The Bridge

A quarterly newsletter from Michigan's Local Technical Assistance Program

Photo: Courtesy of Bruce Gasaway

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Michigan's Local Technical Assistance Program

Photo: CTT Archive

Letter from the Editor

Difficult roads lead to beautiful destinations." How often is it that on our way to our idyllic summer vacation place we encounter traffic slow downs or stops at construction zones that try our patience. The drive is long and tiring, even in the best circumstances. But, our destination reminds us that making that long drive on that difficult road was worth it.

In this issue of The Bridge, we look at some of the challenges that Michigan's local road-owning agencies face in their journey. For example, work zones continue to see an increase in crashes, so this issue takes up the topic of arrow boards and how to use them most effectively.

This issue also looks at social media, a powerful information-sharing, trust-building platform that local agencies can use. However, social media can quickly become unwieldy for agencies if comments spiral out of control. So, we offer agencies strategies for managing comments in their social media spaces.

We also look at the need to stay up-to-date with one's knowledge and skills and how graduate certificate programs can help do that. These pages address the challenges posed by poisonous plants and how to identify and work safely around them. And, this issue confronts the problem of roadside salt with a look at salt-loving plants near roadways.

Finally, this issue continues to look at ways to increase your cybersecurity. It also continues to look at where Michigan agencies' great ideas are today.

As always, the success of our articles depends on your stories—your innovations, and your experiences. We invite you to reach out to us at ctt@mtu.edu with your engineering projects, operations and management strategies, shop products and practices, and safety resources.

In the meantime, let's remember that beyond the difficult road ahead lies that beautiful destination.

Victoria

Photo: Courtesy of Bruce Gasaway

Perception and Reaction: The Standards and Research Behind Arrow Boards

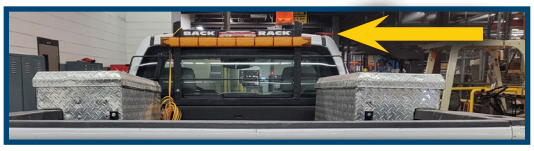
Nate Anderson, *Technical Writing Intern*
Center for Technology & Training

Work zone crashes have been on the increase, rising almost 40 percent between 2019 and 2023, according to the Michigan State Police. In 2023 alone, there were 8,017 work zone crashes. Related fatalities also increased from 17 to 24 annually during that time, according to the Michigan State Police.[1] Even just one death is too many.

In light of the rising number of work zone crashes and related fatalities, the role of uniform, visible, and properly-placed traffic control devices is important. Correct use of traffic control devices keeps local agency employees, incident management personnel, and road users safer. Proper device deployment can directly impact driver behavior and reduce the likelihood of crashes in work zones.

"Arrow boards are very effective," said Bruce Gasaway, retired traffic operations and safety coordinator from Muskegon County Road Commission. He added, "But, arrow boards are probably one of the most misused traffic control devices in the industry today."

A common mistake that Gasaway has seen is relying on a "pickup truck or other vehicle outfitted with a smaller light bar unit". He emphasized, "Avoid using these for merging lane closures or giving directional cues on a two-lane, two-way roadway because they lack Michigan traffic control device requirements."



Truck outfitted with smaller light bar. (Photo: Courtesy of Bruce Gasaway)

Arrow boards are panels with "elements capable of flashing or sequential displays" that "provide additional warning and directional information to assist in merging and controlling road users". Arrow boards are highly standardized per federal and state guidelines. Newer units are built with high-intensity lights that have day- and night-time dimming features, and they can be more visible in fog, rain, and snow. These portable, LED-based signs are typically placed in merging lane closures or on the side of the road to alert drivers of closures, changing conditions, or hazards. They have multiple standard traffic display patterns, including a right arrow, left arrow, double or sequential arrows (chevrons), caution bar, four-corner flashing caution lights, and alternating diamonds.

Guidelines for Using Arrow Boards

"All agencies and anyone working in the public road right-of-way are required to comply with the Michigan Manual of Uniform Traffic Control Devices Part 6," explained Gasaway about the state-specific version of the federal Manual of Uniform Traffic Control Devices (MUTCD). The current edition of the MUTCD was released in 2023; following suit, the 2022 version of the Michigan-specific MMUTCD is in the process of being updated. These federal and state standards provide direction on arrow board use in work zones. Sections 6F and 6L of the manuals identify minimum sizing and legibility distances for arrow boards. They also identify placement based upon application (i.e., location and job type). For example, one arrow panel is required per merging closed lane on a multi-lane road, but arrow boards should not be used for lateral traffic lane shifts.

Correct uses of arrow boards on various roadways (Photo: Courtesy of Bruce Gasaway)

"There are standards, guidance, and options," explained Gasaway about the manuals. ""Standards' are 'shall' conditions and, if you're not complying, you should have a good reason." The standards and guidance promote proper perception and reaction time for drivers and provide a safer environment for road agency employees working in a work zone.

"The Michigan Occupational Safety and Health Administration states that 'it is critical that employers provide all their employees with training on how to work adjacent to motor vehicle traffic in a manner that minimizes their vulnerability and exposure' and that includes work zone traffic control," Gasaway

explained, adding that MMUTCD standards and guidance should be part of those trainings. "When there's a work zone incident and MIOSHA investigates, one of their first question may be 'Were the employees trained?' and too often the answer is 'no'."

Seeing Results

Several elements affect the effectiveness of arrow boards.

For example, the brightness of the arrow board significantly influences the overall effectiveness. Researchers at the University of Kansas found that arrow boards with low luminous intensity, especially in bright daylight, have reduced visibility at a distance, limiting their effectiveness.[2] At speeds of 45 miles per hour or less, their recommended minimum brightness during daytime conditions for side views is 500 candelas per lamp (cd/lamp) and for direct views is 4000 cd/lamp.[2] At similar speeds, their recommendations for nighttime conditions for side views is at least 150 cd/lamp and for direct views is 1200 cd/lamp to ensure clear visibility and improve driver response.[2]

