Evaluating an Herbicide-Applying Mower for Invasive Species Control

What Was the Need?
MnDOT is charged with managing roadside vegetation on state highways where invasive species are an acute problem. Because roadsides are continuously disturbed habitats with open canopies and moist soil, they are major corridors by which invasive species spread. Invasive species, including some singled out by Minnesota’s noxious weed law, can have a serious environmental and economic impact by crowding out native species and potentially threatening agriculture and forestry. They can also affect driver safety: One invasive type of grass, the common reed, grows 15 feet tall and can impair visibility.

An effective way of controlling such weeds is to apply herbicide by broadcast spray. However, this approach can result in herbicide drift, where wind carries the chemical away from its target area. Since the road network is so extensive, herbicide drift from weed control efforts can damage crops, trees, landscaping and human health on neighboring properties.

The WetBlade, manufactured by Diamond Mowers, is a mower that applies herbicide directly to plant stems via the bottom of the mowing blade. In theory, this can effectively control invasive species while eliminating the potential for herbicide drift.

What Was Our Goal?
MnDOT has already purchased one WetBlade. The goal of this project was to evaluate its effectiveness in controlling invasive species and minimizing herbicide drift before determining if further investment is warranted.

What Did We Do?
Researchers conducted two tests to compare the effectiveness of the WetBlade to traditional broadcast herbicide application in controlling Canada thistle, a serious invasive species in Minnesota, and minimizing herbicide drift.

To evaluate weed control, researchers identified two roadsides in the Twin Cities area where Canada thistle was the dominant plant. Researchers divided the sites into blocks to test herbicide application timings (spring only, fall only, or fall and spring). They further divided each block into subplots and randomly assigned each subplot to be treated by either the WetBlade or broadcast application with one of three herbicide application rates.

Researchers tested herbicide drift at two additional roadside sites in the Twin Cities. They placed filter paper on the ground in the center of each of six plots at each site, and at 14 more points between 0.25 meters and 10 meters downwind from each plot edge. Then they used the WetBlade to apply herbicide that contained a dye solution to half of the plots at each site and used the broadcast treatment to apply herbicide to the other half. After treatment, researchers extracted dye from each piece of filter paper and
measured the light absorbency of the resulting solutions as an indicator of how much herbicide drifted beyond the application area and how far.

Finally, researchers performed a cost analysis for the WetBlade, broadcast herbicide application and traditional mowing. This analysis included labor, maintenance, repair, fuel, depreciation and herbicide costs.

**What Did We Learn?**

Tests showed that the WetBlade was equally effective at controlling Canada thistle as broadcast herbicide application. Researchers based this conclusion on decreases in thistle density, thistle biomass and plant size.

The WetBlade produced very little herbicide drift. Less than 1 percent of the herbicide reached the soil, even directly underneath the application equipment. Broadcast treatments did produce detectable drift, averaging 2 to 10 percent of the tank mix, at distances up to 3 meters. This drift was not statistically significant, but it did show a high degree of variability, likely due to differences in wind speed during application.

The WetBlade costs $46.68 per acre of treatment—significantly more than the $18.57 per acre cost of broadcast application without mowing due largely to its slower speed. However, broadcast application combined with a follow-up traditional mowing cost $48.02—slightly more than WetBlade mowing.

Given the similar performance and reduced herbicide drift, the WetBlade is likely best-suited for limited applications such as high-risk sites like schools, hospitals, high-value cropland or wetlands, where it is critical to minimize pesticide drift. In some locations, both mowing and herbicide application are desired for aesthetic reasons so as not to leave dead weeds standing. WetBlade could also be used to control thistle at times of the year when the plants are already setting seed and mowing alone would spread the seeds rather than control the weeds.

**What’s Next?**

MnDOT will use the information gathered in this project to make further purchasing decisions; no further research is planned.

Researchers suggest that it may be valuable to evaluate the WetBlade’s effectiveness on other invasive species as well as to explore the use of the WetBlade to apply plant growth inhibitors that would reduce mowing needs.

---

“Herbicide drift is a big concern. If herbicides drift away from where they’re applied, they can affect neighboring trees and crops in rural areas and landscaping and fruit trees in urban areas.”

—Ken Graeve, Roadside Vegetation Manager, MnDOT Roadside Vegetation Management Unit

“Canada thistle is one of the 100 worst invasive weeds. Once established, it’s very difficult to control because it has underground roots that can withstand control efforts and difficult weather conditions to sprout again under better conditions.”

—Catherine Tarasoff, Assistant Professor, Michigan Technological University School of Forest Resources and Environmental Science

Produced by CTC & Associates for:
Minnesota Department of Transportation
Research Services & Library
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
651-366-3780
www.mndot.gov/research