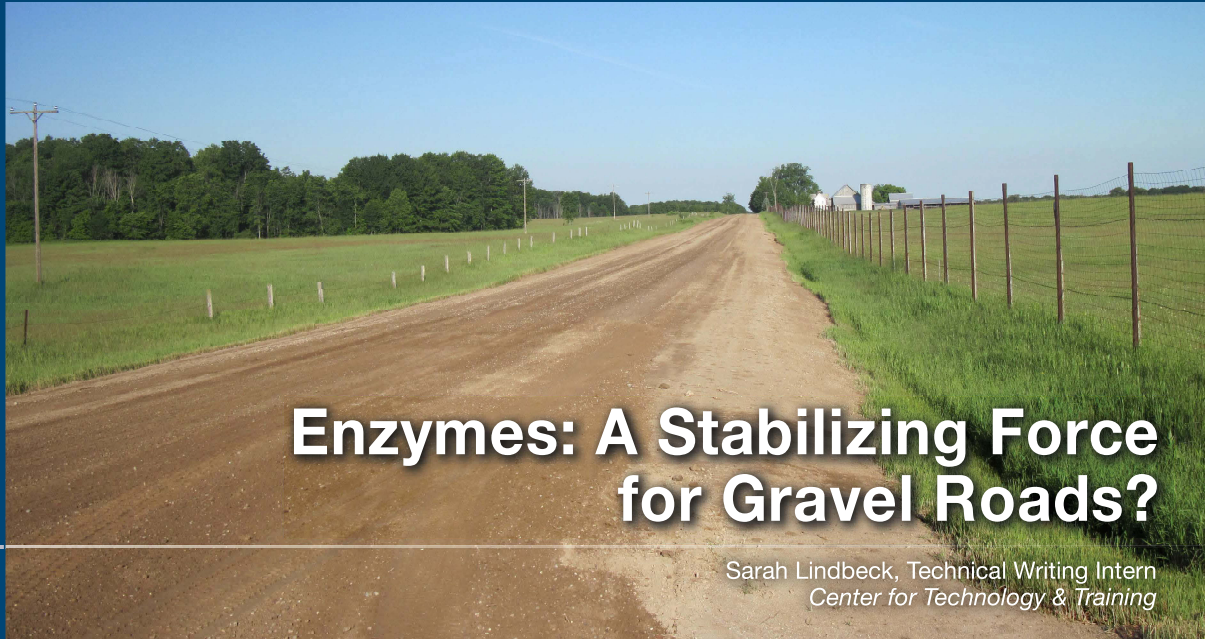




Enzymes may drastically decrease the need for preventive maintenance on unpaved roads. Learn more about this intriguing innovation.



## Enzymes: A Stabilizing Force for Gravel Roads?

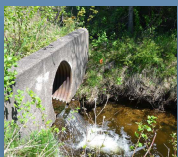
Sarah Lindbeck, Technical Writing Intern  
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The people who built the pyramids, Parthenon, and Empire State Building believed they were engineering something that would stand the test of time. Arguably even more admirable than that are the people who build gravel roads, knowing that they are engineering something that will require constant maintenance until the end of its time. Building a road is a binding commitment. It commits a road owner to contending with freeze-thaw cycles, drought, Labor-Day weekend traffic, and varying gravel and soil qualities over the road's entire service life. But, what if gravel roads did not have to consume so much money, calcium chloride, and time for upkeep? A brighter future for gravel road maintenance may lie ahead with enzymes used to stabilize the gravel.

Enzymes are a relatively new method for stabilizing gravel roads, originating in the 1990s. Eric Seagren, professor of Civil and Environmental Engineering at Michigan Technological University, provided a timeline of unpaved road design, explaining, "Early on, geotechnical and pavement engineers were focused on physical and mechanical things they could do to soil, such as compacting it and adding geosynthetics." He says that, years later, it was discovered soil had a chemistry of its own and was teeming with life. Seagren not only studies soils but also a process called "bio-cementation", in which "microorganisms or enzymes are used to facilitate reactions that create an environment where calcium carbonate can precipitate and cement soil particles together". His work with bio-cementation is part of a gradual movement toward inter-disciplinary

collaboration between science experts to develop better, cheaper, more environmentally-friendly solutions that consider different aspects of road construction and maintenance.

### Enzyme History and Science

Enzymes first found their way into agricultural applications after a family of farmers noticed the ground around their animal feeder became compacted.<sup>1</sup> The farmers determined that enzymes in the feed reacted with the soil to harden the ground. After that, the enzymes were used to harden the surface of farm roads as well as repair leaks and eliminate vegetation growth in ponds. Variations that contained additional nutrients to fertilize soil were developed, but the enzymes in the fertilizer also retained their original water attraction properties, which helped improve the soil quality for crops.

Since those initial uses, manufacturers began selling enzyme products for stabilization of soils in gravel roads because they worked so well on the farm roads. Although many components that make up these enzyme products are proprietary, the company Perma-zyme discloses that their enzyme consists of "food by-products that are created through a fermentation process".

An enzyme is an organic catalyst that can be used in gravel road stabilization. Once it is in contact with the soil, the positively-charged enzyme merges with the soil's organic molecules to form a reactant intermediary, which exchanges ions with the negatively-charged clay structure of the soil. As a result, the clay particles become

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## Letter from the Editor

“Challenges are what make life interesting. Overcoming them is what makes life meaningful,” said author Joshua J. Marine. Michigan’s residents and workforce—especially those in the surface transportation sector—faced a challenge in March when the governor’s executive order shut down the state on the 24th, right at a time when road construction season was just beginning. With a narrow road construction season in Michigan’s wet-freeze climate, road-owning agencies needed to find a way to social distance while getting much-needed road work done in the short-lasting season. State and local road-owning agencies overcame this challenge by adjusting work schedules, adapting job processes, and transitioning some positions to remote work.

The Michigan Local Technical Assistance Program is there, too, with our road-owning agencies. We have overcome the need to social distance by transitioning to remote work environments while still providing road-owning agencies and their consultants with training and resources. We not only have been able to provide our regularly-scheduled webinar offerings with little or no interruption, but we’ve also been working to re-vamp some of our on-site trainings to webinar format for this challenging time.

Along with that, we are presenting, here, to you the *Spring issue of The Bridge* newsletter, 32.4. In this issue, we are highlighting innovations for both paved and unpaved roads. We will share with you how some Michigan local road-owning agencies have been saving money on maintenance projects by making their own asphalt with recycled millings. And, we investigate enzymes and their potential for stabilizing gravel roads.

We also investigated the little-known role of drain commissioner. While some counties have rolled the duties of drain commissioner into other road commission positions, other counties still have an elected drain commissioner. In either case, the drain commissioner has a surprising power to benefit your roads.

As things are greening up here in Michigan, we are thinking of the diverse trees that beautify Michigan. As early as September, tree trimming and felling operations can begin. So, in these pages, we share strategies and resources on how to manage trees safely in the right of way.

Finally, this issue includes an overview of how video from unmanned aerial systems/vehicles of road projects can be a tool for public involvement. As a complement to this piece, we also give you a snapshot of emerging research in Michigan on unmanned aerial vehicles and their application to transportation systems.

As we continue to face new challenges of social distancing, let’s continue to work together to overcome them. If there are training topics or newsletter article topics that would benefit you and your agency, please let us know. In our webinars, please share your suggested topics with us in our exit polls. Or, share your topic ideas with us by e-mail at [ctt@mtu.edu](mailto:ctt@mtu.edu), by visiting our conference pages and completing the Present tab form, or by visiting <http://michiganltap.org/TheBridge> and completing the Topic Suggestions form.

Together, we can continue making life meaningful in Michigan!

Victoria



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MICHIGAN'S LOCAL TECHNICAL ASSISTANCE PROGRAM

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# Pave. Recycle. Repeat.