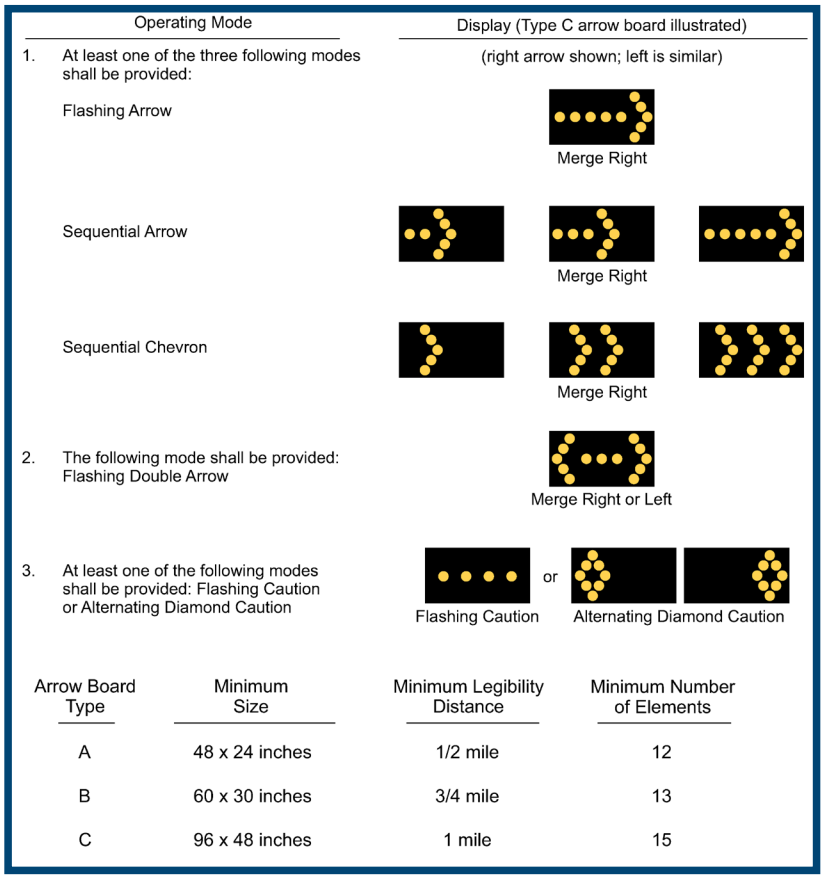
The angle of the arrow board also affects its visibility. "Most units have a sighting instrument on an arrow board for proper vertical and lateral alignment," Gasaway pointed out. He continued, "On an arrow board trailer, there typically is an instructional tag that says 'Use sighting device to ensure the sign panel is aimed directly toward oncoming traffic.'" The arrow board should be slightly aimed toward the roadway to maximize visibility (see MUTCD).

Regarding the placement of arrow boards, Gasaway said, "Arrow board placement specifications are based on driver perception and reaction time." In other words, the effectiveness of arrow boards depends on sign placement and speed along the roadway.

Typically, arrow boards are placed at the beginning of a merging taper and, if space permits, in sequences leading up to the lane closure. Spacing for sequences can be anywhere from 100 to 1,400 feet or more depending on road type (e.g., urban with low or high speeds, rural, or freeway or expressway) and proximity of the sign to the closure. "If you have a side road or commercial driveway, you might need to adjust spacings," said Gasaway. "Space signs closer or placed before and after that access point." Interestingly, MDOT incorporates a fourth sequence–"Be prepared to stop"–to enhance flagger traffic control and provide drivers with a more comprehensive warning system.

In terms of speed, lower-speed urban streets require smaller 48-by-24-inch arrow board signs with a half-mile legibility distance while higher-speed, higher-volume roadways require larger 96-by-48-inch signs with up to one mile of legibility.

Additionally, research at the University of Kansas found that using "dancing diamonds" caution displays, an alternative to the standard flashing lights, reduced mean speeds by 2 miles per hour compared to the standard bar or four corner flashing light caution display.[2] Drivers also rated it as the best method for promoting safe driving in a survey.



Arrow Board Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	48 x 24 inches	1/2 mile	12
B	60 x 30 inches	3/4 mile	13
C	96 x 48 inches	1 mile	15

Advanced warning arrow display board specifications from the MUTCD Section 6L (2023)

Using Arrow Board Correctly

Arrow boards are an effective and critical device for traffic control. When implemented correctly with consideration for brightness, alignment, and visibility, they can help raise driver awareness and lead to safer driving in work zones and incident areas.

Gasaway offers work zone traffic control and safety training on a limited basis (contact brucewg74@gmail.com). Trainings are also offered through the International Municipal Signal Association (IMSA; see https://www.imsasafety.org) and American Traffic Safety Services Association (ATSSA; see https://www.atssa.com). For additional resources on worker protection in work zones, visit ATSSA, https://www.atssa.com/resource/worker-protection-toolkit/ and, for guides and safe driving in work zones, visit the National Work Zone Safety Awareness Week, https://www.nwzaw.org/participate.html. ■

RESOURCES

The Federal Highway Administration's 2023 edition of the Manual of Uniform Traffic Control Devices is available at https://mutcd.fhwa.dot.gov/index.htm. The current Michigan Manual of Uniform Traffic Control Devices is available at https://mdotjboss.state.mi.us/TSSD/getCategoryDocuments.htm?categoryPrjNumbers=1403854,1403855&category=MMUTCD.

The Michigan Department of Transportation also has the Maintenance Work Zone Traffic Control Guidelines, which includes guidelines for arrow boards' taper length and placement on hills and curves. Available: https://www.michigan.gov/-/media/Project/Websites/MDOT/Business/Work-Zone-Mobility/Maintenance-Work-Zone-Traffic-Control-Guidelines.pdf.

1. Michigan State Police. 2023 Statewide Traffic Crash Data Year End Report. Traffic Crash Reporting System. 2023. Available: https://www.michigan.gov/msp/-/media/Project/Websites/msp/CJIC---Annual-Traffic-Crash-Report-Year-End-2023.pdf
2. Schrock, Steven D.; See, Chen Fei; and Mulinazzi, Thomas E. Public Opinion and Understanding of Advance Warning Arrow Displays Used in Short-Term, Mobile, and Moving Work Zones. Report No. 45110-1. The University of Kansas, Lawrence, Kansas. 2008. Available: https://rosap.ntl.bts.gov/view/dot/23508/dot_23508_DS1.pdf

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Balancing Engagement and Management in Social Media Commenting

Allison Szlachta, *Technical Writing Intern*
Emily Bergman, *Technical Writing Intern*
Center for Technology & Training

In today's digital age, effective communication is crucial for local road-owning agencies seeking to engage with the public. Social media offers a powerful platform to share real-time information, improve transparency, and foster community trust. By leveraging social media best practices, local road-owning agencies can enhance their public outreach, provide timely updates on road conditions, construction projects, and emergency situations, and gather valuable feedback from residents.

According to Dustin Earley, APR, deputy director of Engagement at the County Road Association of Michigan, social media is "designed to facilitate two-way communication and designed for you to keep your finger on the pulse of what's going on in a community". Thus, social media's commenting feature is an important way of not only enhancing outreach to and communication with the motoring public but also gaining valuable insights into public needs and preferences.

The Commenting Decision

A review of Michigan local road-owning agencies' social media channels shows that many agencies don't

respond to public comments or disable commenting altogether. While there may be many reasons for this, one factor contributing to the decision to leave comments off or unanswered may be lack of time. In fact, research done by the Minnesota Local Roads Research Board found that limited staff time was one of the biggest social media challenges for local agencies. Earley acknowledged, "Finding time to devote to running a social media account can be really hard since everyone's workday at local agencies is already full with their own jobs." He continued, " To take the limited resources local agencies have and then find a way to shoehorn in social media is really tough."

At Van Buren County Road Commission (CRC), the time commitment for handling social media comments pays off. "Responding to comments can be time consuming, especially if the comment section spirals," said Alyssa McAndrew, communications and project clerk at Van Buren County Road Commission. "As a road agency, we want to be transparent and open in receiving and giving feedback to our community in using social media," she shared. "We want to give the public the opportunity to voice whatever it is they feel."

Whether it's acknowledging compliments, addressing complaints, or answering inquiries, responding to comments demonstrates that your agency is listening and cares about the needs of its constituents. "There is a positive return on investment for the time local agencies can put into social media," noted Earley. Leaving comments open and actively responding can foster a sense of transparency, build community trust, and ultimately improve citizen satisfaction.

