



## RESEARCH SERVICES SECTION

# TECHNICAL SUMMARY

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### PROJECT COST:

\$15,800



Canada thistle, the most invasive noxious weed in Minnesota, quickly replaces native plants and is very difficult to control because of its extensive root systems.

# Putting Research into Practice: Reducing the Costs of Noxious Weed Management

## What Was the Need?

Minnesota transportation agencies are required by law to manage certain noxious weeds along highways, either by eradicating them or destroying as much aboveground growth as possible to prevent maturation and propagation. Noxious weeds are a threat to natural ecosystems, crops and livestock; they make pavement and stormwater maintenance more difficult; and they can threaten driver safety by obscuring road signs.

To control weeds, agencies use a combination of mowing and herbicides, which are costly and can adversely affect the environment. Consequently, it is important to carefully customize weed management practices to fit the severity of infestations. However, determining the location and distribution of weeds over the large areas comprising highway rights of way can itself be costly and time-consuming. Research was needed to develop more efficient methods for surveying weed infestations.

## What Was Our Goal?

This project is Phase II of an implementation effort to increase the precision of noxious weed infestation surveys and reduce the time required to conduct them by comparing the efficiencies of sampling plans developed during the implemented project: one measuring weed population density (area infested per unit length of highway) over 100 225-foot segments, and the other potentially less labor-intensive method measuring weed population distribution (presence or absence of weeds) over 150 14-foot segments.

The goal of Phase II of this implementation was to verify the key findings of [Phase I](#) by supplementing gaps in its data with additional field surveys, data processing and statistical analysis.

## What Did We Implement?

This project is the second phase of an implementation of an earlier Mn/DOT study, "Management Practices for Weed Control in Roadway Rights-of-Way" (2007-42), published October 2007. This study compared the accuracy and efficiency of two weed survey methods used during 2004 and 2005:

- The method used from 2000 to 2004, which involved evaluation of infestations over 3-mile-long segments and extrapolation to the district as a whole.
- A new method that used greater numbers of smaller, 1/4-mile-long segments.

The study showed that the older method was less precise, and researchers predicted via statistical analysis that sampling precision would be further improved by using even smaller segments of 225 feet or less, which were evaluated in this implementation.

## How Did We Do It?

In 2008, Mn/DOT District 4 personnel conducted field surveys in the same areas that had been previously surveyed in 2004, 2005 and 2007, using Global Positioning System devices to map the population distribution of 13 noxious weed species in highway rights of way. Surveyors mapped the population densities for these sites in 225-foot-long segments, recording patch area, location, landscape position, and the number and species of weeds within each segment. They also mapped these sites in 14-foot-long segments for population distribution, or presence-absence data, which measures which segments had at least one weed and which segments had none.

*“These studies laid the groundwork for a systematic approach to weed management in Minnesota. To measure the effectiveness of its efforts and avoid wasting resources, Mn/DOT must have a method for accurately quantifying weed infestations.”*

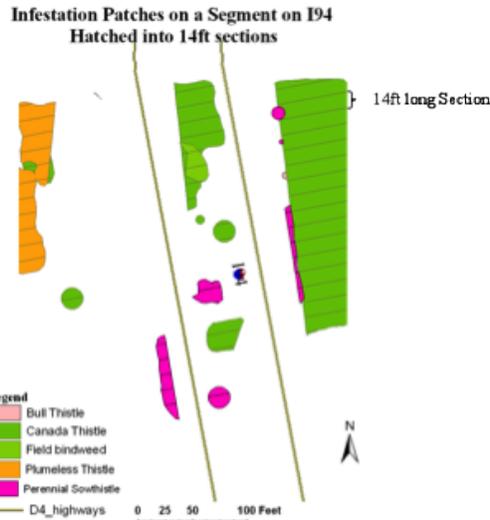
**–Paul Walvatne,**  
Supervisor, Mn/DOT  
Roadside Vegetation  
Management Unit

*“Developing better weed survey methods has given us a more cost-effective way to determine when and where it is better to spray, mow or establish diverse native plant communities to outcompete weeds in their niches.”*

**–John Nieber,**  
Professor, University of  
Minnesota Department  
of Bioproducts and  
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This 225-foot segment mapping infestation by weed species has been divided into 14-foot subsections.

Investigators then used a mathematical model calibrated in Phase I to extrapolate population densities from presence-absence data of 14-foot-long segments and to measure their accuracy by comparing calculated densities to those measured using 225-foot-long segments. They also compared the costs of each sampling plan by analyzing the amount of time it took weed inspectors to inspect each sampling segment, travel between segments, travel to and from sites and their offices, and to complete other tasks such as servicing equipment and taking breaks.

### What Was the Impact?

Results showed that using 14-foot segments required significantly less effort than using 225-foot segments. It took inspectors less time both to inspect the 14-foot segments and to travel between them. However, the study also confirmed the results of Phase I showing that the use of 14-foot segments was less precise than the use of 225-foot surveys, and too imprecise to be used to quantify infestation density. Nonetheless, this 14-foot method is an effective and less costly way to detect new weed species or early invaders in highway rights of way.

### What's Next?

The 225-foot segment surveys developed in this series of studies have been implemented successfully in Mn/DOT District 4, and other districts are planning implementation. These surveys save time and effort in quantifying weed infestations, and are part of Mn/DOT's ongoing development of an integrated systems approach to weed management that targets the right combinations of weed control strategies to the time of year and type and severity of infestation.

Researchers recommend the further development of systems approaches, especially for the control of Canada thistle, which is the most prevalent and problematic noxious weed in Minnesota. They also recommend closer analysis of the 14-foot segments examined in this study, and will continue to process study data in an ongoing effort to develop more cost-effective weed survey methodologies.

*This Technical Summary pertains to the LRRB-produced Report 2009-28, "Implementation of Methodology for Weed Management Practices—Phase II," published September 2009. The full report can be accessed at <http://www.lrrb.org/PDF/200928.pdf>. The report for Phase I of this implementation effort can be accessed at <http://www.lrrb.org/PDF/200910.pdf>.*

*The research being implemented via this project is Report 2007-42, "Management Practices for Weed Control in Roadway Rights-of-Way," published October 2007. This report can be accessed at <http://www.lrrb.org/PDF/200742.pdf>.*