## Michigan Agencies Recycling Millings for Road Maintenance

Victoria Sage, Technical Writer  
Center for Technology & Training

A brisk summer morning in the Keweenaw. In most of the United States, those words—“brisk” and “summer”—are not found together. But, sweatshirt weather can last throughout a Keweenaw summer as days can crest over 90 degrees Fahrenheit but overnight lows still oftentimes drop to the 50s and 60s. And, with the proximity to the Great Lakes, humidity hangs in the air.

These conditions pose a chronic problem for pothole patching, however: cool, damp mornings aren't the best for optimal tight pothole patches. Not only that, but Keweenaw County pothole-patching endeavors need to factor in hauling time for hot-mix asphalt since no asphalt plant exists in the county.

Their potholed roads are not county exclusive. Tackling potholes is an annual statewide maintenance issue. Every year, pothole patching on the trunkline alone costs the state on average \$7.9 million. When factoring in the annual need for pothole patching on Michigan's local roads, it's a significant maintenance expense for Michigan's state and local agencies. Thus, it's important to find solutions that are cost-effective and can improve the level of service the road can provide.

### Turning to Innovation

Keweenaw County Road Commission (KCRC) has turned to innovation to tackle its pothole problems on county-owned roads. In 2018, KCRC acquired a Stepp Master Mixer Trailer (SMMT) Trailer-Mounted Asphalt Recycler from Stepp Manufacturing Co., Inc. The recycler melts down stockpiled or recycled millings along with additional rejuvenator to make a hot-mix asphalt that can be used to patch a pothole. The hot-mix asphalt creates a tight seal with the existing pavement.

In fact, the U.S. Federal Highway Administration (FHWA) prioritizes paving and patching solutions that take advantage of existing materials through recycling, suggesting that recycling may have “engineering, economic and environmental benefits”. Consequently, the FHWA says recycled materials should be given “first consideration in overall materials selection”.<sup>1</sup>

However, years before KCRC turned toward this innovative patching solution, the City of Traverse City invested in not only a KM International KM T2 trailer-mounted asphalt recycler, but also an KM 448 infrared patching machine, which heats up a four-foot by eight-foot section of pavement causing the

asphalt to liquify and be capable of re-use (for more on infrared, check out The Bridge 28.3, <http://michiganltap.org/bridge/283>). They use their two machines in conjunction with one another because an infrared patch typically needs additional asphalt and rejuvenator.

KCRC's Maintenance Foreman Chris Cronenworth says that homemade hot-mix asphalt made from recycled millings has benefits—ranging from lower materials costs, an extended paving season, and longer-lasting patches—that outweighed initial startup expenses by far. And, the City of Traverse City's Street Department Superintendent Mark Jones agrees.

### Savings on Material Costs

“The last time we purchased cold patch,” said Jones, “it was 145 dollars a ton.” Although he said that figure is now six years old, a 2014 report analyzing Ohio materials costs also found cold patch costs in excess of \$100 per ton: Ohio agencies were paying on average \$102 per ton for cold-mix patching material.<sup>2</sup>

While expensive, cold patch does have benefits. Cold patch is an asphalt mixture that does not require heat in order to use it for

▶ next page



# Pave. Recycle. Repeat. (continued from page 3)

► patching or paving.<sup>3</sup> It can be purchased in small amounts, and it is usable in cold weather when hot-mix asphalt typically can't be used<sup>3</sup> because of hardening before adequate compaction. Cold-mix asphalt uses either virgin or recycled aggregate and binder.

Nonetheless, Jones said, "We didn't like how cold patch worked because it doesn't stay in the hole and, if you're going to do another repair [later], you don't want cold patch in with your mix." Because of that, they started investigating other options and settled on infrared patching with recycled asphalt made from stockpiled millings.

Both the City of Traverse City and KCRC found that being able to make their own hot-mix asphalt has reduced materials costs by approximately a third or more when compared with a cold-mix-asphalt patch. For them, using recycled millings has made for a more economical mix design.

"Last year, we got [a late-season hot-mix asphalt purchase] down to 65 dollars a ton," shared Jones. "When you add fuel and rejuvenating liquid, we're looking at about 79 dollars a ton." While hot-mix asphalt can range between \$60 and \$75 per ton, the City of Traverse City can store this asphalt and use it throughout the winter season and use it in conjunction with their asphalt recycler on winter-season paving or patching projects.

But, the City of Traverse City realizes lower costs when they use their own stockpiled asphalt. "That asphalt is free other than the time and labor to bring it back after we tear it out," he continued. "To make a ton of asphalt [with the stockpiled material], we're looking at 17 to 20 dollars for fuel and rejuvenating liquid."

For KCRC, Cronenworth says their recycled hot-mix asphalt is "approximately a third of the cost" of cold mix. His estimates concur with the Ohio study, in which Ohio agencies reported hot-mix asphalt patching material at \$68 per ton.<sup>2</sup>

Making hot-mix asphalt using stored virgin asphalt or recycled millings is possible with a trailer-mounted asphalt recycler. The KM T-2 model, which the City of Traverse City purchased can make 1.3 tons of recycled asphalt in approximately 30 minutes or a little longer if moisture from snow or water needs to be dried out of the asphalt; once dried, the process can go quickly. The Stepp SMMT model, which KCRC recently acquired, can produce up to a quarter ton in about 8 to 15 minutes. While a Minnesota report suggests that similar models of the



Steps in using a trailer-mounted asphalt recycler: (counterclockwise from right) setting the burner timer, checking the temperature of the mix with a gun, adding rejuvenator pucks (Photos: CTT Archive).

Stepp asphalt recycler are prone to clogging and may result in an inconsistent asphalt mix<sup>4</sup>, Cronenworth says they've found no problems when using clean millings broken into smaller-than-baseball-size pieces.

Millings fed into the trailer-mounted recycler are heated to 300 to 350 degrees Fahrenheit using an indirect diesel burner and mixed with rejuvenator pucks using an engine-driven hydraulic system. When ready, the recycler ejects fresh hot-mix asphalt into a pan at the back of the trailers to be shovelled into cleaned and prepped potholes and then compacted or dispenses the asphalt directly into the pothole by raising the trap-door floor of the pan. Going over the filled pothole with a plate compactor finishes the patching job.

## Labor and Equipment Factors

Generally, a throw-and-roll cold patching operation requires a two-person maintenance crew plus a supervisor, which could be estimated as approximately \$700 per day. In comparison, a hot-mix-asphalt operation using an asphalt recycler requires a three- or four-person maintenance crew plus a supervisor, meaning labor costs could be expected to be as much as \$890 to \$1,080 per day.<sup>2</sup>

Along with the larger crew, the latter method requires more up-front time. "[Using the trailer-mounted asphalt recycler] is a bit more labor intensive," Cronenworth said. "You have more time when the crew is heating up a batch, laying it out, and heating another batch. And, we also do the plate compactor to

compact the hot patches so that's significant in getting the longevity out of it."

But, Jones points out that that up-front time pays off. "My crew didn't like the cold patch days when they had to keep going back [over patched areas]," he said. "They love [the infrared and asphalt recycler]...It's a huge benefit to be able to patch something and not have to go back."

Equipment costs also weigh in favor of cold patching. Throw-and-roll cold patching doesn't require specialized equipment: the mix is simply shovelled into a pothole and then compacted. Cleaning and preparing the pothole is optional although it is recommended.<sup>2</sup> Thus, cold patching runs approximately \$40 in equipment per day.

By comparison, hot-mix methods run up to ten times higher in per-day equipment costs.<sup>2</sup> The City of Traverse City paid \$79,000 in 2014 for their KM International trailer-mounted asphalt recycler, which they use in conjunction with their \$19,000 infrared machine. KCRC paid approximately \$40,000 in 2018 for their Stepp trailer-mounted asphalt recycler. Nonetheless, Jones says the infrared machine and asphalt recycler used in tandem "would probably pay for itself within a couple years...if you use it regularly".