Managing Negative Comments

When using social media in a way that engages followers through commenting, one of the issues that arises is how to respond to negative comments. While responding to negative comments may seem daunting, these comments actually offer a valuable opportunity to improve public relations and infrastructure. Earley shared, "If somebody is being critical but they have some valid points or real questions on social media, then responding to comments is a great way to say 'We hear you, we understand what you're asking, here's some explanation' or 'Here's an answer to that' and to help inform that person."

Negative comments can be separated into three categories—legitimate concerns or disagreements, dissatisfaction, and hostile comments. The type of comment determines the best way to respond.

When individuals have legitimate concerns or disagreements about local agency operations like traffic safety concerns or road closure questions, these comments should be acknowledged quickly and resolved to the best of the agency's ability. Earley emphasized, "Correcting that misinformation is important; calmly, politely, and professionally state the facts."

That's what McAndrew does. For example, she shared, "Last week, we had a comment: 'So, you aren't going to come plow until the afternoon?'" McAndrew looked on the GPS and responded with the times that each of the roads affecting the woman's commute were or would be plowed. "The commenter responded, 'All those were before I was awake, so thanks'," McAndrew continued.

"Try to be informative without backing yourself into a corner or throwing anyone under the bus," reflected McAndrew. Earley emphasized that "giving the facts, explaining the facts or why something

might be occurring goes a long way toward building trust and goodwill within a community".

When negative comments are legitimate concerns or disagreements, they not only highlight areas where additional communication is needed but they also often contain insights that can help an agency improve services. In cases where Van Buren CRC's social media sites get comments about concerns that are appropriate for the agency's service request system, McAndrew enters the concern into the system and responds with "Great suggestion! I'll put it in for future evaluation. Keep an eye on our website". She says that that acknowledges the commenter and helps alleviate their concern.

Yet, McAndrew pointed out, "It's never really a one-size-fits-all when it comes to responding; but, it is just try to limit the misinformation without making people feel bad."

With comments of dissatisfaction like complaints about road construction delays or detour routes, it may be more complicated. In these situations, clear explanations and transparency are key. Earley said, "If they are frustrated, put yourself in their shoes, and empathize with them." Providing context about why certain decisions are made, such as road maintenance schedules or safety improvements, can help the public understand the bigger picture.

Nonetheless, McAndrew shared, "We have a few regulars that love sitting and waiting for negative comments so that they can hop in and start dogpiling negativity on us. I find it's best to try and just respond to everybody, and it eliminates some of that negative situation."

However, some comments may not warrant a response. Citizens have the right to speak their minds and sometimes it is best to let them do so without response if they are not asking a particular question or communicating misinformation. An example is hostile comments. "I think it is a common misconception that you have to respond to every single comment," Earley points out. "Don't engage if somebody is being hypercritical and rude, being inappropriate," he continued. "If they were at a public board meeting, you wouldn't engage with that person, so why do it on social media?" While a hostile comment does not warrant a response, it should not be taken down unless there is language or sentiment that violates agency social media policy. "We very much want to give the public the opportunity to voice whatever it is they feel, obviously within reason but, if it's threatening, vulgar, or goes against Facebook community guidelines, it gets hidden, removed, or we end up blocking somebody," explained McAndrew. "It's a very rare occurrence if that happens."

If it is felt that a response is warranted, a respectful, calm response—offering a solution or inviting further discussion offline—can de-escalate tension and demonstrate professionalism.

Strategies to Simplify Social Media

Despite the challenges of integrating social media into a local road-owning agency's work flow, agencies can benefit from using social media channels by adopting a proactive approach that streamlines the posting process and avoids stress related to social media posting. Earley suggests road commissions put policies in place to run social media accounts effectively. One option is to create a content calendar that outlines key updates, such as routine road maintenance or seasonal construction, so that posts are pre-planned and ready to go. For example, Van Buren CRC uses Facebook "to let people know of their operations"

but also "to keep engagement", according to McAndrew, who schedules historic images to go out on their "Throwback Thursdays" and fun posts for "Sunday Fun Day".

Agencies can also designate a specific team member to manage social media as part of their job description. McAndrew is the sole content manager for the Van Buren CRC social media. For McAndrew, allocating 30 minutes a day to managing Van Buren CRC's social media comments is what puts a face to the agency. "I think we get a lot of people that feel it's a faceless void until we respond to them, so it kind of humanizes us a little bit and gives us a personality at times," she said.

"But, things can get a little out of hand in the comment section during the weekends or if I'm on vacation," she shared. "My boss and our receptionist have the login information as well, and they're both able to step in when I'm gone."

By organizing and simplifying the process and allocating 30 minutes a day to managing comments, agencies can stay engaged with the public without feeling overburdened.

From Enemies to Advocates

As the world becomes increasingly digitized, more people are relying on social media as their primary source of information. Social media is an incredibly effective, free tool that can be used to engage and effectively inform the local community. "It's important to put information out there and create awareness on platforms where people already are," says McAndrew. "Awareness of what we are doing at the road commission is the number one goal we hope to achieve." Earley added, "Social media and comments is one great way to turn an enemy into an advocate by providing some explanation and context that helps inform that person." Being transparent and willing to engage with the local community in a digital forum that more people are using can increase agency awareness and community satisfaction. ■

RESOURCES

In 2022, the Minnesota Local Roads Research Board published a guidebook on social media for local transportation agency professionals. The 20 social media tips are grouped by an agency's goals, like getting started, building an audience, or being successful in social media. Find "20 Tips to Up Your Agency's Social Media Game", published by the Minnesota Department of Transportation, at https://mdl.mndot.gov/items/202215.

Photo: Shutterstock

Cybersecurity for Local Agencies

Emily Bergman, *Technical Writing Intern*
Victoria Kaplewski, *Technical Writer*
Michigan Technological University

In this five-part series, we will explore strategies that local road-owning agencies can use to be more cybersecure.

Previously-covered Strategies:
1. Rely on Trusted Resources
2. Protect Passwords

STRATEGY 3: Back Up Data

"Local agencies, like other industries or businesses, can be lucrative targets for attackers to go after because their data is valuable and attackers may think they have a better chance of being paid a ransom," shared Ingrid Sandberg, research engineer at the Center for Technology & Training (CTT). "That is part of the reason why having backups for your data is really important," she added.

Data backup ensures that local agencies will have their critical information available in the event of cybersecurity threats like ransomware attacks, or other unforeseen circumstances.

Ransomware is a type of malware used in cybersecurity attacks in order to hold data or devices hostage. Once this type of malware has been introduced to a system, individuals lose access to their data or device and those who initiated the attack demand a ransom be paid in order for access to be granted again. Oftentimes, ransomware infects a system through links in phishing attempts, or from websites that are

not secure. If data is backed up and secure, it is less likely that ransomware attacks will result in the loss of data because it is being stored in multiple locations.

There are two easy ways to backup data—syncing it to the cloud or traditional backups such as an external hard drive and flash drives. "For hard drive backups, somebody should take it to another location but, even if you don't take it off premises, it should go into a fireproof safe or something like that," explained Sandberg. "There has to be some additional level of protection."

