



# Clear Roads Overview and Highlights

AASHTO SCOM

July 2016

Clark County Nevada

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NDDOT State Maintenance Engineer

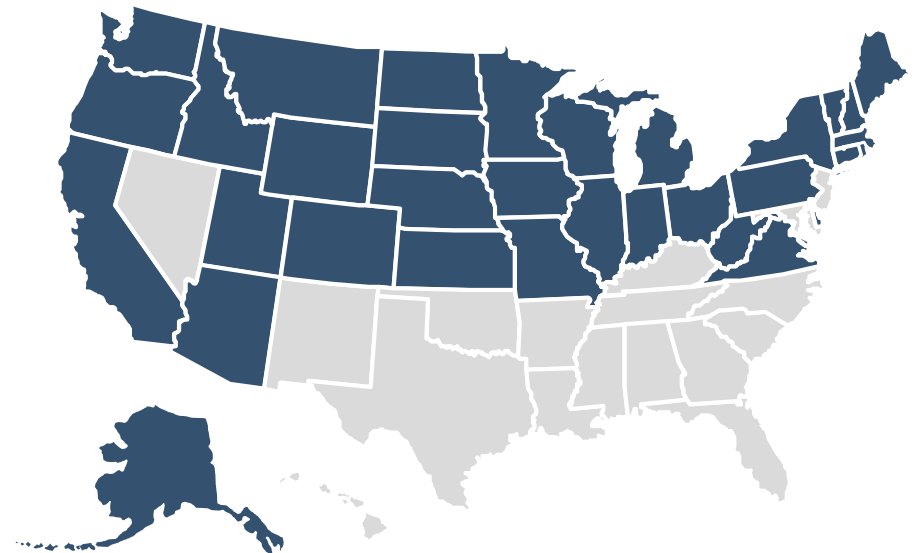


# Overview

Clear Roads Winter Highway Operations Pooled Fund, TPF-5(218), is a national research consortium that tests, develops and advances materials, equipment, and methods for winter highway maintenance.

Currently 33 members.

AK	AZ	CA	CO	CT	DE
IA	ID	IL	IN	KS	MA
ME	MI	MN	MO	MT	NE
ND	NH	NY	OH	OR	PA
RI	SD	UT	VA	VT	WA
WI	WV	WY			



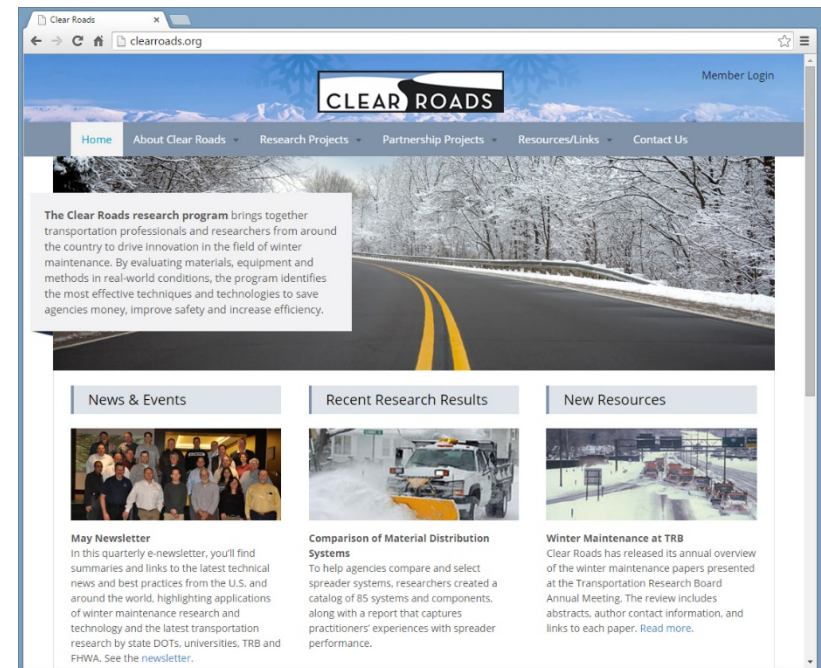


## Core Activities

- Evaluate winter maintenance materials, equipment and methods.
- Develop specifications and recommendations.
- Study and promote innovative techniques and technologies.
- Support technology transfer by developing practical field guides and training curricula to promote the results of research projects.