Cronenworth notes that the time and effort for operating the recycler means they limit its use to significant stretches of potholes on county-owned roads. Jones also admitted, "It's time consuming but, when you're done with the job and don't have to go back, it

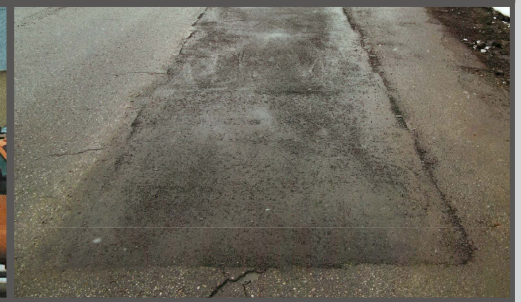


removes that drawback.” While he says the benefit on city roads is “huge”, he speculates county road commissions might be slower to adopt the innovation because they typically cover more road miles.

That speculation was corroborated by Cronenworth. “If there’s only a few holes, it’s better to cold patch quickly,” he explained. “The machine takes longer to get up and running, so it pays to use it when you have more patching to do.” To get the first batch of recycled asphalt made, KCRC has experienced anywhere from 6 to 30 minutes depending on the morning’s temperature and the moisture content of the recycled millings. “But, once it gets going,” he said, “the batches will take 6 to 10 minutes.”

### Never Out of Season

Being able to create a hot-mix asphalt on site can also extend the paving season. Stepp equipment was found to produce successful batches of hot-mix asphalt for patching in temperatures as low as 20 degrees Fahrenheit<sup>4</sup> although the manufacturer suggests it can be used at a broader range of ambient temperatures. Both the City of Traverse City and KCRC stockpile their millings. Jones says they use these stockpiled millings or hot-mix purchased late in the season to “get through winter and spring” pothole patching. He also notes that they use their infrared machine throughout the winter although it has been reported that heating the asphalt to the necessary 275 to 300 degrees Fahrenheit can take ten minutes or longer.<sup>4</sup> Nonetheless, Jones says the infrared machine and asphalt recycler enable them to repair problem areas quickly, “especially if we start seeing blowing tires in potholes”, throughout the winter and early spring seasons.



Millings from road project for recycling (top left) and asphalt recycler in operation (bottom left); Pavement in Traverse City prior to (top right) and after infrared patching (bottom right) (Photos: courtesy of City of Traverse City).

### Longer Lasting

When subjected to traffic or rain or snow, using recycled hot-mix-asphalt patches seems to be out-performing throw-and-roll cold patches in terms of longevity.

In the Ohio study, cold patch had poor adherence to the pavement itself.<sup>2</sup> Performance improved with the addition of a tack coat. The study identified two factors contributing to its shorter life: density and compaction techniques. Those two factors can be improved by compacting from the center outward and leaving a crown on the patch for subsequent compaction via traffic load.<sup>2</sup> However, the study noted that the temperature difference between the patch and the existing pavement is the “main

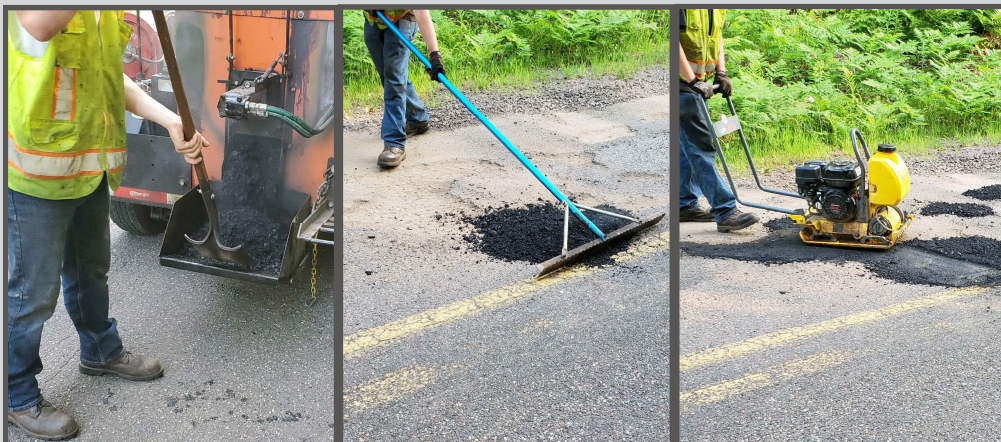
drawback” and limits the “bonding” ability of the patch, potentially allowing for “water or other debris to enter the pothole patch”.<sup>2</sup>

On the other hand, hot-patch methods performed better over time, being more cost effective as a longer-term solution, according to the Ohio study.<sup>2</sup> Over time, throw-and-roll cold patching was least expensive in a 12-month cost comparison.<sup>2</sup> However, patching with infrared technology, which uses warmed pavement in addition to hot-mix asphalt, creates a tighter seam that is more long lasting and, thus, would realize a better cost-effectiveness for durations longer than 12 months, according to the Ohio study.<sup>2</sup>

What the Ohio study found was also an experience shared by the City of Traverse City and KCRC. Jones noted, “In some of our cold patch years of working, we could maybe get a day, sometimes, out of a repair; when we use the infrared machine on a bad stretch of pavement, we’re not going back for the rest of the winter.”

Although KCRC’s trailer-mounted asphalt recycler has only been part of their maintenance operations over the past two years, Cronenworth observed, “As of last fall, we still had some patches that we had put in when we first got the machine [over a year ago].” He surmised, “They could last for a season or up to two seasons.”

Even though the results produced from



Freshly-made recycled asphalt being dispensed from a trailer-mounted asphalt recycler (left), raked into a pothole (center), and compacted with a plate compactor (right) (Photos: CTT Archive).

► continued on page 8



# Drain Commissioners: A Benefit to Your Road down the Road

Thomas Page, Technical Writing Intern  
Center for Technology & Training

**W**ant to win your next trivia night? Ask your friends the question “what is a little-known elected office that is unique to the State of Michigan?” You’ll likely be the only one in the room who would be able to know the answer. County drain commissioners are found throughout Michigan, but what they are, the services they provide, and the benefits they offer are often not known to the general public and sometimes even to county employees.

Established in Public Act (PA) 40 of 1956, the office of the drain commissioner exists in (almost) every county in the State of Michigan to manage county drains, which are natural or artificial routes for surface water runoff to flow through safely, minimizing flooding. The “Drain Code”—as PA 40 is popularly called—says that each of the 83 counties in Michigan must have a person or department who exercises the powers of the drain commissioner.<sup>1</sup> Most counties simply have an elected drain commissioner.

As an elected position, the only qualification to be a county drain commissioner is residency within the county of election. However, candidates have a better chance of being elected if they have prior experience

with water management. “Technically, there really isn’t a list of qualifications, but I think a well-rounded drain commissioner or water resources [commissioner] should have a great knowledge of Drain Code...and a lot of experience in something like surveying engineering,” said Joe Bush, water resources commissioner for Ottawa County. “You don’t have to be an engineer or a professional engineer, but I think your background [should be related to] water or water management.”

Also little known is the ability of the drain commissioner to levy taxes and borrow money without a vote of the people or approval from the county commission or state legislature.<sup>2</sup> While former Shiawassee County Drain Commissioner Robert Tisch says this makes a drain commissioner “more powerful than the governor”, drain commissioners are only authorized to spend up to \$5000 annually per mile, per drain for maintenance and repair.

Although all counties must have a drain commissioner, counties with less than 12,000 residents have the option to abolish the elected office and instead appoint the chairman of the board of road commissioners to

fill the role. Currently, about 11 counties in the Upper Peninsula and the northern Lower Peninsula have done so. In these counties, the role is filled but there is no distinct office of the drain commissioner.

Michigan’s drain commissioners serve their counties by addressing drainage issues faced by constituents and public agencies. Some drain commissioners are already an integral part of their counties, but others are under-utilized and are itching to get out and establish drains to improve their counties.

