety during road maintenance, utility operations, and incident management. Each recipient also received a work zone traffic control course taught by WV LTAP staff member Andrew Morgan.

Including this year's group of package winners, the West Virginia LTAP has awarded 85 sign packages to West Virginia municipalities since the program began in 1995. We would like to thank every agency that took the time to apply for this year's award. We also encourage West Virginia municipalities to apply in the future, should the program be available.

City of Chester - Mayor Larry Forsythe and Steve Shuman

Gilmer County PSD - Steve Jones

City of Kenova - Dennis Gumbert, Nicholas Hanshaw, Bryan Haynie, Gordon Jones, Scott Paul,Richard Ruff, J. Smith, Billy Stambaugh, and Ed Terry (names not listed in a particular order)

City of Mannington - Ted Nice and Dennis Hayes

Town of Middlebourne - Matt Lamp, Steve Forrester, and Seth Watson

Moundsville Water Board - William Dove, Terry Roberts, Jeffrey Krivenko, James Conner, and Joshua Mace

City of Romney - John Jenkins, Eileen Johnson, Ken Maiers, Steve Bowers, Steve Reed, Shannon Doman, and Dan Oates

City of Rainelle - Charles Stout and Shane Altizer

Town of Sophia - Brandon McMillion, Jeffrey Pittman, Derek Foster, William Shannon, Brett Webb, and Paul Kelley,

Town of Rowlesburg - Darel Moats and Benito Perea

Study Shows How Truck Speed and Distribution Method Influence Salt Bounce and Scatter

Shaughn Kern, Technical Writer; and Alexander Slepak, Technical Writing Intern Center for Technology & Training
Article originally published in Michigan LTAP's newsletter, *Bridge*, volume 27.3. Images and artilce reprinted with permission.

Thousands of years ago, salt was prized for its ability to preserve food; it was also sown into the soil of enemy lands by invading armies to make the soil unsuitable for agriculture. Whether our ancestors understood the science of soil salinity is debatable, but they did have one thing in common with today's winter maintenance professionals: they knew the value of salt as a resource, and they appreciated the environmental damage salt could cause if misused.

According to a study conducted by the Michigan Department of Transportation (MDOT) in the early 1970s, 30 percent of dry salt used on roads is lost immediately to bounce and scatter. The study concluded that pre-wetting the salt before spreading it reduced bounce and scatter by improving the application pattern and accelerating the melt-rate. Today pre-wetting has become common practice and is recognized by state and local transportation agencies as a significant cost-saving measure. However, further research was necessary to determine the influence of other distribution variables on the effectiveness of salt.

Building on Past Experience

In the summer of 2012, the MDOT Operations Field Services Division built on the research from the 1970s, with the goal of determining an optimum vehicle speed and distribution method for applying salt. MDOT's Operations Field Services Division provides training and support for maintenance garages that are responsible for summer and winter maintenance on state trunk lines in Michigan.

The new study re-examined the effectiveness of salt treated with a liquid chloride solution, and correlated it to truck speed and salt distribution systems. The comparison of two salt types (untreated and treated), three truck speeds (25, 35, and 45 mph) and two distribution systems (Y-chute and cross-conveyor) made for a total of twelve tests. To conduct the tests, MDOT staff laid out a grid on a 100-foot stretch of unused freeway in Southwest Michigan. This location made for an ideal test site where traffic would not disturb the salt or create a dangerous situation for the staff conducting the tests.

The test grid was made up of 12 four-foot lanes, which simulated a two-lane road with 12-foot paved shoulders. Trucks driving in the left travel lane dropped salt into the "target area," which spanned four feet on each side of the centerline. The amount of salt recovered from the target area and each four-foot grid lane was tabulated as a percentage of the total amount of salt that was dropped.

Special attention was paid to salt recovered in the target zone and the rest of the travel lane, since only salt in the travel lane is considered effective. Over the course of the entire study, salt recovered in the travel lane ranged from 95.3 percent to 35.7 percent, depending on the speed of the truck, the distribution system used, and whether the salt was treated or untreated. As expected, the results of treated vs. untreated salt verified those found 40 years ago: treated salt performed significantly better at all speeds and through all distribution systems. The comparison between cross-conveyor and y-chute systems resulted in slightly better performance for the conveyor type. For untreated salt, nine percent more stayed in the

travel lane when distributed through a conveyor; with treated salt, 13 percent more stayed in the travel lane.

