Three new tools from Clear Roads offer a path to improve winter maintenance operations and efficiency. Image courtesy of the Iowa Department of Transportation.

Tools to make better winter maintenance decisions

Free decision-making resources from Clear Roads help agencies optimize their wintertime operations

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While most agency resources seem to be shrinking, there is one thing that reliably grows year after year: the public's expectations. Especially when it comes to winter maintenance.

Despite this, doing more with less has become standard practice for public transportation agencies across the country. Limited budgets are a perennial challenge, but in recent years staffing shortages and supply chain issues have compounded the more usual constraints.

"Our work hasn't really changed over the years," says Craig Bargfrede, winter operations administrator for Iowa DOT. "We get about the same amount of snow as we always have, and the winter season lasts about as long. But we are getting more questions about our reasoning and why we make the choices that we do."

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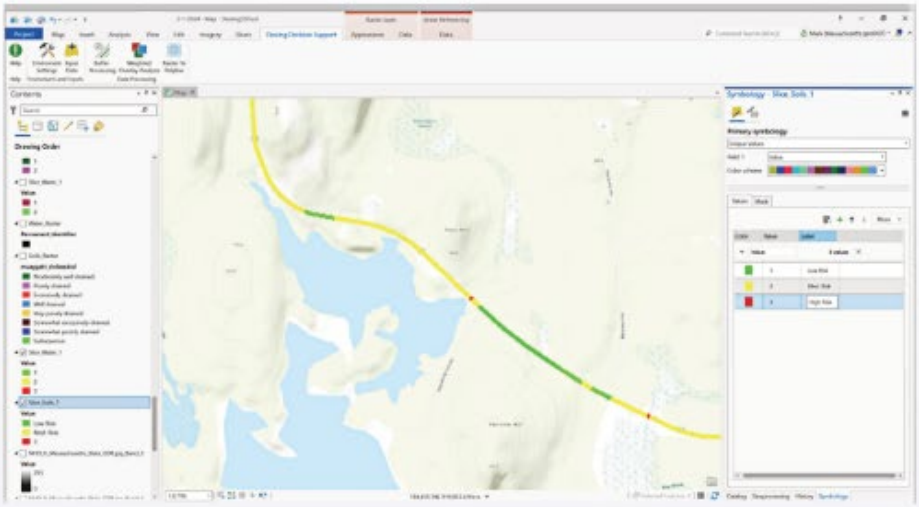
In the high-stakes—and highly visible—world of winter maintenance, decision-making tools can provide some much-needed relief. Three new free tools from the Clear Roads winter maintenance research pooled fund (clearroads.org), a consortium of 39 member agencies, aim to alleviate some of the decision-making workload and improve maintenance operations and efficiency for state and local transportation agencies of all sizes.

"This job is all about balance," says Kevin Hensley, public works director for the City of Grimes, Iowa and APWA's liaison to Clear Roads. "We have to weigh the pros, cons, and costs of every operational decision we make. At the same time, public perception is something that we are always cognizant of. Being able to show that we made decisions based on data can be incredibly valuable."

A tool to identify chloride-sensitive roadways

Sodium chloride is commonly used by transportation agencies



Leveraging topographic and other data to produce interactive maps can help decision-makers see areas that are more sensitive to chloride deicers. Image courtesy of Clear Roads.

because it's inexpensive and effective against ice and snow. But it's also corrosive and harsh and can damage ecologically sensitive areas. As agencies strive to balance mobility with environmental impacts, understanding local topography and which areas are most vulnerable to salt contamination is critical to deciding whether and how to adjust deicer applications. To give maintenance managers a more complete picture, Clear Roads developed a geospatial tool that any agency can use to visualize sensitive locations in real time.