County drains can be created to serve roads, too. John Pekkala, the Houghton County drain commissioner, said, “[It] may be a benefit to county road commissions knowing that they can start drainage projects off road rights-of-way if they choose by petitioning their drain commissioner...If you want to petition for a drain, it might benefit your road down the road.”

Local road-owning agencies have the option to start the petition process to create county drains, a fact that is not used often. The process is lengthy for private citizens, but municipalities and public agencies have the time and resources to figure it out.



Photo: CTT Archive



## County Drains: No, they're not the ones in your sink

The drain commissioner isn't a public plumber and won't fix the leaky pipes in your home. A county drain is a much larger waterway that enables clean water to flow to a larger body of water. It's a path of least resistance, an easier route through which water can flow rather than through a lawn or, worse, a basement.

Drains come in many shapes and sizes: open drains are natural or artificial streams, rivers, or ditches, and enclosed drains are buried pipes and catch basins. Despite misconceptions, waste-water sewer systems are not county drains. "A drain is for clean water," clarified Pekkala. "[A] sewer is for your wastewater from your home or your business."

Surprisingly, county drain commissioners cannot start the process to establish new county drains. The process to establish county drains, as defined in the Drain Code, begins with a petition signed and filed by either private citizens or a municipality authorized by its governing body—that is, petitioned for by landowners, municipalities, road commissions, or the Michigan Department of Transportation (MDOT). "Do we need drains? We do, but I'm not the person that starts the process," said Pekkala. "I can aid the process by giving landowners a petition to sign or I can offer a resolution to an individual township to get its township board to authorize the project, but I can't start these projects."

After a petition is filed, a board of determination is established for the specific petitioned-for drain to assess its necessity. Bush said, "The petition goes to a public hearing, in which the public has a voice about whether they're in favor [of it]." The drain commissioner appoints three people from within the county but not within that drain district or township to make a decision during the public hearing about establishing the petitioned-for drain.

If the drain is found to be necessary and beneficial, the drain commissioner begins working with civil engineering firms to create an engineering plan for the proposed drain. The drain is paid for by both the county and the taxpayers through a special tax assessment divided appropriately among all of the parcels of land that will benefit from the drain.

After the petition process is complete but before work on the drain commences, the drain commissioner may be required to obtain a permit from the Michigan Department of Environment, Great Lakes, and



Photo: CTT Archive

Energy (EGLE). Work on county drains that would classify as "streams", or wetlands, requires a general permit or a public notice permit along with detailed construction and/or maintenance work plans.

While counties may have in excess of 1,000 drains and drainage networks, only those drains that underwent the petition process classify as county drains. This distinction is important to determine which agency has jurisdiction and the responsibility to maintain these drains. "The cities themselves maintain their infrastructure and their drains, [and MDOT maintains] the drainage associated with roads," Pekkala noted. "Drainage associated with county roads is maintained by the county road commission." Private citizens may also construct drains on their own property.

Abandoned, or "orphan", drains are those drains that were formerly maintained by residents or companies but have since fallen into disuse. The petition process can be used to classify an orphan drain as a county drain and bring it back into active, useful service.

### What Can a Drain Do for Your Infrastructure?

County drains encourage proper drainage to alleviate flooding. More often than not, these drains serve residential and agricultural purposes and are meant to prevent damage to homes and fields. Though most rain and runoff can be managed naturally without established county drains higher-than-normal precipitation events may benefit from county drains. Pekkala observed, "there's a lot that

should be done regarding drainage."

### Drain Commissioner Duties: As Varied as Michigan's Landscape

The size of the drain commissioner's office varies from county to county. Some counties, like Houghton County, are staffed by only the drain commissioner. Other counties, like Ottawa County, have dozens of support staff that include administrative assistants, civil engineers, and drain maintenance crews. The largest drain commissioner offices, like Genesee County, have hundreds of staff to operate large drain networks and wastewater treatment facilities. In counties that have abolished the elected position, the drain commissioner office staff are the road commission staff although they are not often called out as such.

Although the minimum duties of the drain commissioner are established in the Drain Code, the actual duties and the manner in which each county's drain commissioner performs them varies drastically.

In many Upper Peninsula and northern Lower Peninsula counties, drain duties have been minimal or non-existent, although the possibility of establishing a county drain is always present. Geographically, these counties tend to have rolling terrain, which often provides enough natural drainage for the communities therein. So, the establishment of new drains is not often necessary. Many of these counties have given the duties of the drain commissioner to the road commission.

► next page



## Drain Commissioners (continued from Page 7)

► In the counties that don't have drains, but have more than 12,000 residents, drain commissioners often perform other duties related to water management, though counties with drains may also perform these duties. The main duty of the drain commissioner is managing drain maintenance. Managing maintenance most often involves sending drain office staff or hired contractors to remove brush, sediment, or other blockages, or to identify problems. "That can be woody debris removal or something in the drain that's causing other issues, or maybe [addressing] a severe erosion problem," Bush explained.

Miscellaneous duties that may be delegated to the drain commissioners include the enforcement of the soil erosion control program and the management of inland lake levels. Any particular county drain office may perform all, some, or none of these duties.

Houghton County has no county drains. So, Pekkala, drain commissioner in Houghton County, spends most of his time enforcing the soil erosion program. "I spend a lot of my time in the field inspecting sites and giving contractors and landowners advice on what should be done to prevent off-site sedimentation," Pekkala related. In contrast, Bush, water resource commissioner in Ottawa County, oversees maintenance of over 800 storm water

management systems. He has staff members dedicated to the ancillary duties. "I have a soil erosion control agent and an inspector that work for me," Bush shared. "They work with me on issues out in the field, but they take care of a lot of the soil erosion issues."

To reflect modified drain commission duties, the position of the drain commissioner may be renamed by the county board of commissioners to the water resources commissioner. This renaming most often occurs when a drain commissioner manages lake levels or wastewater systems. Additionally, the optional position of public works commissioner may be merged into the drain commissioner's office, which would then assume all drain and public works duties. "In the Drain Code, there's certain titles that are different, like Public Works Commissioner or Water Resources Commissioner, and they all wrap around job responsibilities within your county, [which determines] whether you can change the name," explained Bush. ■

### RESOURCES

1. Michigan Legislature. *The Drain Code of 1956 - Act 40 of 1956*. Available: <https://tinyurl.com/migov-act40-1956>.
2. Walcott, E. 2016. *What does a drain commissioner do?* Michigan State University MSU Extension. Available: [https://www.canr.msu.edu/news/what\\_does\\_a\\_drain\\_commissioner\\_do](https://www.canr.msu.edu/news/what_does_a_drain_commissioner_do)

## Pave. Recycle. Repeat. (continued from page 5)

using an asphalt recycler in maintenance operations seem promising, a Minnesota study had mixed results.<sup>4</sup> In the study, the trailer-mounted asphalt recycler had operational problems and produced a less-than-desirable hot-mix asphalt. It also found that the longevity of the patches was not good in comparison to other methods. In any case, the report does recommend using a trailer-mounted asphalt recycler for out-of-season patching of localized potholes greater than two inches in depth.

When used in conjunction with infrared technology, patches were found to perform significantly better than the cold-mix throw and roll method and other patching methods.<sup>2</sup>

Regarding this new-found ability to create hot-mix in a trailer mounted asphalt recycler and use it for patching, Cronenworth exclaimed, "The longevity, it by far outweighs the cold patch--it's a night and day difference!"