Speed Increases Bounce and Scatter

Regardless of salt type or delivery system, truck speed had the most profound effect on how much salt was lost to bounce and scatter. The most effective method of spreading salt on roads, a truck driving at 25 mph spreading treated salt with a conveyor, lost only nine percent to bounce and scatter. The same test at 35 mph resulted in 32 percent loss, with 45 mph showing a 45 percent loss. The table above shows the projected cost associated with the salt loss at each speed, based on the seasonal cost of salt in MDOT's Southwest region of Michigan.

Speed	Percent Wasted	Projected Cost
25 mph	9%	$355,080
35 mph	32%	$1,247,400
45 mph	45%	$1,762,200

The main recommendation from this study, the complete results of which are available in a project summary report that MDOT published in November 2012, is crystal clear. According to the report, "The most effective scenario … occurs when a treated salt product is applied with a cross conveyor from a truck traveling at 25 mph. Conversely, salt bounce and scatter is at its highest when applied from a Y-chute delivery system in a truck traveling at 45 mph."

Less Salt is Better

Reduction of salt waste has benefits beyond cost savings. Salt causes deterioration of the road, corrosion of the vehicles travelling on it, and it can negatively affect roadside vegetation. Further, effective salt use can limit the need for abrasives such as cinders and sand, for which cleanup costs can be significant.

The report called for further testing using other delivery systems such as zero velocity spreaders (which eject salt in a way that compensates for truck speed), salt slurry generators, and a variety of y-chute heights. This past summer, MDOT ran a second phase of testing to cover these additional variables.

Phase 2: Dialing it in

In the second phase of testing, which was conducted during the summer of 2013 at the same site as the first phase, MDOT Roadway Operations Engineer Justin Droste established a simplified method of quantifying results. "Instead of reporting results in graphical form organized by grid lane, we combined all grid lane values into a single point value for each test," Droste explained. "The single point value provided a simple overall assessment, which enabled us to compare test results more easily."

Results indicated that the most effective methodology was to spread salt from a zero-velocity system at 25 mph, with an effectiveness score of 0.93 on a scale of 0.00 to 1.00. Even at 35 mph, the zero-velocity system had an effectiveness score of 0.82, which was better than all other systems running at 25 mph. Notably, when accelerated to 45 mph, the effectiveness of the zero-velocity system dropped to two-thirds of the score at 25 mph.

In Conclusion

Based on results from the two phases of the study, MDOT released a Maintenance Advisory to update statewide deicing practices. The advisory specifies a maximum speed of 25 mph while applying deicing material. Justified exceptions to the practice include: peak hours on high-speed routes; using zero-velocity spreaders, slurry generators, or other technology that limits salt scatter; or other circumstances approved by the region engineer. The advisory also recommends 7 to 10 gallons of liquid per ton of dry salt.

Tim Croze, region support engineer of the MDOT Operations Field Services Division, is pleased with what his team learned from the study. "It's nice to assign actual effectiveness numbers to the many different options we have for spreading salt," he said. "The right combination of salt type, distribution system, and truck speed will enable us to minimize salt waste by keeping more of it in the travel lane."

The report in its entirety, can be found on the Michigan DOT website, https://www.michigan.gov/documents/mdot/Final_ReportNov2012_404228_7.pdf

Winter Operations Safety Checklist

Reprinted with permission of the Pennsylvania LTAP. Information is from their technical information sheet #87, with information provided by the Salt Institute.

Completing this checklist below can help you think safe, act safe, and be safe in winter operations. Make photocopies and use a copy before each winter operation. Note that dry runs, an item at the beginning of the checklist, ideally should occur in rainy weather just prior to snow season. This makes it easier to identify areas of poor drainage where water may "pond" and freeze.

Safety Preparation for Winter Operations

- ❍ Training for crews
- ❍ Dry runs (wet runs) – make notes
- ❍ Marking obstacles
- ❍ Trimming trees

Safety During Winter Operations

- ❍ Crew Safety
- ❍ Adequate sleep / rest
- ❍ Personal protective equipment
- ❍ Multi-layered warm clothing
  - ❍ Hardhat with liner
  - ❍ Safety vest
  - ❍ Safety shoes
  - ❍ Boots
  - ❍ Gloves
- ❍ Emergency Survival Kit
  - ❍ First-aid kit
  - ❍ Flashlight with extra batteries
  - ❍ Ice scraper/snow brush
  - ❍ Jumper cables
  - ❍ Basic tool kit
  - ❍ Flares or reflectors
  - ❍ Flags for traffic control
  - ❍ Shovel and traction material (sand)
  - ❍ Fire extinguisher – check pressure
  - ❍ Thermos and lunchbox