# Our Website, [www.clearroads.org](http://www.clearroads.org)

- Go-to source for all program and project information
- Details on completed and in-progress research
  - All reports, guides, tools
  - Research briefs
  - Recorded closeout videos with investigator Q-and-A
- Clear Roads newsletter
- Meeting minutes



# CLEAR ROADS

*research for winter highway maintenance*

The screenshot shows a web browser window with the URL <http://clearroads.org/completed-projects/>. The browser's address bar also displays 'Completed Projects | Clear ...'. The website's header features the 'CLEAR ROADS' logo and a 'Member Login' link. Below the header is a navigation menu with the following items: Home, About Clear Roads, Research Projects (which is highlighted), Partnership Projects, Resources/Links, and Contact Us. The main content area is titled 'Completed Projects' and contains a list of 25 project entries, each with a date and a title. The projects are listed in reverse chronological order, starting from 13-04 and ending with 05-01. The list includes titles such as 'Best Practices for the Prevention of Corrosion to DOT Equipment: A User's Manual', 'Establishing Effective Salt and Anti-icing Application Rates', 'Weather Severity Mapping Enhancement', 'Comparison of Materials Distribution Systems', 'Development of a Totally Automated Spreading System', 'Environmental Factors Causing Fatigue in Snowplow Operators', 'Understanding the True Costs of Snow and Ice Control', 'Determining the Toxicity of Deicing Materials', 'Cost-Benefit Analysis Toolkit (Phase II)', 'Snow Removal at Extreme Temperatures (Phase I)', 'Developing a Training Video for Field Testing of Deicing Materials', 'Mapping Weather Severity Zones', 'Cost-Benefit Analysis Toolkit', 'Identifying the Parameters for Effective Implementation of Liquid-Only Plow Routes', 'Development of Standardized Test Procedures for Carbide Insert Snowplow Blade Wear', 'Correlating Lab Testing and Field Performance for Deicing and Anti-icing Chemicals (Phase I)', 'Development of Interface Specifications for Mobile Data Platforms on DOT Vehicles', 'Development of Standardized Test Procedures for Evaluating Deicing Chemicals', 'Developing and Evaluating Safe Winter Driving Messages', 'Determining Effectiveness of Deicing Materials and Procedures', 'Calibration Accuracy of Manual and Ground-Speed-Control Spreaders', and 'Synthesis of Best Practices for Eliminating Fogging and Icing on Winter Maintenance Vehicles'.

Member Login

Home About Clear Roads **Research Projects** Partnership Projects Resources/Links Contact Us

## Completed Projects

- 13-04: Best Practices for the Prevention of Corrosion to DOT Equipment: A User's Manual (May 2015)
- 12-02: Establishing Effective Salt and Anti-icing Application Rates (February 2015)
- 14-08: Weather Severity Mapping Enhancement (March 2015)
- 12-05: Comparison of Materials Distribution Systems (December 2014)
- 11-03: Development of a Totally Automated Spreading System (May 2014)
- 11-05: Environmental Factors Causing Fatigue in Snowplow Operators (March 2014)
- 10-03: Understanding the True Costs of Snow and Ice Control (January 2014)
- 11-02: Determining the Toxicity of Deicing Materials (December 2013)
- 11-01: Cost-Benefit Analysis Toolkit (Phase II) (June 2013)
- 11-04: Snow Removal at Extreme Temperatures (Phase I) (March 2013)
- 10-01: Developing a Training Video for Field Testing of Deicing Materials (December 2012)
- 10-02: Mapping Weather Severity Zones (September 2012)
- 08-02: Cost-Benefit Analysis Toolkit (November 2010)
- 09-02: Identifying the Parameters for Effective Implementation of Liquid-Only Plow Routes (September 2010)
- 07-01: Development of Standardized Test Procedures for Carbide Insert Snowplow Blade Wear (September 2010)
- 09-01: Correlating Lab Testing and Field Performance for Deicing and Anti-icing Chemicals (Phase I) (August 2010)
- 08-02: Development of Interface Specifications for Mobile Data Platforms on DOT Vehicles (April 2010)
- 07-01: Development of Standardized Test Procedures for Evaluating Deicing Chemicals (April 2010)
- 08-02: Developing and Evaluating Safe Winter Driving Messages (March 2010)
- 06-01: Determining Effectiveness of Deicing Materials and Procedures (December 2009)
- 05-02: Calibration Accuracy of Manual and Ground-Speed-Control Spreaders (February 2008)
- 05-01: Synthesis of Best Practices for Eliminating Fogging and Icing on Winter Maintenance Vehicles (September 2006)