"We use [the asphalt recycler] like crazy," said Jones. "As far as drawbacks, I can't even

come up with one. The asphalt comes out of that machine like it comes out of an asphalt plant, and that's the material you want." ■

### RESOURCES

1. Federal Highway Administration. 2017. *Recycling: FHWA Recycling Policy*. [www.fhwa.dot.gov](http://www.fhwa.dot.gov). Available: <https://www.fhwa.dot.gov/pavement/recycling/>
2. Nazzal, M.; Kim, S.; Abbas, AR. 2014. *Evaluation of Winter Pothole Patching Methods*. Report # FHWA/OH-2014/2. Ohio Department of Transportation, Columbus, Ohio. Available: <https://tinyurl.com/ohdot-nazzal-et-al-patching>
3. Colorado Pavement Solutions. 2019. *What's the difference between Hot Mix and Cold Mix Asphalt?* [copavementsolutions.com](http://copavementsolutions.com), 27 Nov 2019. Accessed 9 April 2020; available: <https://copavementsolutions.com/hot-mix-vs-cold-mix-asphalt/>
4. Barman, M. 2017. *Comprehensive Field Evaluation of Asphalt Patching Methods and Development of Simple Decision Trees and a Best Practices Manual*. Final Report 2017-25. Minnesota Department of Transportation, Duluth, Minnesota. Available: <http://mndot.gov/research/reports/2017/201725.pdf>

Photo: CTT Archive



# Tree Trimming in the Right of Way: How to Cut and Remove Trees in the ROW Safely

Hannah Bershing, Technical Writing Intern  
Center for Technology & Training

“I think that I shall never see/A poem as lovely as a tree,” wrote Joyce Kilmer, the American poet, in 1913.<sup>1</sup> The public nowadays does still agree with Kilmer that trees are beautifying and beneficial to our state. Interestingly, the State of Michigan even has a document extolling 22 benefits of urban street trees.<sup>2</sup>

While the public are passionate about trees, maintaining trees to keep residents and road users safe is an important consideration for local road-owning agencies. Trees can shade the road and create moisture issues on the road surface, as well as pose a hazard for runoff-the-road crashes potentially making those crashes more catastrophic. Roadway tree management helps to flag and address potentially hazardous trees and to prune others in order to improve their health and sustain their beauty. Hasan et al. defined roadway tree management as “a reduction of hazards through inspection and mitigation, maintaining the level of hazard with the need to keep large, beautiful trees on the site”.<sup>3</sup> Local road-owning agency staff aim to improve road safety by flagging, trimming, or felling hazardous trees.

Examples can be seen of beautiful trees being hazardous. In Michigan, a 2016 Detroit Free Press article shared the story of one resident who was “attracted” to her current home by a once big and healthy ash tree.<sup>4</sup> Fortunately, she recognized the potential hazard the dying tree created for her home and the neighborhood children who rode their bikes nearby.<sup>4</sup> Counteracting the public’s sentiment for the trees can be tricky, but understanding that these roadside trees can pose multiple hazards to nearby roadways and users, is the first step to managing trees in the right-of-way. In fact, a limb from a tree near a road did fall on a woman’s car in Chattanooga, Tennessee, according to a News Channel 9 report.<sup>5</sup> She was struck by the limb when driving.<sup>5</sup> Although the tree was on private property, it fell into the city’s right of way<sup>5</sup>, showing why it’s important to manage trees that encroach on said

right-of-way. The City of Detroit responded to the tree hazards by removing roughly 3,000 trees in 2016. This big sweep of the “worst of the worst” trees, maintained the city’s beauty, while removing dead trees and pruning others.

During each season, roadway tree management by the local road owning agency is an important safety measure for road users. Yet, working in the right of way is no easy task, especially when it comes to the safety of both the local road-owning agency staff operator and road users.

## No Small Task

“Any tree can kill you,” said Jim McBreen, a construction maintenance supervisor with the U.S. Forest Service. “You really have to respect that fact.” In fact, the Occupational Safety and Health Administration says fatal accidents are commonly caused by “workers being struck by falling trees and limbs...[or] by motorized equipment; workers falling from trees, lifts, and ladders; workers caught in chippers; and electric shock while working near overhead power lines”.<sup>6</sup> So, how do local road agencies trim or fell trees in the right of way safely?

## Felling and Trimming Practice

In Michigan, the road-owning agencies have the authority to maintain or remove vegetation in the right of way.<sup>7</sup> McBreen contends it’s important to “identify which trees pose the greatest risk”. Once such trees have been identified, safe tree cutting practice involves six steps, according to McBreen and Dustin Brighton, a full-time firefighter in southern Michigan who also serves as an adjunct professor at Bay College where he teaches chainsaw safety.

Safe tree cutting practices, spelled out by OSHA, can be broken down into six steps, according to Brighton and McBreen. Before beginning, a risk assessment of the surrounding area identifies potential hazards. For example, power lines can often be found near the right of way. The tree itself needs to be inspected as well. Trees can have risks like a lean in one direction, mushrooms close to roots, and dead or weakened branches. Little details like mushrooms around the base of a tree can be indicative of a more significant problem, like a rotting root structure, explained McBreen.

Both McBreen and Brighton say those preparing to cut a tree then need to “size the tree up”, looking for things like height, diameter, lean, and overall health.

Depending on the risk assessment and the tree assessment, the right tools are selected for the job. “[When someone is] pulling trees over or pushing trees over with equipment,” said Brighton, “I see a lot of accidents [because] somebody’s cutting the tree and somebody’s in a piece of equipment pulling or pushing the tree [to remove it and]...they’ll either overcompensate or undercompensate.” Instead, Brighton encourages making “proper cuts”. Common equipment to make these cuts are a chainsaw or axe, felling wedges, and pulley systems. More unique equipment are tree cutting cranes that removes branches from the top and can set the branches by the road. McBreen suggests using heavy equipment, harvesting equipment, or—in rare circumstances—explosives for trees that are hazardous in and of themselves.

Establishing escape routes is also critical for safety. An escape route plan gives workers a couple routes to go away from the tree in case the tree begins to fall in a direction that was unplanned. McBreen said having escape routes are important for anticipating “whatever the tree is going to do, whether that be the tree spinning or falling back at you”.

Finally, developing a notch plan and a hinge-placement and back-cut plan will best guide the tree in how it should fall. The safest way to fell a tree, according Brighton, begins with “just going through a good process of analyzing the tree as opposed to traditional methods of just going at the tree and cutting it”. A good analysis establishes how a tree is going to fall based on its direction of lean and height, using basic mathematical principles related to triangles.

## Equipment Safety

Chainsaws are frequently used due to their relatively low price and easy mobility. Despite their popularity, chainsaws have risks. When felling a tree, a person using a chainsaw is directly under the tree, exposing himself or herself to falling limbs and branches. A chainsaw also creates different forces when tree cutting: push and pull, and

► continued on page 14



► more stable, lose their affinity for water, and bind with other clay particles and subsequently cause aggregation. The result of enzymes acting upon the soil's fines and hardening them is a water resistant, cement-like material. Fascinatingly, the enzyme is regenerated by each reaction, so the process can repeat for years, drastically decreasing the need for maintenance on a road. According to some manufacturers, the use of enzymes in gravel stabilization can reduce average maintenance frequency of a road from every one to three months to every one to three years.

Ken Skorseth, retired program manager for the South Dakota Local Technical Assistance Program (LTAP) began his career 50 years ago working in road construction. He likes enzymes for their ease of application in the field. He noted, "Every manufacturer that I'm familiar with touts the ease of using

them: just loosen the soil, apply the product, mix it, and compact it." Skorseth added that, while a mobile mixer is the best equipment for the process, "something as simple as an agricultural disk can be used to mix the soil".

A study was done to compare the effectiveness of enzymes with other gravel stabilization options.<sup>2</sup> The study compared the application of stabilization products on road sections over time: enzymes, portland cement, water, and soap. Portland cement performed the best of the four, although the enzymes did significantly better than the water and soap in most cases. The study found that the two best products, portland cement and enzymes, proved to be even better together. A mixture of the two made the hardest and most durable road surface. However, enzymes do beat cement outright in terms of price. The cost per square yard for an enzyme product is approximately

\$0.20, whereas the cost of portland cement for stabilizing gravel road soils per square foot is approximately \$0.50. Enzymes are applied at a volume ratio of roughly 1000:1 with water, meaning a little goes a long way.

