

# RESEARCH SPOTLIGHT

## Project Information

**REPORT NAME:** Identifying Mapping Techniques of Invasive Plant Species Within MDOT Right of Way

**START DATE:** October 2023

**REPORT DATE:** October 2025

**RESEARCH REPORT NUMBER:** SPR-1759

**PROJECT COST:** \$213,000

**COST SHARING:** 20% MDOT, 80% FHWA through the SPR, Part II, Program

## MDOT Project Manager



### Carla Ahlschwede

Resource Specialist  
TSMO-Roadside Operations

[AhlschwedeC@Michigan.gov](mailto:AhlschwedeC@Michigan.gov)  
517-242-1232

### RESEARCH ADVISORY PANEL MEMBERS:

André Clover, Tom Howlett, Rachael LeTourneau, Todd Rowley and Cameron Sherman.

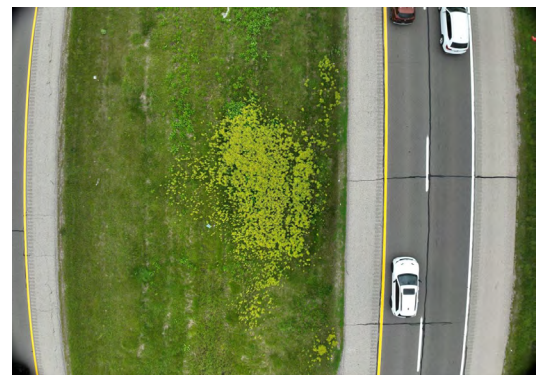
## Mapping invasive vegetation species in roadside rights of way

Controlling invasive plant species in the Michigan Department of Transportation's (MDOT) rights of way (ROWs) helps enhance traveler safety, protect roadway infrastructure and support the state's natural resource-based economies. Traditional survey methods, however, are insufficient for finding and eliminating fast-spreading vegetation. New methodologies show promise for identifying and mapping invasive species using remote sensing and machine learning algorithms. Using currently available tools, MDOT can more efficiently monitor areas with problematic invasive species and plan effective treatment strategies.

### PROBLEM

Invasive vegetation along Michigan roadsides causes numerous issues. Fast-growing species can damage pavement and other roadway infrastructure, contribute to soil erosion and create safety concerns such as obstructed visibility. Invasive vegetation can also alter natural habitats by crowding out native plants, harming ecosystems and negatively impacting sectors of Michigan's economy that depend on natural resources.

MDOT works to mitigate the spread of invasive plants in its ROWs through early detection, tracking and control. Vegetation management staff has traditionally located, mapped and monitored problematic species through on-the-ground surveys. However, these methods are resource- and time-intensive and are not always effective at controlling fast-spreading vegetation.



Using drones to remotely identify invasive plant species, such as leafy spurge, along roadsides can help MDOT quickly locate and manage fast-spreading vegetation.

Seeking an easy-to-implement, cost-effective way to map invasive vegetation within the ROW, MDOT explored remote sensing methods to better target control efforts. The agency already uses drones for road surveys, bridge inspections and other routine operations and has experimented with payload drones for herbicide applica-

*“MDOT now has tools and methods to more efficiently survey all areas where invasive vegetation is problematic and respond quickly to prevent spreading. This research is also a win for worker safety, eliminating the need for on-the-ground access to hard-to-reach areas.”*

**Carla Ahlschwede**  
Project Manager

tion. This study focused on developing efficient data collection and mapping methods to support rapid response to invasive species in MDOT’s ROWs.

## RESEARCH

After reviewing research and current practices related to remote sensing technologies and classification algorithms for vegetation mapping, researchers worked with MDOT staff to identify four invasive species commonly found along roadsides – wild parsnip, leafy spurge, phragmites and Japanese knotweed – to test collection and mapping methodologies.

MDOT had already identified all four species as active concern. Wild parsnip and leafy spurge, for example, are aggressive spreaders and highly toxic to humans and animals. The research team also had experience mapping two species: Phragmites and Japanese knotweed, which grows rapidly, limits roadway visibility and can damage infrastructure. Using monitoring networks such as the Midwest Invasive Species Network and MDOT’s long-term invasive weed database, the team selected six study areas containing these target species.

Data collection occurred during the 2024–2025 growing seasons at optimal

seasonal times for identifying each species. Wild parsnip, for example, has tall yellow flower heads in midsummer and turns bright orange in late summer, while the distinctive yellow-green foliage of leafy spurge is visible in late spring. Aerial surveys using Michigan Tech Research Institute’s multispectral drone were validated through on-the-ground vegetation surveys.

The research team used multispectral imagery and five classification tools within ArcGIS Pro to delineate target species from surrounding vegetation. Comparing results from each tool with ground survey data showed that Support Vector Machine and Random Forest classification methods most reliably identified the species of interest.

## RESULTS

Researchers recommended mapping methods to identify the distribution of large existing invasive species populations, detect early-stage invasions and monitor previously treated areas. Using tools already familiar to MDOT, the team guided agency staff through the mapping process.

- **Data collection:** Collect drone-based RGB and multispectral imagery at appropriate seasonal windows for each species, ranging from May and June for leafy spurge to September until winter snow cover for Japanese knotweed.
- **Classification:** Process imagery into standard data layers and classify using the most accurate algorithms identified for each species. Despite mixed results in previous studies, researchers found accurate algorithm for leafy spurge that also produced strong results for wild parsnip.

## VALUE

The new mapping methodologies will help MDOT identify and manage invasive species more effectively across the state. Unlike other classification software that would require additional purchase and training, the drone and software used in this study are

already available, familiar to MDOT staff and compatible with state IT requirements, supporting faster and easier implementation.

MDOT plans to use this approach to identify invasive vegetation in wetlands to meet state mitigation requirements and to map and treat steeply sloped roadsides, where on-the-ground surveys can be difficult and hazardous. Looking ahead, MDOT may also apply similar drone imaging techniques to identify threatened and endangered vegetation.

## Research Administration

### Principal Investigator

**Richard Dobson**

Research Scientist III  
Michigan Tech Research Institute  
Michigan Technological University  
3600 Green Court, Suite 100  
Ann Arbor, MI 48105

[rjdobson@mtu.edu](mailto:rjdobson@mtu.edu)  
734-913-6872

### Contact Us

**PHONE:** 517-281-4004

**E-MAIL:** [MDOT-Research@Michigan.gov](mailto:MDOT-Research@Michigan.gov)

**WEBSITE:** [Michigan.gov/MDOTResearch](https://Michigan.gov/MDOTResearch)

### The final report is available online at

[MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1759](https://MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1759).

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