Material Safety

- ❍ Material Safety Data Sheets (MSDS)
- ❍ Emergency Procedures

Vehicle and Equipment Safety

- ❍ Preventive maintenance
  - ❍ Daily checks
- ❍ Pre-trip inspection
  - ❍ Fluid levels
  - ❍ Tire tread and inflation
  - ❍ Brakes
  - ❍ Heater
  - ❍ Defroster
  - ❍ Windshield wipers
  - ❍ Clean windows and mirrors
  - ❍ Lights
  - ❍ Backup alarm
  - ❍ Plow flags
  - ❍ Warning signs on rear of truck
  - ❍ Radio communications
  - ❍ Full fuel tank

Facility Safety

- ❍ Good housekeeping
- ❍ Well lit facility

Operations Safety

- ❍ Safety belt
- ❍ Defensive driving
- ❍ Obey traffic laws
- ❍ Do not speed
- ❍ Safe backing circle-of-safety
- ❍ Allow sufficient stopping distance
- ❍ Dump bed no higher than cab top when moving
- ❍ Block plow before changing blade
- ❍ Disconnect spreader before unclogging
- ❍ Be aware of fatigue

Stormfighting Practices for Different Types of Snow

From the Snowfighters Handbook. Adapted and reprinted with permisson of the Salt Institute.

The density of snow varies greatly, with some storms producing heavier, wet snow, while others produce a lighter, dry snow. Wet or heavy snow can often be plowed away, while other storms may require the use of salt or other materials. Winter storms produce a number of hazardous conditions other than snow. Even without rain, ice may occur when moist air contacts a cold surface, particularly on bridge decks. Rain may freeze as it falls on pavement, and frozen rain, which falls as sleet or hail, may also stick to pavements.

There are roughly five major kinds of storms, as shown in the "Stormfighting Practices" box. Each requires a somewhat different treatment approach and everyone on your maintenance force should know how to properly combat each type.

Stormfighting Practices

Condition 1 **Temperature** Near 30 **Precipitation** Snow, sleet or freezing rain **Road Surface** Wet	If snow or sleet, apply salt at 500 lb per two-lane mile. If snow or sleet continues and accumulates, plow and salt simultaneously. If freezing rain, apply salt at 200 lb per two-lane mile. If rain continues to freeze, re-apply salt at 200 lb per two-lane mile. Consider anti-icing procedures.
Condition 2 **Temperature** Below 30 or falling **Precipitation** Snow, sleet or freezing rain **Road Surface** Wet or Sticky	Apply salt at 300-800 lb per two-lane mile, depending on accumulation rate. As snowfall continues and accumulates, plow and repeat salt application. If freezing rain, apply salt at 200-400 lb per two-lane mile. Consider anti-icing and deicing procedures as warranted.
Condition 3 **Temperature** Below 20 and falling **Precipitation** Dry Snow **Road Surface** Dry	Plow as soon as possible. Do not apply salt. Continue to plow and patrol to check for wet, packed or icy spots; treat them with heavy salt applications.
Condition 4 **Temperature** Below 20 **Precipitation** Snow, sleet or freezing rain **Road Surface** Wet	Apply salt at 600-800 lb per two-lane mile, as required. If snow or sleet continues and accumulates, plow and salt simultaneously. If temperature starts to rise, apply salt at 500-600 lb per two-lane mile, wait for salt to react before plowing. Continue until safe pavement is obtained.
Condition 5 **Temperature** Below 10 **Precipitation** Snow or freezing rain **Road Surface** Accumulation of packed snow or ice	Apply salt at rate of 800 lb per two-lane mile or salt-treated abrasives at rate of 1500 to 2000 lb per two-lane mile. When snow or ice becomes mealy or slushy, plow. Repeat application and plowing as necessary.

Note: The light, 200 lb application called for in Conditions 1 and 2 must be repeated often for the duration of the condition.

West Virginia Local Technical Assistance Program
West Virginia University
Benjamin M. Statler College of Engineering and Mineral Resources
Department of Civil and Environmental Engineering
PO Box 6103
Morgantown, WV 26506-6103

Change Service Requested

Non-Profit Organization
U.S. Postage Paid
Morgantown, WV
Permit No. 34

The WV LTAP encourages you to share this newsletter with others or direct them to the electronic version on our website http://wvltap.wvu.edu.

- Road Supervisors
- Elected Officials
- Public Works Department
- Road Crew
- Managers
- City Engineers
- Others