## **Predictability of Success?**

Enzymes may decrease the amount of maintenance a road needs, be easy to apply, and be relatively cheap compared to other stabilization products on the market, but using them does come with a challenge: it can be difficult to predict the success of an enzyme product in a specific region. Biological and chemical diversity in both soils and different enzyme products mean the results are variable.

While they do improve the performance of an unpaved road, Skorseth considers enzymes to be "more of a soil stabilizer than a gravel or aggregate stabilizer". One study tested two different enzyme products on two



Photo: CTT Archive



soils with differing clay content and percentage of fines.<sup>3</sup> Neither of the enzymes were as effective on the soil with low clay content, although one enzyme was significantly more effective at hardening the low clay content soil than the other enzyme. This experiment shows the difference a certain type of soil or enzyme can make on the success of the project. Further research indicates that a plasticity index between 6 and 15 may be an indicator of a good soil for enzyme stabilization.<sup>4</sup> Even if an enzyme does work on a soil type, Skorseth pointed out, “Unless you have homogeneous soil on an entire project—in other words, same type, same mixture of soil—you’re going to have a challenge.”

Although there are still unanswered questions associated with this product, Skorseth stressed, “Don’t be afraid to try a product, whether it be an enzyme or anything else marketed for stabilization or dust control.”

Testing a product on a full project when not certain of a product’s performance can be a costly and time-consuming mistake. So, Skorseth provided advice to avoid wasting money and resources while still being open to new products, saying, “As I’ve told so many people: just build a test segment, which quite often doesn’t need to be more than a thousand feet, and watch it for a year or more to make sure it performs in your soils and surface aggregate.”

Enzymes are unique because they provide an environmentally-friendly solution to gravel road maintenance. Seagren concluded, “I think in general these biological techniques have a lot of promise for the future in terms of low environmental impact as we try to move away from cement-based materials.” Enzymes as a gravel road stabilizer may be a newer innovation that come with some questions, but those questions may be worth answering for a better future. ■

## RESOURCES

1. FARM SHOW Magazine. 2013. *Amazing Product Turns Gravel Into Solid Surface*. FARM SHOW Magazine, Issue 13, page 91. Accessed 28 April 2020; available: [https://www.farmshow.com/a\\_article.php?aid=26761](https://www.farmshow.com/a_article.php?aid=26761).
2. Eggett, D., Guthrie, W., Simmons, D. 2015. *Enzyme Stabilization of Low-Volume Gravel Roads*. Transportation Research Record, issue 2511-13. Transportation Research Board. DOI: 10.3141/2511-13.
3. R. A. Velasquez, M. O. Marasteanu, R. M. Hozalski. 2006. *Investigation of the effectiveness and mechanisms of enzyme products for subgrade stabilization*. International Journal of Pavement Engineering, 7:3, 213-220. DOI: 10.1080/10298430600574395.
4. Fuller, A., Nucifora, R., O’Donnell, B., Renjith, R., Robert, D., Setunge, S. 2017. *Enzyme based soil stabilization for unpaved road construction*. EDP Sciences. DOI 10.51/mateconf/201713801002.
5. University of Minnesota. 2005. *Enzymes as a Soil Stabilizer*. soilok.com. University of Minnesota Department of Civil Engineering. Accessed 24 April 2020; available: <http://soilok.com/road-building/enzymes-as-a-soil-stabilizer/>.



# Innovation Synergy: UAS Videos Enhance Virtual Public Involvement Techniques

U.S. Department of Transportation *Federal Highway Administration*  
In: Innovator March/April 2020

Videos and other virtual public involvement techniques are effective ways to draw people into transportation planning and project development processes. Using unmanned aerial systems (UAS) to capture video footage enhances agency efforts to tell compelling visual stories and garner public support for infrastructure improvements.

## Touring Tunnel Construction

The Washington State Department of Transportation's Visual Engineering Resource Group (VERG), which helps the agency communicate about infrastructure projects through visual media, uses aerial video in many of its products. WSDOT credits UAS with reducing lead time and cost on video production.

"UAS are the way to go for aerial visual acquisition," said Kurt Stiles, VERG manager. The price of a UAS system can be similar to the cost of a few hours of helicopter rental, and the UAS provides years of service. VERG uses UAS to recreate cinematic shots and effects in its visual storytelling of a project.

To support public involvement for one of the most complex projects in WSDOT's history, VERG used drones to capture footage of key stages of the Alaskan Way Viaduct replacement. The project included replacing the viaduct, an elevated section of State Route 99 in Seattle, with a 2-mile-long tunnel under the city, removing a seismically vulnerable structure from the road network and clearing the way for new public space on the downtown waterfront.

The agency used UAS footage to provide updates through web links, public meetings, and social media, including its online video channel.

One video, "View from a drone inside the SR 99 tunnel," takes viewers on a 4-minute tour of the tunnel under construction, showing where a tunnel-boring machine installed the curved concrete segments that make up the tunnel walls and crews built the double-deck road inside the circle. The video of the tunnel, which opened to traffic in 2019, received nearly 250,000 online views.

From planning and communication to design and construction, VERG products such as videos are vital to project success, said Stiles. "With virtual public involvement and conducting your visual communication effort virtually, you will win," said Stiles. "You will find a lot more yeses. You will gain a lot more consent. At the end of the day, if you're saving time, you're saving money, and our infrastructure and our public deserve it."

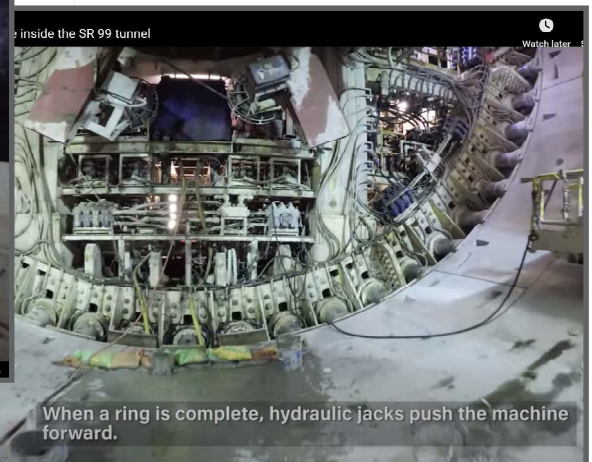
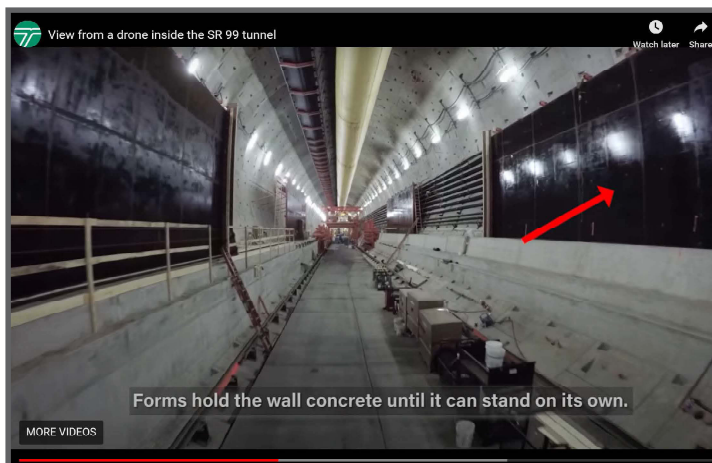
## Revealing Roundabout Benefits

The North Carolina Department of Transportation (NCDOT) used an informational

video, captured in part by UAS, to educate the public and gain buy-in on its plan to use roundabout intersection designs to enhance safety and reduce congestion. NCDOT reports that the video was critical in helping the public become comfortable with the design concept and changing the minds of some who did not like the idea of using roundabouts. The bird's-eye perspective of the drone footage helped those unfamiliar with roundabouts understand how they work and demonstrated the safety benefit offered by keeping traffic flowing.