It is also important for local road-owning agencies to consider the technology that they use in the field when performing backups. Typically, laptops and tablets used for field data collection may contain the only copy of data that took significant effort to obtain. Sandberg points out that oftentimes "there is no backup to that data because that laptop isn't connected to the network [since] it's in the field all the time".

Data isn't always lost due to outside threats. Sometimes, it can be as simple as a spilled cup of coffee on a laptop that hasn't had proper backups and "years worth of data can just get destroyed in a second", Sandberg stresses.

If data is backed up correctly, local road-owning agencies can save time and money by being able to access their data without the need to pay a ransom or to recreate data that has been lost due to other unforeseen circumstances.

To learn more about how to backup your data visit: https://security.berkeley.edu/education-awareness/backing-your-data. ■

Photo: Shutterstock

Road Conductor[SM] Release

Allison Szlachta, *Technical Writing Intern*
Center for Technology & Training

When a local road-owning agency conducts a project on their road network, there can be more than 150,000 pay item codes, each detailing a different item of work. Keeping these pay item codes straight and ensuring contractors are paid correctly is a big task even on small road projects. Starting in 2025, a new web-based application will help road-owning agencies keep track of pay item codes for locally let road projects: Road Conductor[SM]. Road Conductor[SM] will be available from the County Road Association (CRA) of Michigan in the summer of 2025 (see https://micountyroads.org and https://roadconductor.com for more information).

"The core purpose of Road Conductor[SM] is to provide job management for local agencies' locally let projects," explained Nick Koszykowski, senior project manager at the Center for Technology & Training where the application was developed. "It's about making their jobs easier." It was built specifically for agencies in Michigan to use for their local jobs.

User-driven Development

The driving force behind the development of this new application was the CRA of Michigan. They were also responsible for acquiring funding for the development of the software.

In 2022, a steering committee was formed to represent all potential users and their unique needs. This committee consisted of local agencies, consultants, contractors, and various representatives from counties, cities and the American Council of Engineering Companies of Michigan (ACEC). They accounted for a wide variety of positions from rural and urban parts of the state, and they worked together to determine the application's goals and requirements.

Subscription-based Software

To ensure ongoing improvements and access, the application was designed with a funding model that supports its long-term viability. It's an annual, subscription-based license that local agencies can purchase through the CRA of Michigan. This license fee will go towards application support and any future development.

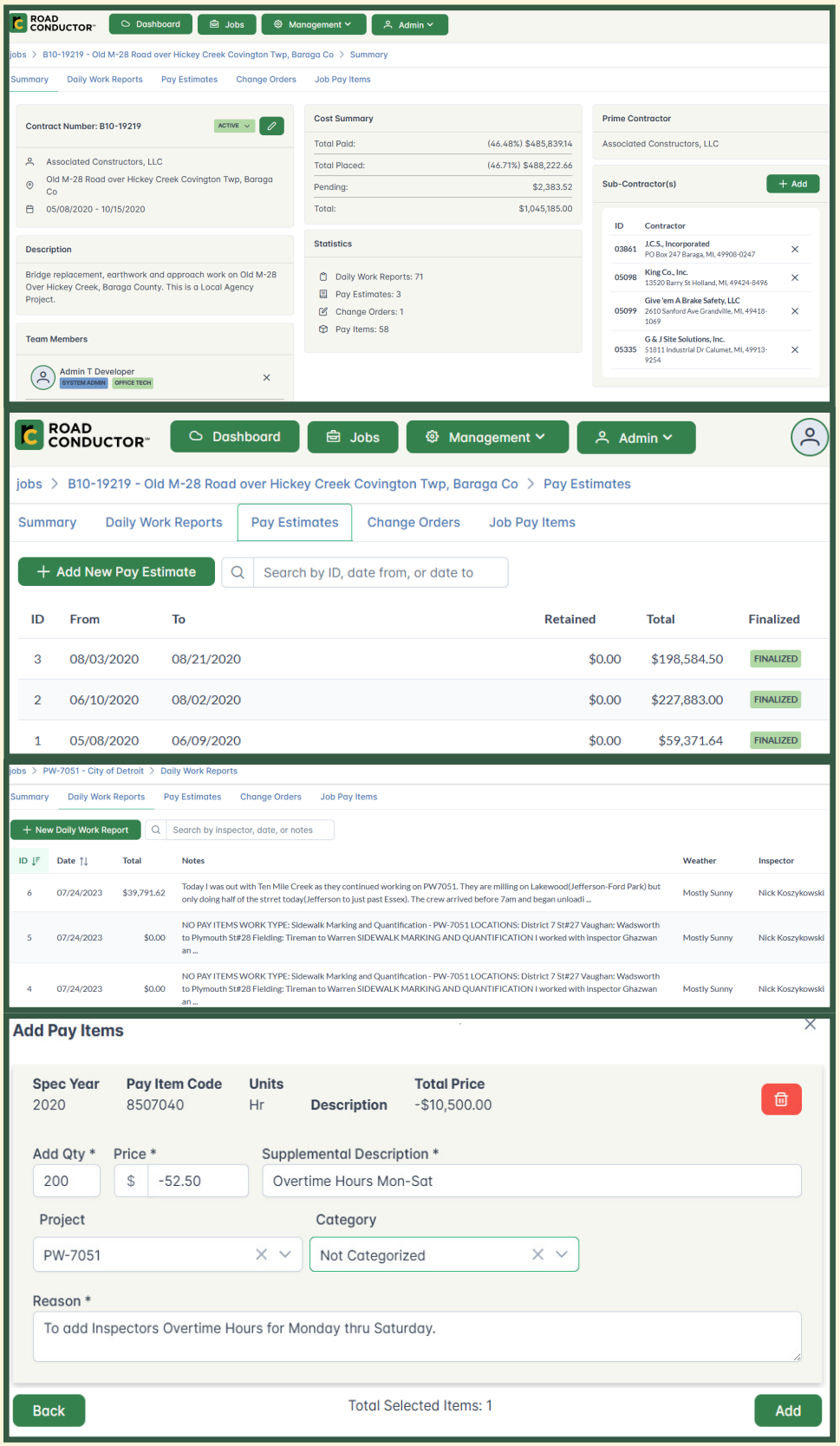
Web-based Application

Road Conductor[SM] is a web-based application; that means, the database and site are all hosted in Microsoft's Azure Cloud. Unlike desktop software or other similar tools, there's no installation required. Anyone with an account can run it through an internet browser regardless of where they are–at home on a tablet, in the office on a desktop, or in the field on a phone.

The most significant benefit in having a web-based application rather than a cloud-based one is the ease of updates and fixes. "Fixes and updates take a while before you can actually put together a release with a desktop application," Koszykowski pointed out. "Software developers have to build an installer, run tests, make sure the fix doesn't break, and then send it out to users who have to install the update on their machines." However, with Road Conductor[SM], he says changes can be made in a development environment and pushed to production almost instantly. Beyond accessibility and ease of updates, Road Conductor[SM]'s design prioritizes adaptability to meet the varying project management needs of Michigan road-owning agencies.

