Road Weather Management in Low Visibility Conditions

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Office of Transportation Operations
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Overview

- Highway Safety & Mobility in Low Visibility Conditions
- Mitigation Strategies for Low Visibility Conditions
- Low Visibility Warning Systems
- Road Weather Management Program Activities
- Next Steps
Highway Safety & Mobility in Low Visibility Conditions

Fog, Smog, Heavy Precipitation, Blowing Snow and Wind-Blown Dust reduce visibility distance on roadways.

These weather events impact traffic operations by:

- Affecting driver behavior
- Lowering speeds
- Increasing speed variability
- Escalating crash risk
- Increasing delay
- Causing road/bridge restrictions and closures
### Highway Safety & Mobility in Low Visibility Conditions

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Weather Condition</th>
<th>Number of Vehicles</th>
<th>Casualties</th>
<th>Road Closure Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/02</td>
<td>CA</td>
<td>fog</td>
<td>194</td>
<td>41 injured</td>
<td>11-hour road closure</td>
</tr>
<tr>
<td>2/03</td>
<td>MI</td>
<td>snow whiteout</td>
<td>60</td>
<td>1 dead</td>
<td>10-hour road closure</td>
</tr>
<tr>
<td>2/01</td>
<td>VA</td>
<td>snow whiteout</td>
<td>130</td>
<td>1 dead, 31 injured</td>
<td>12-hour road closure</td>
</tr>
<tr>
<td>5/03</td>
<td>MD</td>
<td>fog</td>
<td>73</td>
<td>2 dead, 100 injured</td>
<td>Over 24-hour road closure</td>
</tr>
<tr>
<td>4/04</td>
<td>CA</td>
<td>fog</td>
<td>66</td>
<td>23 injured</td>
<td>Road closure</td>
</tr>
<tr>
<td>4/04</td>
<td>NM</td>
<td>blowing dust</td>
<td>18</td>
<td>1 dead, 13 injured</td>
<td>4 road closures in area</td>
</tr>
<tr>
<td>4/04</td>
<td>CA</td>
<td>fog</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Sources:**
- [Highway Safety & Mobility in Low Visibility Conditions](#)
Mitigation Strategies for Low Visibility Conditions

Advisory strategies provide information on predicted and prevailing conditions.

Control strategies regulate traffic flow and roadway capacity.

Treatment strategies supply resources to roads to mitigate weather impacts.
Low Visibility Warning Systems
Alabama DOT

A fog warning system on the Interstate 10 Bay Bridge in Alabama warns motorists and manages speed.

System components and strategies:
- Visibility sensors
- Closed Circuit Television (CCTV) cameras
- Advisories/restrictions on Dynamic Message Signs (DMS)
- Variable speed limit (VSL) signs
- Vehicle guidance by Highway Patrol

The system has improved safety and traffic flow by reducing average speed, decreasing speed variance, and minimizing crash risk.
Low Visibility Warning Systems
California DOT

A motorist warning system on Interstate 5 and State Route 120 is used to alert drivers to fog and wind-blown dust.

System components and strategies:
- Environmental Sensor Stations (ESS)
- Vehicle detectors (loops)
- Advisories on DMS
- Vehicle guidance by Highway Patrol

The system has improved safety by significantly reducing the frequency of low-visibility crashes
- 19 in four years before deployment
- None since deployment in 1996

Photo Credit: Caltrans
Low Visibility Warning Systems
South Carolina DOT

A fog warning system on the Interstate 526 Cooper River Bridge informs drivers, reduces speed limits, and guides vehicles.

System components and strategies:
- Visibility sensors
- ESS
- CCTV cameras
- Advisories, restrictions & reduced speed limits on DMS
- Vehicle guidance with pavement lights

The system enhances mobility by clearly delineating travel lanes and improves safety, as no fog-related crashes have occurred since deployment.
A fog warning system on Interstate 75 in Tennessee is used to advise motorists and manage speed.

System components and strategies:
- Visibility sensors
- ESS
- Vehicle detectors
- Advisories on DMS & Highway Advisory Radio (HAR)
- Combined VSL/DM signs
- Close freeway with ramp gates

Safety has improved due to reduced crash risk.
- 200 crashes prior to system deployment
- Only 1 fog-related crash since deployment
Low Visibility Warning Systems
Utah DOT

The Utah DOT operates a fog warning system on a low-lying segment of Interstate 215 to notify motorists of safe travel speeds and promote more uniform traffic flow.

System components and strategies:
- Visibility sensors
- Vehicle detectors
- Advisories on DMS

The warning system:
- enhances mobility by increasing average speed by 15%
- improves safety by decreasing speed variance by 22%
The program aims to develop and promote effective tools to predict, observe, and mitigate the impacts of low visibility on highways. To achieve these goals, we are:

- **Building partnerships**
  - NOAA/FHWA Partnering
- **Promoting new tools and technologies**
  - Nationwide Surface Transportation Weather Observing System (NSTWOS)
  - Weather-Responsive Traffic Management
- **Developing outreach and training materials**
  - Best Practices for Road Weather Management, V2.0
  - Intelligent Transportation Systems (ITS) Standards
Next Steps

Several agencies have developed mitigation strategies for low visibility in localized areas.

There is a need to examine low visibility conditions from a system-wide perspective.

- How do we predict and monitor low visibility events?
- What is the role of vehicle-based technology, such as mobile environmental sensors and head-up displays?
- How do drivers behave in low visibility conditions?
- What is critical traveler information? How do we disseminate it?
- What are risk management and liability issues?
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  - http://www.fhwa.dot.gov/weather/