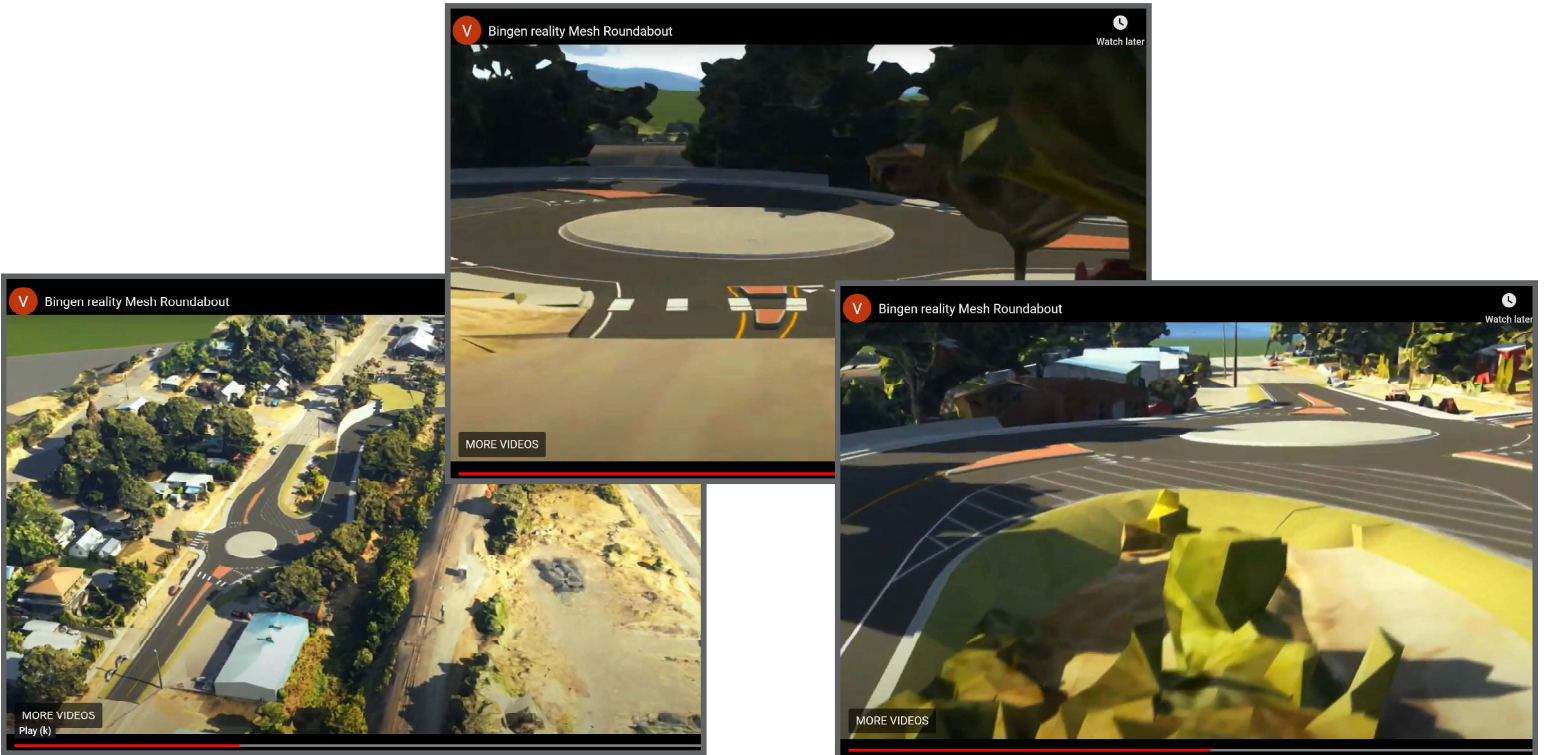
"Watching a short video is easier than reading through a plan or report," said Jamille Robbins, NCDOT's public involvement and community studies group leader. "The greater utility of these types of videos is that they can be available 24 hours a day, 7 days a week—far beyond the timeframe of a traditional public meeting."

Virtual public involvement and UAS also came together on a project where a roundabout was proposed in the city of Bingen,



The Washington State Department of Transportation flew a drone through the SR 99 tunnel to record construction progress. To avoid disrupting crews, the video was recorded between regular work shifts. Credit: Washington State Department of Transportation





The North Carolina Department of Transportation used UAS to create a video to education the public about the benefits of roundabouts. Credit: North Carolina Department of Transportation

WA. The Bingen Point Access project, now in the design phase, will construct intersection improvements along SR 14 to enhance safety and mobility in an area of planned economic expansion. WSDOT’s VERG combined aerial video with three-dimensional modeling to create a combined view of what the completed project would look like. This visualization helped explain the project to stakeholders, including local government officials and businesses, which helped generate support for the project while avoiding potential delays. ■

*Reprinted from Federal Highway Administration: Innovation Synergy: UAS Videos Enhance Virtual Public Involvement Techniques. In: Innovator, March/April 2020. U.S. Department of Transportation Federal Highway Administration. Available: <https://www.fhwa.dot.gov/innovation/innovator/issue77/>. For more information, contact Scott Allen or Carolyn Nelson of the Federal Highway Administration Office of Planning, Environment, and Realty for information on virtual public involvement. Contact James Gray of FHWA Office of Infrastructure or John Haynes of the FHWA Utah Division for information on UAS.*

## Unmanned Aerial Vehicle Technology Put to the Test

The Michigan Tech Research Institute (MTRI) is a research center of Michigan Technological University that specializes in research and development of remote sensing and information technology used to solve a variety of critical global issues. The MTRI has been working with the Michigan Department of Transportation (MDOT) to develop unmanned aerial vehicles (UAVs) for transportation assessment purposes.

Senior research scientist Colin Brooks helped develop a project that consists of three phases. The goals for Phase I were to develop, test, and demonstrate how UAVs can provide new visual inspection capabilities for infrastructure in a variety of ways. The test looked at UAV use in many applications such as inspection of bridges, inspection in confined spaces like culverts, and monitoring of traffic levels on roadways. Phase II built on the momentum from Phase I as the researchers developed, deployed, and implemented UAV assessment based on the data collected in the first phase. A third phase started in 2019. It is focusing on integration of UAV-enabled assessment methods in day-to-day operations. The projects have involved the use of optical, thermal infrared, and lidar sensors mounted primarily to multi- rotor UAVs as well as demonstrating tethered blimps.

For more information, visit [mtu.edu/mtri](http://mtu.edu/mtri).

Sarah Lindbeck, Technical Writing Intern – CTT



Photo courtesy of Colin Brooks



# Tree Trimming (continued from Page 9)

► then pull-in and rotational kickback.<sup>8</sup> According to Ken Palmer in Incident Prevention Magazine, these forces can create a kickback that’s “seven times faster than a human can react”. Brighton said, “The biggest thing with chainsaws that gets overlooked is the forces they create.” Consequently, he advocates training in proper handling of chainsaws.

While heavy equipment can be safer than a chainsaw since it allows the operator to be in a cab and out of the way of falling limbs, there are many more safety considerations. Brighton illustrated, “If you have a 8,000 pound bobcat and a large tree that’s back-leaning with 20,000 pounds of limbs and leaves and wood, you’re trying to overcome 20,000 pounds with an 8,000-pound piece of equipment, [which is] a good start for figuring out how much force and how much mass you’re trying to overcome to get that tree to go where you want it to go.” To get a clearer picture of a particular bobcat-versus-the-tree scenario for pine trees, an agency can calculate the estimated weight of the tree’s total green weight (wood, bark and foliage) or volume using tables developed by Georgia Forestry Commission researchers Alexander Clark III and Joseph Saucier.<sup>9</sup> Then, guiding the tree’s fall with chains and pulleys gives the agency more control over how the tree will fall than using heavy machinery, according to Brighton. “You’re really at the mercy of the operator in the loader and his foot on the gas if you are going to use [heavy machinery] equipment,” Brighton said. “So, you really need good communication between the chainsaw operator and the loader or

equipment operator in order to make [felling] happen safely.”