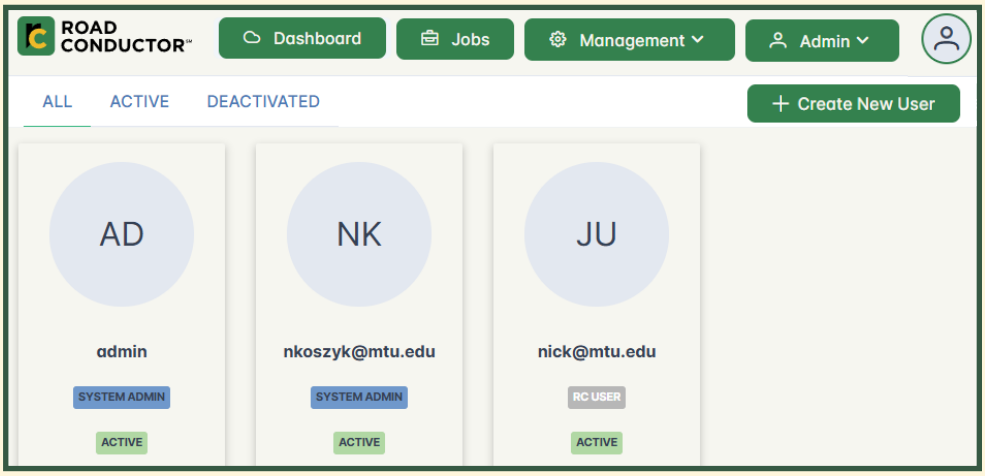
Customizable Tool

Since every county has different management requirements and needs depending on the type and size of the project, Road ConductorSM was developed to be a customizable user experience rather than one-size-fits-all application. The main goal of Road Conductor[SM] is to give local agencies and consultants the ability to customize the requirements based on the project. "This application is suited for everything from a very small culvert replacement, to a crack seal, to a large, federal-aid-style project," said Koszykowski. Any job, regardless of complexity, can be run using Road Conductor[SM]. Koszykowski, along with everyone involved in the development of Road Conductor[SM], understands there isn't a "one-size-fits-all" when it comes to project management. Koszykowski explained, "Baraga and Oakland counties have different requirements and needs based on the size of their jobs." He continued, "A crack seal won't have as many components as a several-mile-long road and bridge project, so we wanted to give agencies the ability to customize the requirements." If agencies want to manage a job as if it's a federal-aid project, they can set their requirements that way in Road Conductor[SM]. Smaller-scale projects can also be tracked in the application as well.



Screenshots of Road Conductor℠: first (top) – job summary, second – pay estimates, third – daily work report, fourth (bottom) – add new pay estimates

An additional element that enhances customization is the ability to designate specific roles within Road Conductor℠ to different employees. The available roles include an inspector, office staff, project engineer, and IT personnel, each with distinct responsibilities and access levels. Oftentimes, local-agency employees wear multiple hats, handling a variety of responsibilities. Any of these roles within the site can be assigned individually or combined as needed, allowing agencies to tailor permissions and functionalities to best suit operations and employee functions.



Screenshot of user roles in Road Conductor℠

Supporting Michigan's Project Management Needs

Designed specifically with Michigan in mind, Road Conductor℠ will be a reliable and efficient tool, incorporating feedback from those who will use it most.

Visit RoadConductor.com for more information and to sign up for occasional news alerts. ■

CTT's Newest Staff: Meet Lori and Daryl

Nate Anderson, *Technical Writing Intern*
Allison Szlachta, *Technical Writing Intern*
Center for Technology & Training

Business & Training Support Specialist: Lori Krings

Lori Krings is the Center for Technology & Training's (CTT) newest business and training support specialist. She joined the CTT in July 2024.

After earning bachelor's and master's degrees in social work, Lori began her 30-year career as a sex offender group therapist. She dedicated 15 of those years to work in human factors engineering, focusing on people-drive process improvements or the human element in technical systems.

After 15 years, Lori co-founded a maintenance and reliability consulting firm with her husband, a mechanical engineer. "I brought a unique focus to the firm—the human side of operational performance," she explained. Recognizing that lasting improvement goes beyond tools and technology, Lori worked to align people, processes, and behavior. She shared, "I was able to engage human factors as a critical driver of sustainable reliability."

Most recently, Lori and her husband moved back to the Keweenaw. "I lived in the UP since I was in second grade," shared Lori. "But, I had this idea in my mind when I graduated and moved away, that other places outside of Houghton would be as nice and as enjoyable." Over time, Lori came to realize that wasn't the case. Reflecting on the decision to return to the Upper Peninsula, she explained, "It felt like coming back home to me and to my husband, who's from northern Minnesota."

As a business and training support specialist for the CTT, Lori provides training that enhances col-

laboration and brings new perspectives to the team. “I’ve been trained in and applying the Social Style® model since the start of my career, and I’ve consistently seen its impact—especially when teaching topics like Managing Difficult Situations or People Skills for the CTT,” she said, explaining that only certified facilitators can teach the model. “It opens the door to our attendees finally having a system that explains people problems they can’t seem to fix, and it offers practical ways to get them better results.” Lori continued, “I hope it’s one of those tools they didn’t know they needed—but won’t want to be without again.”

Outside of work, Lori enjoys hiking and exploring new places. “I do enjoy the trail that runs from campus to Chassell,” she said. Recently, Lori has been enjoying hikes along the Lake Superior shoreline. “There’s this giant tree that washed up on the beach,” she shared. “I always wonder- what’s beyond that? And then it’s endless, right? You just keep going.”

That sense of curiosity and drive to explore is something Lori brings with her to the CTT every day as she seeks solutions for CTT staff and the agencies that the CTT serves.

Senior Research Engineer: Daryl Gotham

Daryl Gotham is the Center for Technology & Training’s (CTT) newest senior research engineer. He joined the CTT in May 2024.

While Daryl grew up in Saginaw, Michigan, he went to Michigan Technological University for his undergraduate degree in environmental engineering. He was always intrigued by the outdoors and was excited by the opportunity to work outside.

His 30-year career began in environmental consulting. Daryl shared, “I spent about six years with an environmental consulting firm doing soil and groundwater investigations, and then went to work for the state Department of Environmental Quality.” Later, he became the director of the Department of Public Services in Saginaw Charter Township, overseeing people who work in the water distribution and wastewater collection system. The opportunity allowed him to serve his hometown in a critical and vital role

within the public sector.

Since his undergraduate studies, Daryl felt a special connection to the Upper Peninsula and the Keweenaw, where he now resides. “I tell people that if I could have found a job up here I never would have left,” he said. “It’s been a special place for me and my family.” Daryl’s oldest son just completed his second year at Michigan Tech, and his youngest son is about to start at Michigan Tech in the fall.

At the CTT, Daryl has been involved in several key projects of the center’s Great Lakes Environmental Infrastructure Center (see gleic.org). Those projects include EPA-funded training initiatives focused on small water systems and hydraulics. “We provide training, not just to folks in our region, but people throughout the country,” he explained. One of the biggest challenges, he says, is providing training to people across the nation while being based in Houghton. Underscoring the far-reaching impact and expanse of the CTT’s work, Daryl added, “We’re here and we have to be someplace else... there’s a possibility that we’ll be going to New York, Arkansas, and New Mexico.” Additionally, Daryl has been able to accept technical consulting requests in areas like drinking water treatment.

