A new tool from Clear Roads can help agencies determine where deploying a TowPlow will result in the greatest efficiency gains. Image courtesy of Missouri DOT.

New winter maintenance tools emphasize efficiency

Free tools from Clear Roads aim to make agencies' winter maintenance work easier, faster and more cost effective

Katie Johnson, Senior Associate,
CTC & Associates LLC
Madison, Wisconsin

From equipment enhancements to data-savvy software tools, technological advances promise to help transportation and public works agencies save significant time and money on their winter maintenance activities. But determining which solutions are worth the investment can be challenging.

To help agencies of all sizes navigate their options, the 37-state Clear Roads winter maintenance research consortium (clearroads.org) has developed several free tools that make choosing and using new strategies simpler and easier. With a better understanding of how to realize the greatest gains from newer equipment and practices, operations managers can more quickly and confidently make selections that are right for their agency.

"Generally speaking, transportation agencies are working with less right now," says Doug McBroom, maintenance operations manager for the Montana Department of Transportation (DOT). "Budgets are tighter, but it's not only funding—there are fewer people available to do the jobs as well. We need to be able to work smarter, to get more done with our existing equipment and personnel."

Making smart investments in equipment

Proprietary accessories like TowPlows

and commercially available wing plows can help agencies do just that. By widening the plowing path, these add-ons allow operators to clear more snow in a single pass. But deploying them in the right locations is key to maximizing productivity gains.

The TowPlow trailer can almost take the place of a second truck.

In West Des Moines, Iowa, the city's wide side streets and winter parking bans help create an ideal environment for wing plows, says Public Services Director Bret Hodne. "Wing plows are the biggest thing we've done in the last 30 years to improve plowing efficiency," he says.

With wing plows now standard equipment on the city's plow trucks, West Des Moines recently added the first TowPlow to its fleet and has another one on the way. Used on the city's busy multilane arterials, where signal pre-emption helps plow trucks avoid stop-and-go traffic, the TowPlow trailer can almost take the place of a second truck, Hodne says.

"For agencies that have the right infrastructure, TowPlows definitely offer an opportunity to save money and increase productivity," he says.

To help agencies understand the full range of costs and benefits of buying, operating and maintaining TowPlows and wing plows, Clear Roads developed a spreadsheet-based tool that quantifies and compares the efficiencies of different equipment configurations on specific types of roadways.

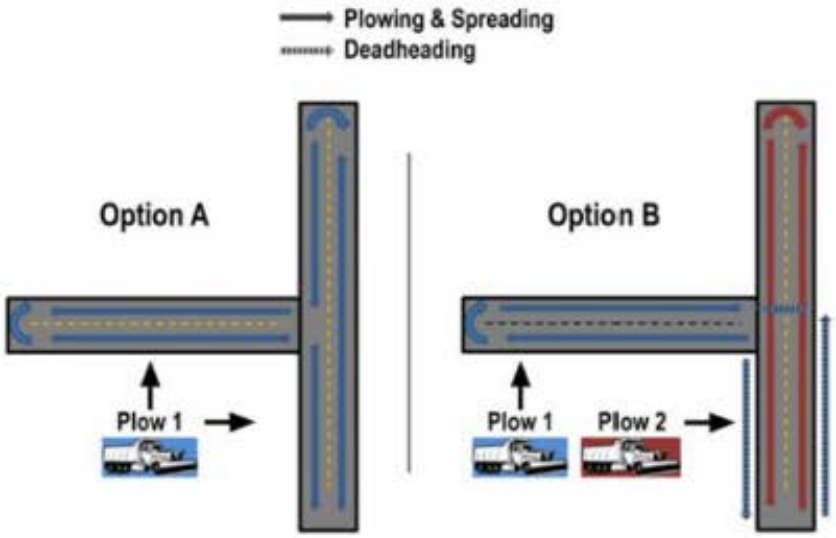
Based on user-supplied details about a particular plow route, the tool weighs factors such as roadway characteristics (including route length, number of lanes, and lane width), labor costs and other operational expenses, as well as maintenance and storage considerations. By quantifying the costs and benefits, a user can determine which plow configuration should be used on a specific route for greatest efficiency.

In Montana, the DOT currently has 34 TowPlows in its fleet—a number that the tool has shown is right for the agency, McBroom says.

"We may be just about saturated," he says. "TowPlows are extremely helpful on our four-lane roadways, where one driver can pretty much do the work of two plows. But in many areas, we are finding that more TowPlows would not necessarily give us more value for our investment."