Brighton thinks it’s important to “train everyone at an agency on the same topics” related to safe tree removal practices especially in the right of way where factors can pose a risk to the motoring public. “Supervisors are out on the job watching staff do things so they need to understand what they’re looking for,” he said. “And, creating a culture [of safe tree removal practice] in an agency allows everybody to participate and share their knowledge.

Brighton notes that the “culture around chainsaws and humans [is] very ego driven and nobody is willing to help others or accept help, because they think that they should just automatically know it”. And, the knowledge about chainsaw usage can be generational, learned from our parents who, in turn, learned from their parents. Training allows for new findings and techniques to be introduced into chainsaw usage. “The idea [of agency-wide training] is to create that culture where employees are open to taking help from other employees and we have your more experienced employees that help, as well,” said Brighton.

## Training

Chainsaw safety and cutting technique classes are offered through Bay College Training and Development (Michigan Technical Education Center, or M-TEC) in Escanaba (see <https://www.baycollege.edu/on-campus/workforce-training/index.php>).

For those who intend to use aerial lift for

tree removal in the right of way, aerial lift specialist classes accompanied by basic rigging techniques are also available and can be used to obtain aerial lift certification training. Brighton offers advanced classes, which are inclusive of advanced hazardous tree cutting and advanced rigging courses; these can be arranged by contacting him directly at [brightondustion@yahoo.com](mailto:brightondustion@yahoo.com).

The International Society of Arboriculture (ISA) Michigan division also hosts two conferences a year on tree cutting, felling, and other agricultural practices such as wildlife and environment (see [www.asm-isa.org/](http://www.asm-isa.org/)). This conference includes training opportunities offered on site or through agencies like Bay College. ■

## RESOURCES

1. Kilmer quoted in Burden (see 2)
2. Burden, Dan. 2006. Urban Street Trees: 22 Benefits. Michigan Department of Natural Resources. Accessed 28 April 2020; available: [https://www.michigan.gov/documents/dnr/22\\_benefits\\_208084\\_7.pdf](https://www.michigan.gov/documents/dnr/22_benefits_208084_7.pdf)
3. Hasan, R., Othman, N., & Ismail, F. 2016. Roadside Tree Management in Selected Local Authorities for Public Safety. *Procedia - Social and Behavioral Sciences*, 234, 218–227. DOI: 10.1016/j.sbspro.2016.10.237.
4. Helms, M. 2016. Detroit to cut down thousands of dead trees. *Detroit Free Press*. Accessed 23 April 2020; available: <https://tinyurl.com/freep-dtw-cuts-trees-2016>
5. Spirato, A. 2016. Trees falling in roadway: Who’s responsible for the damage? *News Channel 9*. Accessed 23 April 2020; available: <https://tinyurl.com/newsch9-falling-trees>
6. Safety.BLR.com. 2014. OSHA targets tree trimming and clearing operations. *Business & Legal Resources*. Available: <https://tinyurl.com/blr-osa-treecutting>
7. Michigan Legislature. 1921. Trees and Shrubs (Excerpt). Act 2 of 1921, 247,241. Available: <https://tinyurl.com/migov-1921-trees>
8. Palmer, Ken. 2014. *Chain Saw Safety, Planning and Precision Felling Techniques*. Incident Prevention Magazine, November-December 2014. Available: <https://tinyurl.com/incidentprevention-chainsaw>.
9. Clark III, A., and Saucier, J.R. 1990. *Tables for Estimating Total Tree Weights, Stem Weights, and Volumes of Planted and Natural Southern Pines in the Southeast*. Georgia Forest Research Paper, Issue 79, September 1990. Available: [https://www.frames.gov/documents/jfsp/biomass\\_review/clark\\_saucier\\_1990.pdf](https://www.frames.gov/documents/jfsp/biomass_review/clark_saucier_1990.pdf).
10. Russo, D., Cistrone, L., Garonna, AP., Jones, Gareth. 2010. Reconsidering the importance of harvested forests for the conservation of tree-dwelling bats. *Biodiversity and Conservation*, 19, p. 2501-2515. Available: <https://link.springer.com/article/10.1007/s10531-010-9856-3>



Left: Tree cutting operation using ropes to guide the fall; right: notching a tree using a chainsaw (Photos courtesy of Dustin Brighton)



# The Problem of Endangered Species

Hannah Bershing, Technical Writing Intern – CTT

When trimming and felling trees in Michigan, agencies risk coming into contact with endangered species. The nesting period of bats, for example, restricts cutting and removal of trees to September through March, which gives agencies a very narrow window to get all of their cutting done. Complicating the issue is that the trees most in need of trimming or removal are often home to various wildlife that include endangered species. McBreen notes that “due to the lack of moisture, snags—or dead trees—are typically wildlife-rich trees”. Similarly, in an article discussing forests environmental integrity, based on the populations residing in them, Russo et al. note that “[b]ats are often deemed effective environmental indicators” since “large, old or defective trees offer excellent roosting opportunities to virtually all tree-dwelling bats” (2009).<sup>10</sup> To ensure the safety of the endangered species, tests can be performed by the DNR or a wildlife biologist to ensure the zone of cutting is not inhabiting any of the endangered species.

The Center for Technology & Training’s Michigan Local Technical Assistance Program offers Local Agency Program training on threatened and endangered species. This webinar, offered each spring, brings together specialists from Michigan Department of Transportation, Michigan Department of Natural Resources, and US Fish and Wildlife Services to discuss what agencies need to know if they encounter threatened and endangered species on federal- or state-funded transportation projects. Visit [ctt.mtu.edu/training](http://ctt.mtu.edu/training) for more information. ■



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The Center for Technology & Training (CTT) is a part of the Department of Civil & Environmental Engineering at Michigan Technological University in Houghton, Michigan. The mission of the CTT is to develop technology and software, coordinate training and conduct research to support the agencies that manage public infrastructure. In support of this mission, the CTT houses Michigan’s Local Technical Assistance Program, which is part of a national effort sponsored by the Federal Highway Administration to help local road agencies manage their roads and bridges. For more information, visit [www.ctt.mtu.edu](http://www.ctt.mtu.edu).

# The Bridge

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## About LTAP

The Local Technical Assistance Program (LTAP) is a nationwide effort funded by the Federal Highway Administration and individual state departments of transportation. The goal of the LTAP effort 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.

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*webinar: May 19; May 20; May 21*

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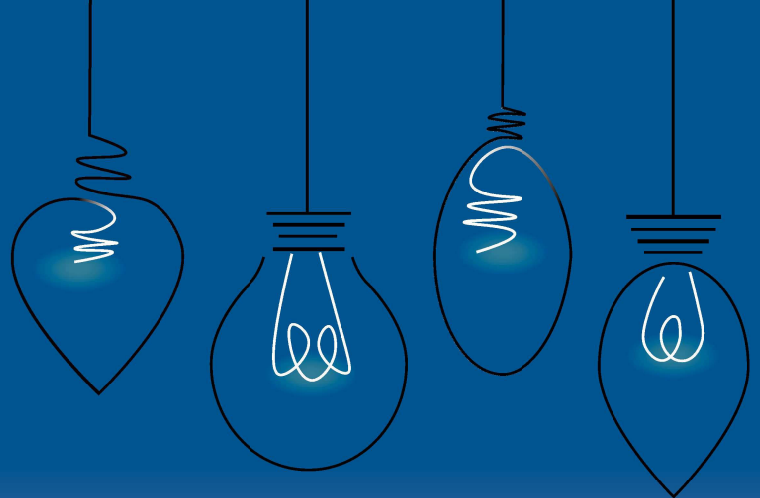
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### Mark Your Calendar: 2021 Michigan Bridge Week

*February 16-18 – Ypsilanti*



Great **Ideas** Michigan LTAP

## 2020 Challenge

Shining a spotlight on local road agency innovations  
for a brighter Michigan

Enter your submission at  
[www.MichiganLTAP.org/GreatIdeas](http://www.MichiganLTAP.org/GreatIdeas)