Outside of work, Daryl enjoys spending his time in nature through activities like mountain biking, fishing, and hunting. These hobbies reflect his deep appreciation for the outdoors and the environment in Michigan. ■

Advancing Your Career with Certificate Programs

Victoria Kaplewski, *Technical Writer*
Emily Bergman, *Technical Writing Intern*
Center for Technology & Training

Navigating the demands of modern road and bridge management requires staying up-to-date with the latest skills and knowledge, but not everyone has the time or resources to commit to a master's degree. For employees of local road-owning agencies, online graduate certificate programs in civil and environmental engineering offer an accessible, flexible, and cost-effective alternative for professional development. For example, pursuing a graduate certificate can typically be done online with on-demand classes while still working at the road agency. Also, graduate certificate programs are more focused on real-world, practical knowledge in a specific area, which means employees can apply what they learn directly to their day-to-day tasks at work.

Graduate certificates are offered by a degree-granting institutions and, in many cases, some or all of the coursework for certificate programs can be counted toward a master's degree. They offer many of the benefits of higher education without the risks associated with full-time post-secondary education.

In Michigan, graduate certificate programs that may benefit local road-owning agency employees include:

Michigan Technological University has certificates in advanced structural engineering analysis, bridge analysis and design, and sustainable pavement design and construction. These certificates require nine credit hours and the first two can be completed online. Plus, the certificates can be stacked together to create a customizable master's degree in civil engineering, which is offered in an online format as well. See https://www.mtu.edu/gradschool/programs/certificates/?tags=grad-cert and https://www.mtu.edu/globalcampus/degrees/graduate/civil-engineering/.

The **University of Michigan**'s (U of M) Department of Civil and Environmental Engineering offers an online certificate in construction engineering and management through Michigan Engineering Online and Professional Education. Enrollees must complete six courses in no more than nine months. Up to six credits can be applied toward a master's degree in Construction Engineering and Management at U of M. See https://cee.engin.umich.edu/2024/12/18/relaunched-cem-certificate-now-available-on-michigan-engineering-online-professional-education/.

Michigan State University does not offer a certificate program in civil engineering, but it does have an entirely online master's degree in civil engineering. See https://online.msu.edu/programs.

Other notable programs include:

University of Illinois Urbana-Champaign has an online certificate programs in AI + civil engineering, construction modeling and robotics, general construction management, underground engineering, pavement science and engineering, urban mobility systems, and vehicular and traffic operations. The

programs require 12 credit hours, or three to four courses, that can later be applied to a master's degree. See https://cee.illinois.edu/academics/graduate-programs/cee-online/cee-online-certificate-program.

Johns Hopkins University offers online graduate certificates in civil engineering and engineering management and a post-master's certificate in environmental engineering and science. Each certificate requires completion of 4 or 5 courses, which can be applied toward a master's degree. See https://ep.jhu.edu/degree-certificates-courses/certificates/.

The **University of Stanford** has an online civil and environmental engineering graduate certificate. Enrollees must complete four graduate courses, requiring about 15 to 20 hours per week. See https://online.stanford.edu/programs/civil-and-environmental-engineering-graduate-certificate-general-track.

Aside from graduate certificates, professional organizations and societies sometimes offer professional certificates. These non-academic credentials generally require a test that demonstrates knowledge or skill in a particular area.

For example, the **American Society for Civil Engineering** has professional certificate programs that include construction engineering and geographic information systems for asset management. The certificates require completion of five courses, each containing between 3 and 24 hours worth of content. While the courses don't count toward a master's degree, they can be listed on a resume. See https://www.asce.org/education-and-events/explore-education/certificate-programs/. ■


Photo: Shutterstock

Could Salt-loving Plants Catch Roadside Salt Runoff?

Sophie Koch, *Contributing Writer, University of Minnesota Center for Transportation Studies*
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One of the biggest problems with roadside salt runoff is that it is nearly impossible to extract from the water table once it's there. Halophytes—plants that tolerate or even thrive in salty conditions—might be a way to mitigate salt near its source.

As part of her master's thesis, lab and research specialist Andrea Renshaw from the Virginia Polytechnic Institute and State University studied the possibility of utilizing halophytes as a means of capturing salt runoff along roadsides.

Roadside salt, Renshaw says, is incredibly detrimental to plant and soil health. It kills plants—not just above ground, but also the root networks that promote soil stability underground—and it makes soil more likely to wash away or compact through a process called dispersion. It also makes toxic metals more bio-available to plants and animals, and it can render drinking water dangerously salty.

"Trying to find a way to stop that salt from hitting the water table in the first place is kind of a priority right now, which is where halophytes come in," Renshaw says.

Potential Halophyte Families

Selecting effective halophyte species is very regionally specific, Renshaw says, but some general plant families that have a lot of potential as roadside salt mitigators include:

- Acanthaceae
- Aizoaceae
- Asteraceae
- Brassicceae
- Caryophalles
- Chenopodioideae
- Cyperaceae
- Oxalidaceae
- Plumbaginaceae
- Poaceae
- Rosid
- Tamariceae

How Halophytes Work

Halophytes fall into three main categories: salt excluders, salt excreters, and salt accumulators.

Accumulators are generally the most useful, Renshaw says, because they are capable of absorbing salt through their roots and storing it in their tissues—sometimes as much as 20 percent of the plant's dry weight.

"Once the salt's been accumulated up into the biomass, what's cool about the accumulators is you can then harvest the aboveground biomass and physically pick some of that up and move it somewhere else," Renshaw says.

Excreters, by contrast, do not store salt—instead, they excrete it onto their leaves, whereupon the wind can disperse the salt crystals. This has its own uses, Renshaw says—excreters can be planted close to the roadside as a way of dispersing salt over a wider area and making it easier for accumulators to uptake the salt without being overwhelmed.

Excluders are the least overtly useful when it comes to remediation, since their salt-tolerance strategy is to not absorb any salt at all. However, they can produce salt-hardy root networks that can stabilize soil and promote incidental beneficial species such as bacteria and fungi.

When selecting halophyte species, Renshaw broadly recommends factors that should be taken into account:

Low-maintenance plants that are perennial or self-seeding annuals are ideal for reducing labor needs.

Plants need to be winter- and drought-resistant, and they need to handle a wide range of salt concentrations.

A biodiverse blend of different species will generally establish faster and be more resilient than a monoculture.

Invasive species need to be avoided.

Renshaw also warns that halophytes have their limitations: They can only absorb salt as far down as their roots extend (about six inches), and it is difficult to find species that germinate early enough to catch the worst of the spring salt runoff. Halophyte ecosystems might also take two or three years before they become fully established and effective.

"You want to invest the time into it," Renshaw says.