The right information to help refine plow routes

At first glance, leveraging data to design more efficient snowplow routes may seem like a no-brainer, but there can be complicating factors when it comes time to make changes. For example, when North Dakota DOT initiated a route optimization project in 2017, the agency sought to optimize plow routes and garage locations to reduce plow cycle time, reduce total miles traveled, and provide an evenly distributed workload. While the project yielded valuable operational insights, the agency ultimately chose not to put the optimized routes into effect.



The results of snowplow route optimization can vary depending on an agency's service priorities. The option on the left uses a single plow to achieve lower costs. On the right, the same route can be cleared more quickly with two plows working together. Image courtesy of Clear Roads.

"The results did show how we could eliminate nearly 30 routes and reduce plowing time while maintaining levels of service," says Maintenance Operations Engineer Brandon Beise. "But implementing the optimized routes would have meant reallocating a substantial number of staff and plows to higher-service-level routes—moving plows away from small towns to the Interstates and higher-population areas—which didn't fit with the public's expectations."

Roadside environmental sensor stations can measure air and pavement temperature, precipitation, wind speed, and other data used in evaluating storm severity. Image courtesy of Utah DOT.

Other agencies have had similar experiences, balking at implementing optimized routes that would have led to unintended staff cuts or plow cycle times that didn't match existing level-of-service guidelines.

> The Clear Roads tools will allow you to make decisions with eyes wide open.

To help agencies get more usable results, Clear Roads created a decision support guide that identifies the critical issues that agencies should address before they embark on a route optimization project. These include identifying agency priorities, setting realistic goals, determining data needs and sources, and defining metrics for success.

As a companion to the guide, Clear Roads developed a contracting language template that agencies can use to build a scope of work for route optimization services. The suggested language is designed to ensure that agencies and service providers have a shared understanding of project goals and expectations.

"To be successful, a route optimization project requires extensive collaboration among stakeholders and the full support of agency leadership," says Ohio DOT State Snow and Ice Coordinator Scott Lucas, who helped oversee Clear Roads' efforts to develop the guidance tools. "There are a lot of details to work through and expectations to manage.

"Route optimization isn't for every agency," he continues. "But the Clear Roads tools will allow them to make decisions with eyes wide open."

Weather data provide key insights

Winter weather represents yet another dimension of data that agencies can use to optimize their winter operations. Comparing the severity of winter storms across seasons can help agencies measure and improve their performance. By translating variables like storm duration, total snowfall and pavement temperature into a single numerical value, winter severity indexes allow agencies to make apples-to-apples comparisons between storms and across multiple winter seasons.

Many high-quality severity indexes exist, each with slightly different formulas and emphases. To help agencies choose a severity index that suits their environmental conditions, goals and available data sources, Clear Roads developed a simple flowchart tool in late 2020. Users enter information

about weather patterns, key concerns and important variables, and the tool identifies severity indexes that incorporate the relevant variables. This gives users the option to use or modify an existing severity index or develop a new one that better meets their needs.

The free tools discussed in this article can be downloaded from the Clear Roads website: https://clearroads.org.

"For states and municipalities interested in developing weather severity indexes, the flowchart tool will give them a solid idea of what data they need and what kind of index will answer their questions," says James Morin, maintenance and operations branch manager at Washington State DOT.

Clear Roads is currently developing three sets of training modules to help guide agencies through the process of creating a customized severity index. These resources, which will include materials for upper management, snow and ice managers, and supervisors, are expected to be available in 2023.

Even if an agency isn't ready to implement these or other Clear Roads tools immediately, Marc Valenti, operations manager for the Town of Lexington, Massachusetts, says the research will continue to provide value for years to come.

"What's great about Clear Roads is that it takes on issues that agencies may not have the time or resources to take on themselves," he says. "So as priorities shift or an agency becomes more technologically capable, there will be opportunities to benefit from the research in the future."

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

- Measuring the Efficiencies of Tow Plows and Wing Plows: https://clearroads.org/project/19-03/
- Technical Requirements and Considerations for Automated Snowplow Route Optimization: https://clearroads.org/project/19-04/
- Training Module Development for Evaluation of Storm Severity Index and Winter Severity Index Variables: https://clearroads.org/project/21-04/

Katie Johnson is a senior associate at CTC & Associates, which provides management services for the Clear Roads Pooled Fund. She can be reached at katie.johnson@ctcandassociates.com.