## RESEARCH HIGHLIGHT

# Snow and Ice Control Environmental Best Management Practices

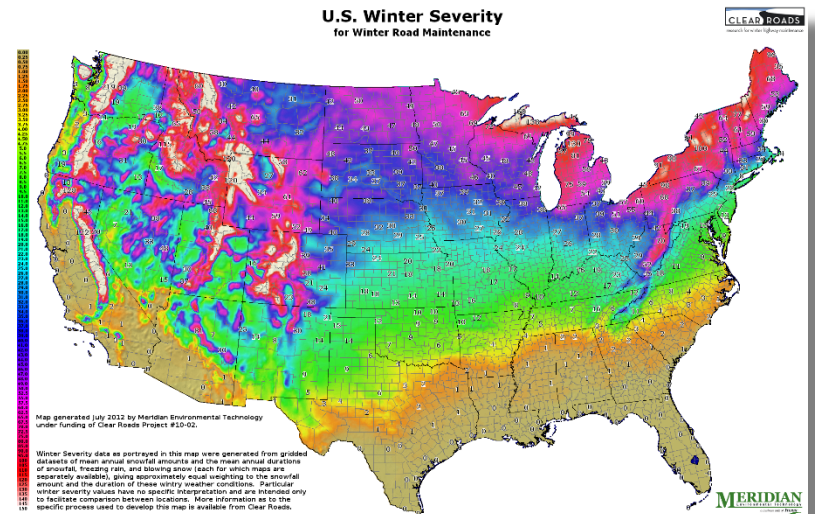
- Assessed impacts of snow and ice control products.
- Determined current environmental best practices for using deicing chlorides in a responsible and affordable snow and ice control program.
- Critical best practices include effective application strategies, equipment calibration, facilities management, and personnel training.



## RESEARCH HIGHLIGHT

# Mapping Weather Severity Zones

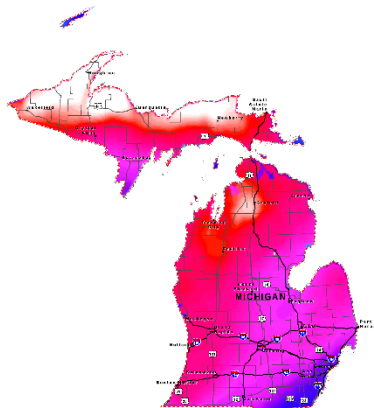
- To identify cost saving opportunities without impacting LOS, state DOTs needed to compare their operations to states with similar weather severity.
- States are starting to use resulting data and maps.
- A follow-up study customized individual state maps.



# CLEAR ROADS

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## U.S. Winter Severity - Michigan for Winter Road Maintenance



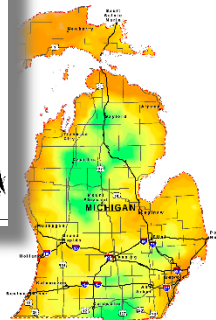
Map created July 2012 by the Clear Roads team, Michigan Department of Transportation, using data from the U.S. Department of Transportation, National Weather Service, and the U.S. Environmental Protection Agency. The map is intended to provide a general overview of winter severity in Michigan and is not intended to be used for specific engineering or planning purposes. The map is intended to provide a general overview of winter severity in Michigan and is not intended to be used for specific engineering or planning purposes.

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## Hours of Freezing Rain - Michigan from Observed and Modeled Data



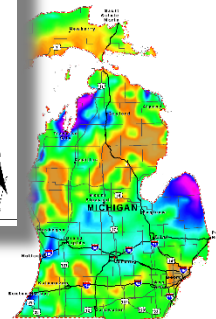
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## Hours of Blowing Snow - Michigan from Modeled Data



Map created July 2012 by the Clear Roads team, Michigan Department of Transportation, using data from the U.S. Department of Transportation, National Weather Service, and the U.S. Environmental Protection Agency. The map is intended to provide a general overview of winter severity in Michigan and is not intended to be used for specific engineering or planning purposes. The map is intended to provide a general overview of winter severity in Michigan and is not intended to be used for specific engineering or planning purposes.

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## RESEARCH HIGHLIGHT

# Cost-Benefit Analysis Toolkit

- Developed a practical tool for DOTs to calculate the cost/benefits and justify expenditures for new equipment, practices, and operations for winter maintenance.
- The user-friendly, web-based interface was later expanded in a follow-up project to expand functionality.
- For example, one DOT analyzed:
  - Tow plows: Benefit-cost of **2.9** to the agency, **68.3** overall.
  - Expansion of Maintenance Decision Support Systems statewide: Benefit-cost of **4.2** to agency, **8.4** overall.