Renshaw presented her findings as part of the 2023 Salt Symposium in August. The event was organized by Bolton & Menk. ■

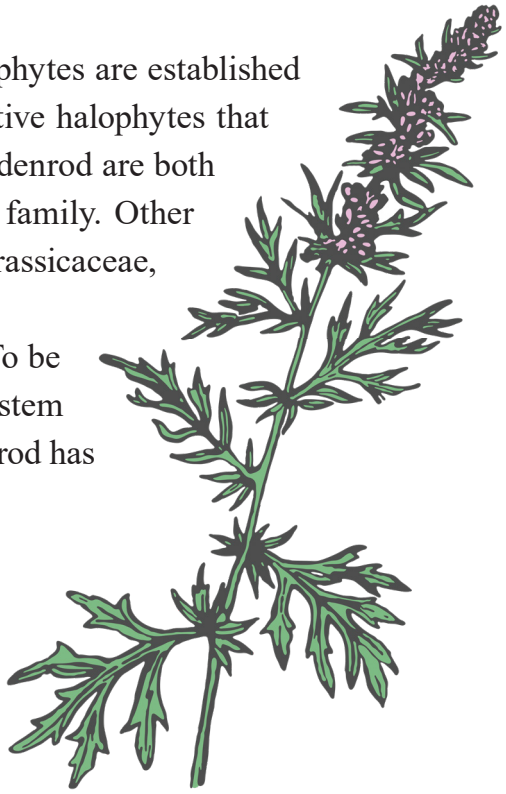
Common mugwort (Photo: Shutterstock)

Reprinted with permission from: Koch, Sophie. Could salt-loving plants catch roadside salt runoff? Minnesota LTAP Technology Exchange, v 31, n 4. University of Minnesota Center for Transportation Studies, December 2023. p4. Available: https://conservancy.umn.edu/server/api/core/bitstreams/038f7dc6-2627-4d28-9a92-8d5c4d46e1dd/content

Michigan's Halophytes

Emily Bergman, *Center for Technology & Training*

Michigan's harsh winters often necessitate extensive road salting to ensure safe travel. However, this practice can have detrimental effects on local ecosystems, including soil degradation, waterway contamination, and harm to vegetation. Although many halophytes have a difficult time surviving in Michigan due to the climate, there are certain species that may be able to survive, thrive, and help to mitigate the effects of road salting.



While it is rare to find halophytes native to Michigan, some halophytes are established in Michigan. Common mugwort and seaside goldenrod are non-native halophytes that grow in at least part of the state. Common mugwort and seaside goldenrod are both members of the Asteraceae family, otherwise known as the daisy family. Other potential halophyte families that could occur in Michigan include Brassicaceae, Caryophyllaceae, Chenopodioideae, Cyperaceae, and Poaceae.

Although they are non-native, they are not necessarily invasive. To be considered invasive species, the plant must cause harm to the ecosystem that it enters, a trait that neither common mugwort nor seaside goldenrod has shown in Michigan thus far.

Halophyte resilience to roadside salinity has also been studied in labs at the University of Michigan – Dearborn, specifically in urban southwest Michigan. Common mugwort (Artemisia vulgaris) and seaside goldenrod (Solidago sempervirens) were two of the halophytes that were identified and studied in Michigan. Both species were found to be able to accumulate salt. ■

Emily Bergman holds a bachelor's degree in Forestry and is currently pursuing a master's degree in Environmental and Energy Policy from Michigan Technological University.

Working Around Poisonous Plants

Emily Bergman, *Technical Writing Intern*
Center for Technology & Training

Maintaining roads involves more than just asphalt and signage. As local road-owning agencies try to ensure safe and efficient roadways, the presence of poisonous and harmful plants that can be found in the right-of-way poses unique challenges. Being able to identify these plants and understanding how to work safely around these plants is crucial for the well-being of both those working in or around the roadside and the communities they serve. What are the poisonous and harmful plants that are common in Michigan? And, what practical strategies and precautions can road maintenance workers take when working around them?

Giant hogweed (Photo: Shutterstock)

Giant Hogweed, Wild Parsnip, and Cow Parsnip

Giant hogweed (Heracleum mantegazzianum), wild parsnip (Pastinaca sativa), and cow parsnip (Heracleum maximum) all have sap that contains photosensitive chemicals, furanocoumarins, that can cause phytophotodermatitis. When the sap-tainted skin is exposed to sunlight, the affected skin area may experience similar symptoms to a severe sunburn, such as reddening and blistering. In severe cases, giant hogweed can cause permanent scarring and even blindness.

Although giant hogweed is not common in Michigan, it is still present. Giant hogweed can be identified by its height, which reaches 6 to 20 feet. Its stem is green and purple with coarse hairs that are easily visible. Its flower is white and can be confused with cow parsnip. However, cow parsnip only grows 4 to 10 feet, and its stem is green, fuzzy, and grooved.

Wild parsnip is easier to differentiate from the others due to its yellow-colored flowers. It also tends to be much smaller than the other species, only growing between 2 to 5 feet tall. It has green hairless stems that are grooved.

Cow parsnip (Photo: Shutterstock)

Safety Tips

When working around species that produce furanocoumarins, it is important to avoid touching the plants with bare skin or touching any equipment that could have sap on it. An easy way to keep sap off skin is to wear gloves, long-sleeved shirts, long pants, and eye protection. Washing equipment and any part of the body that has come in contact with the plants immediately after work can also

help. Sunscreen application is also important in order to prevent ultraviolet rays from reaching the skin.

Poison Hemlock

Poison hemlock (Conium maculatum) is another potentially harmful species that can be misidentified as giant hogweed or cow parsnip. This species stands 3 to 8 feet tall and has a purple-spotted, hairless stem. Poison hemlock has toxins that can seep through the skin. When these toxins are absorbed through the skin, ingested or inhaled in tiny amounts, they can cause severe reactions like dizziness, trembling, paralysis, and sometimes even death in humans and animals.

Poison hemlock (Photo: Shutterstock)

Safety Tips

The best strategy to prevent hemlock poisoning is avoiding contact with the plant, whether alive or dead, when possible. Even dead plants still contain the potentially-fatal toxins. When managing an area occupied by poison hemlock, it may help to wear clothing that covers the skin completely. Some sources also recommend wearing a respirator mask to prevent inhalation of any toxins. It is also important not to burn areas with poison hemlock as the fumes can be toxic.

Poison Ivy, Poison Oak, and Poison Sumac

Poison ivy (Toxicodendron radicans), poison oak (Toxicodendron pubescens), and poison sumac (Toxicodendron vernix) produce an oily resin called urushiol, which can cause redness, itching, swelling, blisters, and, in some cases, difficulty breathing.

These leafy plants can all be misidentified for each other as well as for other non-harmful plants. However, poison ivy will always have three leaves while poison oak typically has three leaves but can have up to seven. The leaves of a poison ivy plant have small toothed edges while poison oak leaves have deeper, more rounded lobes.

Both plants can display different colored leaves depending on the season. Poison ivy will start as red in the spring, green in the summer, and yellow/orange in the fall, while poison oak will start as green and stay that way until fall, when it may turn red.

Poison sumac is easier to tell apart as it has 7 to 13 leaves per stem and grows as a shrub or small tree. Its leaves are also pointed and have smooth edges.

Poison ivy, poison oak, and poison sumac (Photos: Shutterstock)

Safety Tips

When working around plants that produce urushiol, it is best to wear gloves, long sleeves, and long pants to avoid getting the oil on skin. After working at a site where these species are present, make sure to wash all equipment. If skin does come in contact with the oil, make sure to wash the area as soon as possible.