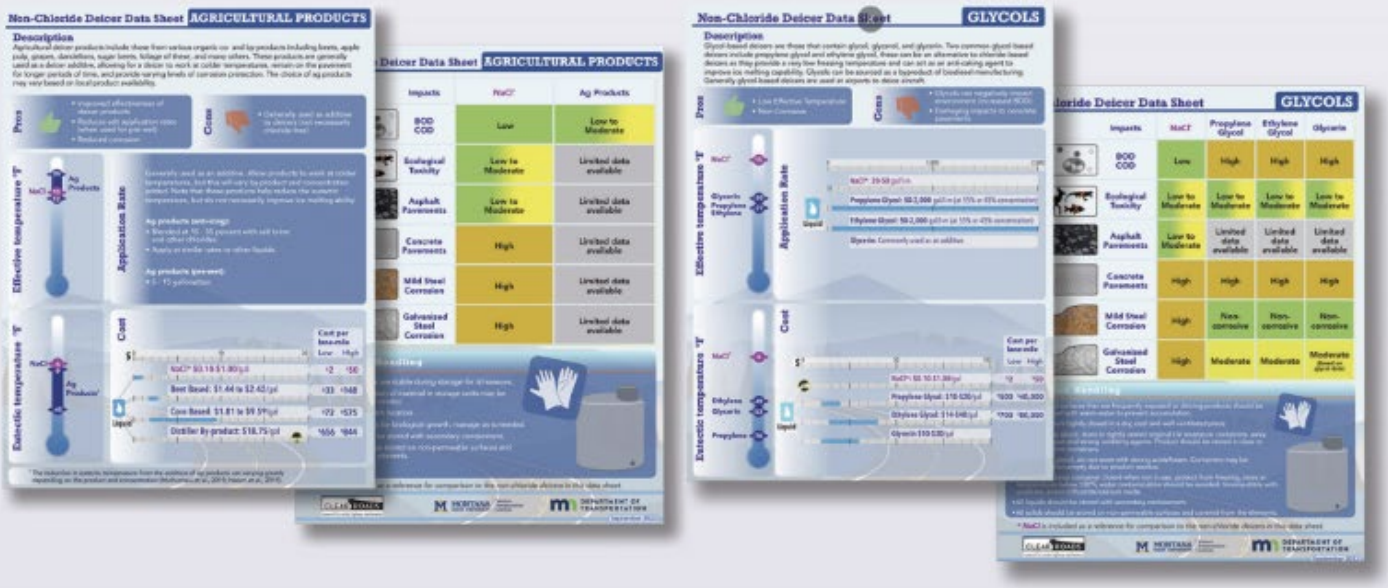
The project's co-champion, Mark Goldstein, worked in Massachusetts DOT's Environmental Services Department before becoming the agency's lead statewide snow and ice engineer. He says factors like soil type, drainage, and land use all affect how chlorides are absorbed into the local environment but aren't always considered as part of a winter maintenance plan.

"A lot of the time, it's obvious when a snowplow route is close to water," he says. "But culverts and other geographical features might be harder to see. This tool uses elevation data and other information to show how the salt that's put down will travel, drawing the user's attention to places that could benefit from a different treatment."

A tool to compare deicer alternatives

With greater societal emphasis on environmental preservation in recent years, interest in non-chloride alternatives has surged, and the list of deicing products available on the market has grown exponentially. In his role as operations manager for the Montana Department of Transportation, Doug McBroom is often asked to consider using these other options in place of salt on the state's roads.

To learn more, McBroom co-championed a Clear Roads project that investigated the costs, performance, and impacts of four categories of non-chloride



Short primers show how liquids like agricultural products (left) and glycol-based products (right) compare with chlorides, helping winter maintenance managers make informed decisions. Similar primers are also available for acetate- and formate-based products. Image courtesy of Clear Roads.

deicers (acetates, formates, glycols, and agricultural products), and compared them with traditional road salts. The research produced four two-page primers—one for each category of chloride alternatives—that show the benefits and drawbacks of each option and give decision-makers a tool for choosing the best treatments for an agency's particular needs and budget, as well as data-based documentation to support their selections.

"We all want to protect our natural resources," he says. "But we found that every non-chloride deicer has its own environmental concerns and issues, which can sometimes be even more harmful than chlorides. These primers give us an important resource explaining exactly why we choose whichever deicers we use."

A tool to visualize snowplow routes in real time

Every transportation agency has snowplow routes and knows about how long each should take to complete. But these routes were likely developed for an ideal scenario, when the agency would be fully staffed and all plows available. Under more realistic conditions, when an agency might be short on drivers, and a plow may be down for maintenance, a manager needs to make on-the-spot decisions to provide a high level of service and ensure the agency's limited resources are allocated effectively.

"When you have fewer staff, you need to make judgment calls in order to move trucks around and maintain safety on higher-traffic roads," says David Gray, winter maintenance program specialist for New Hampshire DOT. "If there's a delay or a road needs to be cleared more frequently because it's getting a lot of snow, you need to be able to call in another truck to help.

A user-friendly dashboard shows where plows are located and the average time anticipated to complete a route based on a number of variables. Image courtesy of Clear Roads.

Knowing where every truck is and when it will be available can help, but if a particular truck is already working on the other side of town, it may not be the most efficient option to reroute."

To help maintenance managers make better real-time operational decisions, Gray championed a Clear Roads research project that developed a map-based visualization tool for snowplow routes. The tool considers several variables, such as the treatment the plow is applying, the number of lanes, weather conditions, and traffic volume, to show where an agency's snowplows are at any given moment and the length of time that each will likely need to complete its current route. A companion how-to guide can also help agencies put the tool into practice and analyze the data during and even after the storm has passed.

Though the new tools have only been available for a short time, Matt Morreim, public works director for the City of Shorewood, Minnesota, says he expects they will become a valuable addition to any agency's toolbox.

"Smaller agencies can certainly benefit from having greater insight into their operations and more data to help them be more responsive," he says.

Hensley agrees. "Clear Roads is providing invaluable research for snow and ice practitioners," he says. "The group's practical and field-based approach gives a lot of legitimacy and value to our everyday work."

The tools discussed in this article can be downloaded from the Clear Roads website:

- Using GIS to Highlight Highway Segments Sensitive to Deicing Materials: www.clearroads.org/project/20-05/
- Efficacy, Cost, and Impacts of Non-Chloride Deicers: www.clearroads.org/project/21-03/
- Calculating Plow Cycle Times from AVL Data: www.clearroads.org/project/21-06/

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