The screenshot shows the web interface of the Cost-Benefit Analysis Toolkit. The header includes the CLEAR ROADS logo and the title "Cost-Benefit Analysis Toolkit - Deicing". The left sidebar contains navigation links: Home, Cost-Benefit Analysis, Glossary, User Manual, Resources, and Contact Us. The main content area is titled "Step 2 of 5: Enter Costs" and includes instructions for entering costs. It features input fields for "Initial Costs" and "Annual operating/maintenance costs", each with a corresponding "calculator" button. There are also sections for "Agency Costs" and "Other Costs". At the bottom, there are buttons for "Add User Costs" and "Add Society Costs". The "Results" section at the bottom shows "Annualized Costs: \$ 0", "Present Value: \$ 0", and "Annualized Costs per unit: \$ 0". Navigation buttons for "Previous" and "Next" are located at the bottom right.

## RESEARCH HIGHLIGHT

# Best Practices for the Prevention of Corrosion to DOT Equipment: A User's Manual

- Compiled comprehensive information on corrosion prevention to extend the life of winter maintenance equipment.
- Developed guidelines and best practices in layman's terms:
  - Causes and effects of corrosion
  - New equipment specification
  - Repair, rehabilitation and retrofitting
  - Preventive maintenance practices
  - Training and facility management



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The screenshot shows a web browser window with the URL <http://clearroads.org/research-in-progress/>. The browser's address bar also displays a tab titled "Research in Progress | Clear...". The website's header features the "CLEAR ROADS" logo and a "Member Login" link. A navigation menu includes links for "Home", "About Clear Roads", "Research Projects" (which is highlighted), "Partnership Projects", "Resources/Links", and "Contact Us". The main content area is titled "Research in Progress" and lists several research projects, each with a year and a title. The last item in the list is highlighted in red text and underlined. At the bottom of the page, there is a copyright notice: "© 2015 Clear Roads. All Rights Reserved." The browser's status bar at the very bottom shows the full URL: <http://clearroads.org/project/understanding-the-chemical-and-mechanical-performance-of-snow-and-ice-control-agents-on-poro...>

Member Login

Home About Clear Roads **Research Projects** Partnership Projects Resources/Links Contact Us

## Research in Progress

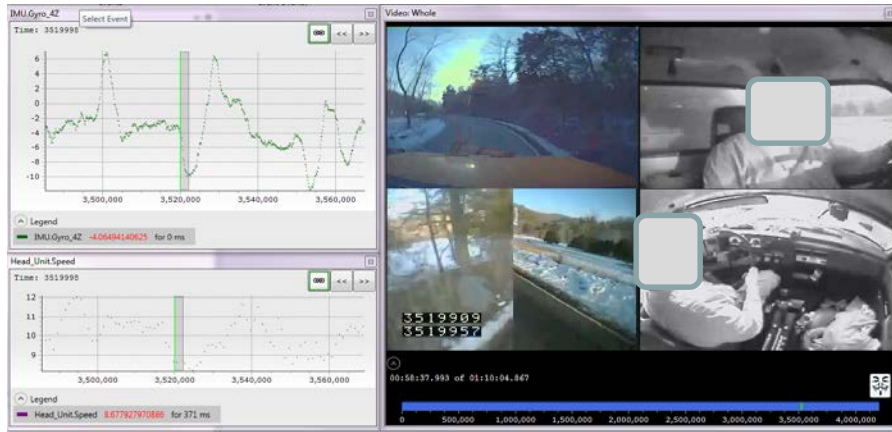
- 14-10: Roadway Salt Best Management Practices
- 14-06: Use Of Equipment Lighting During Snowplow Operations
- 14-04: Plug and Play Phase II
- 14-03: Developing a Training Video and Manual for Best Practices and Techniques in Clearing Different Interchange Configurations and Other Geometric Layouts
- 14-01: Synthesis on GPS/AVL Equipment Used for Winter Maintenance
- 13-03: Cost-Benefit of Various Winter Maintenance Strategies
- 13-02: Understanding the Effectiveness of Non-Chloride Liquid Agricultural By-Products and Solid Complex Chloride/Mineral Products Used in Snow and Ice Control Operations
- 13-01: Snow and Ice Control Environmental Best Management Practices Manual
- 12-06: Plug and Play Initiative
- 12-04: Snowplow Operator and Supervisor Training
- 12-03: Understanding the Chemical and Mechanical Performance of Snow and Ice Control Agents on Porous or Permeable Pavements

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<http://clearroads.org/project/understanding-the-chemical-and-mechanical-performance-of-snow-and-ice-control-agents-on-poro...>

# New Research in 2015

## Identification and Recommendations for Correction of Equipment Factors Causing Fatigue in Snowplow Operators



- Identify in-cab and external equipment factors that cause operator fatigue.
- Make recommendations to reduce, eliminate, or correct those factors.
- Complement a previous Clear Roads study focused on environmental fatigue factors.