Ensuring Safety and Wellbeing

Road maintenance workers face unique challenges when dealing with poisonous and harmful plants like giant hogweed, wild parsnip, cow parsnip, poison hemlock, poison ivy, poison oak, and poison sumac. These plants can cause severe skin reactions, poisoning, or respiratory issues upon contact or ingestion. Understanding how to identify and safely manage encounters with these plants is crucial for ensuring the safety and well-being of both workers and the communities they serve. By implementing appropriate precautions such as wearing protective clothing, using gloves, and promptly washing exposed skin and equipment, road workers can mitigate risks and maintain safe working conditions in their efforts to maintain local roads. ■

Emily Bergman holds a bachelor's degree in Forestry and is currently pursuing a master's degree in Environmental and Energy Policy from Michigan Technological University.

Great Ideas—Where They Are Today
In Focus: A Tool for Connecting with the Public

Emily Bergman, *Technical Writing Intern*
Center for Technology & Training

In 2016, the Road Commission of Kalamazoo County (RCKC) submitted their "RCKC CONNECT" alert system to the Michigan LTAP Great Ideas Challenge. Although this Great Ideas entry did not place, RCKC still uses this tool today.

For RCKC, the RCKC Connect alert system was a solution that has been providing a better way to communicate with residents in Kalamazoo County about closed roads, detours, and other construction projects that could affect travel. "Communication is an ongoing issue, and we're always striving to do better with it", shared Sarah Phillips, RCKC's communications administrator.

Using the software platform Everbridge, RCKC created a mass notification alert system for the public, which they called "RCKC CONNECT". One of its biggest benefits is its ability to be used by people with different levels of access to technology. "Some people don't have text, and some people don't have email," Phillips explained. "With the RCKC CONNECT, we can text, phone call, email, or all the above."

During the construction season, RCKC uses their alert system almost daily to send out daily construction information, chip seal schedules, and road closure notifications to the public. "We don't always have a definitive schedule because it is dependent on so many factors, such as weather, so being able to send daily, timely updates on top of our weekly news project release is very helpful for our users," opined Phillips.

The alert system allows for individuals to opt into whichever the notifications they would like to receive. Selena Rider, administrative assistant for RCKC, detailed, "The nice part is they can choose just the township in which they live, multiple townships, only road closures information, or everything."

Because the idea was successful, over time the road commission added to the alert system. Now, the RCKC CONNECT has features specifically targeted toward their employees, emergency personnel, and the media. "So we have four different organizations on there now whereas we just started with one," noted Phillips. "We have liked it so much that we keep expanding it to use it for different things."

The features in place for employees allows for RCKC supervisors to call in employees en masse during after hours. This mass calling feature is beneficial for situations like emergency road clearing during winter storms when efficiency is key. Before this system was implemented, supervisors had to call each employee individually "so this is a more efficient system for the supervisors", says Phillips.

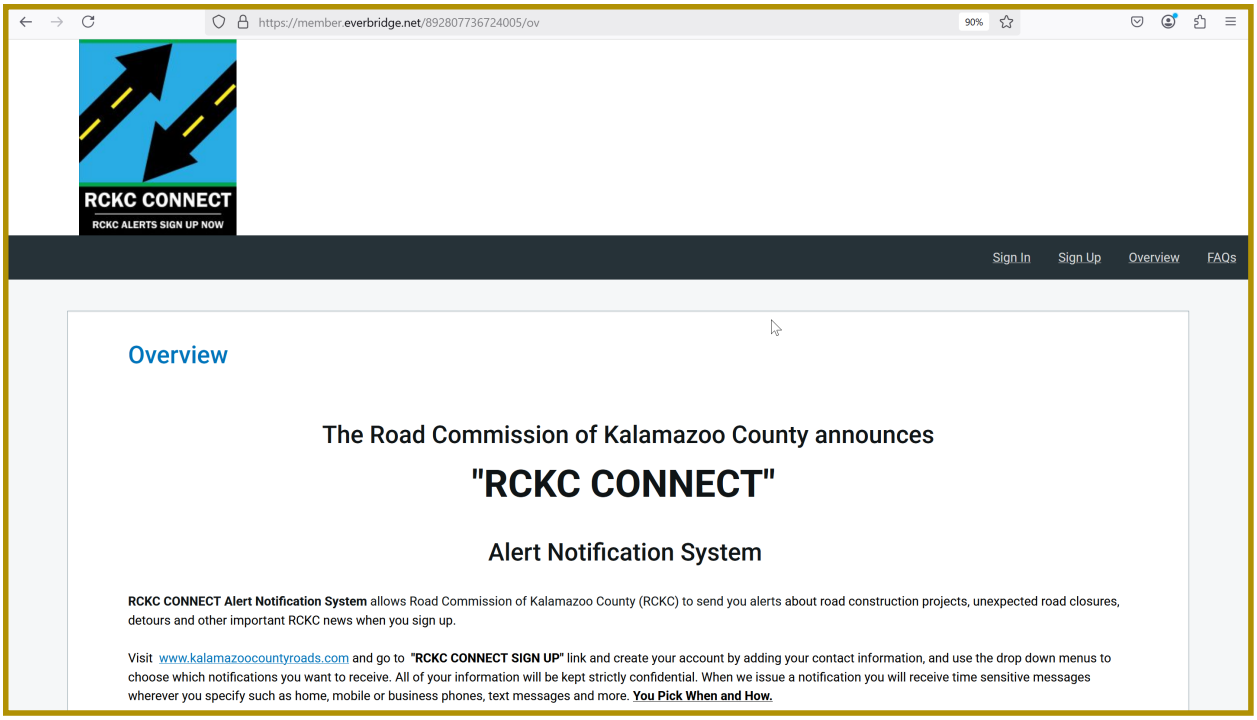
Features in place for emergency personnel allow RCKC to communicate with local fire, medical, and police personnel in a timely manner about road closures and other road situations that could affect emergency response.

For the media, the RCKC CONNECT now offers access to press releases.

Although there are not many challenges associated with RCKC CONNECT, Rider shared that "building it was the challenge" and that they had to work with Everbridge to implement some of RCKC CONNECT's features. She explained, "We added each different township, then we added on road closures, and then

we added on road construction, so it took a while." Once it was set up though, the only challenge was spreading the word to the public. Phillips added, "We just have to keep working on spreading that word but, otherwise, the system itself is very user friendly."

She continued, "Communication is something people are always asking for more of." She says, when people call the road commission and say they were unaware of road construction, she responds by prompting them to sign up for the RCKC CONNECT. "It's always the goal to keep getting better and better with communication, and RCKC CONNECT is just another tool that helps us do that." ■



Screenshot of RCKC CONNECT alert notification system Overview page

Michigan's Local Technical Assistance Program

Michigan's Local Technical Assistance Program (LTAP) serves state, county, and municipal transportation personnel. Its mission is to bridge the gap between research and practice through trainings, engineering technical assistance, and information on state-of-the-art technology in the construction and maintenance of roads, bridges, and other transportation infrastructure. For more information, visit michiganltap.org.

CENTER FOR TECHNOLOGY & TRAINING

The Center for Technology & Training (CTT) is housed 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 ctt.mtu.edu.

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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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