## New Research in 2015 (continued)

- **Synthesis of Material Application Methodologies for Winter Operations**
  - Build on FHWA and NCHRP efforts.
  - Synthesize best management practices for material application and use.
- **North American Study on Contracting Snow and Ice Response**
  - Determine state of practice in contracting for snow and ice control by state DOTs, including best practices/lessons learned.
  - Help inform decision-making by winter maintenance managers.







# Projects selected for funding in FY 2016

- **Utilization of AVL/GPS Technology: Case Studies**
- **Standards and Guidance for Using Sensor Technology to Assess Winter Road Conditions**
- **Emergency Operations Methodology for Extreme Winter Storm Events**
- **Weather Event Reconstruction & Analysis Tool**
- **Training Video for the Implementation of Liquid-Only Plow Routes**
- **Aurora Winter Severity Index Update/Enhancement Partnership**



# Partnerships

## Plug and Play Initiative

- Partnered with industry to develop a protocol that would support a “plug and play” approach to integrating electronic devices and sensors on plow trucks.
- Clear Roads research developed an initial specification, working with public and private partners for buy-in.
- A phase 2 follow-up is underway to define data and transmission standards.
- Clear Roads plans to develop of validation software in ongoing partnership with stakeholders.



## Partnerships (continued)

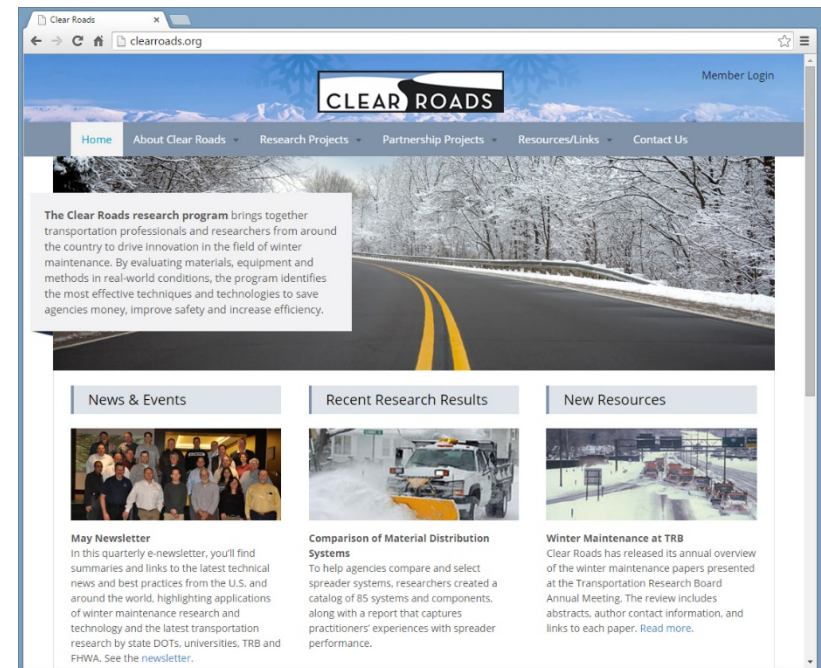
### National Winter Maintenance Peer Exchange

- Collaboration with Aurora Pooled Fund, Snow and Ice Pooled Fund, and AASHTO.
- September 23-25, 2015 in Bloomington, Minn.
  - State DOT best practice presentations
  - Breakout sessions
  - Identification of gaps and follow-up opportunities



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- Details on completed and in-progress research
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- Clear Roads newsletter
- Meeting minutes





## Get Involved

- Join the Clear Roads pooled fund (if you haven't already).
- Work with your agency's Clear Roads representative.
  - Get guidance on using research products.
  - Learn about research-in-progress.
  - Suggest new research ideas.
- Contact Clear Roads. *How can we help you put our results to work?*





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## For More Information

### Clear Roads Advisory Chair

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