Road Weather Management Program

2012 Performance Measures

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RWMP Stakeholder Meeting

Little Rock, AR

July 16-18, 2013

Performance Metrics

- Goals of the 2012 update:
  - Assess RWMP performance in achieving stated objectives from 2009-2012
  - Gather and document available road weather management benefits
  - Incorporate emerging areas of importance to program performance
  - Create a framework for continuous performance measurement

Performance Measures History

2007
Began study to determine RWMP performance measures needed for evaluating goal completion

2009
Formulated RWMP performance measures

2010
Quantified defined RWMP performance measures

2012
Updated and quantified revised RWMP performance measures

Context for 2012 Update

- Transition from SAFETEA-LU to MAP-21
- New program focus areas (Connected Vehicles, SHRP2 Reliability, Climate Change)
- Completion of certain major initiatives (*Clarus)*
- Evolving stakeholder needs

Updated RWMP Objectives

Objectives in 2009	Objectives in 2012
Develop a national, open observing system that promotes data sharing to support weather observing and forecasting and transportation operations.	
	Advance the Collection, Processing, and Distribution of Fixed and Mobile Observations.
	Improve Overall System Performance During Weather Events.
Develop resources and training methods to assist State and local partners in deployment of weather management tools.	Raise Road Weather Management Capabilities and Knowledge across the Transportation Industry.
Advance the State-of-the-practice by developing proactive solutions and disseminating information on adverse weather.	Develop and Support Operational Deployment of Advanced Road Weather Management Strategies.
	Increase the Use of Weather-Based Decision Support Tools and Dynamic Mobility Applications.
Foster a collaborative, comprehensive, and dedicated surface transportation weather research program.	Build Partnerships with Transportation and Weather Communities.
	Engage the Climate Change Community in Transportation Maintenance and Operations.

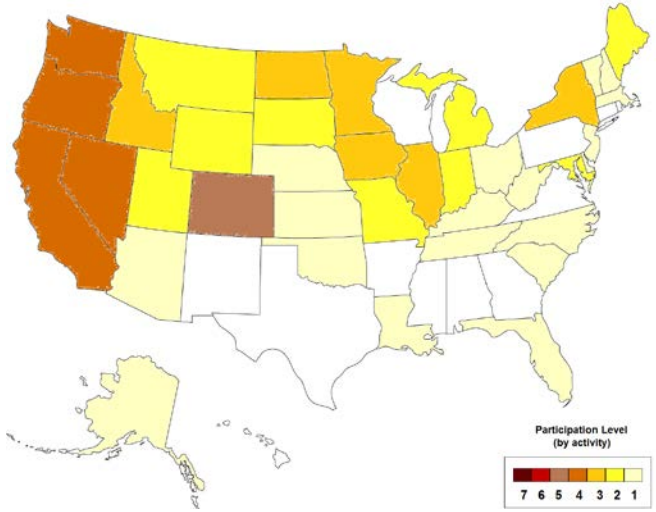
Results from 2012 Update

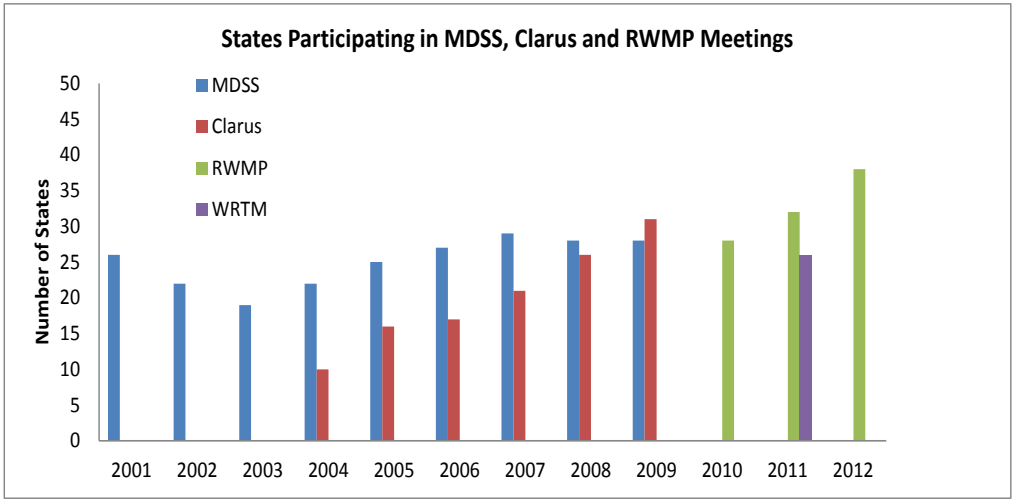
- Detailed measure-by-measure findings available in final report (Upcoming)
- Data sources used:
  - RWMP Data
  - State Surveys
  - Literature Search
  - ITS-JPO databases (Benefit-Cost, Deployment Statistics)

Updated Performance Measures

- Updated based on
  - Internal review of RWMP activities
  - Examining external needs and performance-related initiatives that affect the program
- Organized by the seven program objectives
  - Twenty two (22) measures
  - Measures that remain unchanged from 2009
  - Measures modified from those used in 2009
  - Several new measures reflecting current RWMP priorities

Obj. 1 - Build Partnerships with Transportation and Weather Communities





Measure: States involved in RWMP sponsored R&D

Measure: Agency Participation in Stakeholder Meetings

- Stakeholder engagement continues to grow
- States involved in multiple RWMP R&D efforts
- RWMP actively fostering partnership role through various forums

Obj. 2 - Raise Rd Wx Management Knowledge and Capabilities

Training Activities and Sponsorship	Number of Participants (self-study and blended)	Details of Session
Principles and Tools for Road Weather Management	59	Blended
	19	Self -study
Weather Responsive Traffic Management	36	Fall 2012
	19	Summer 2013
	17	Self-study
Road Weather Information Systems (RWIS) Equipment and Operations (CITE Maryland)	62	Blended
	28	Self-study

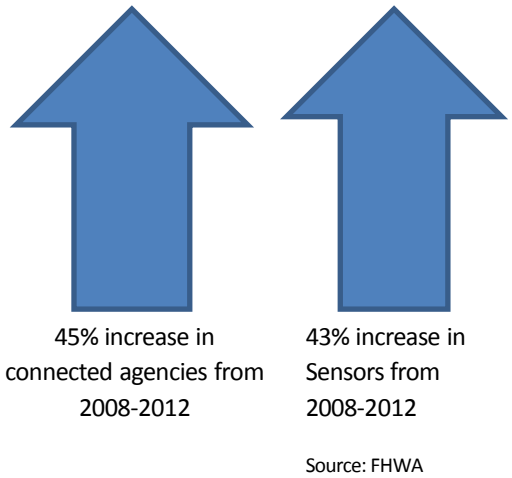
Measure: Training Activities and Courses

Webinar	Date	Participants
WRTM – Guidelines for Disseminating Road Weather Advisory & Control Information	November 1, 2012	99
WRTM – Weather Responsive Traffic Signal Management	May 31, 2012	111
WRTM – Use of Social Media During Weather Events	April 19, 2012	148
WRTM – Active Traffic Management (ATM) and Weather	March 20, 2012	121
Integrating Weather Information in TMC Operations	August 6, 2009	98
Road Weather Management Update	September 30, 2008	75
Road Weather Management Update	March 14, 2007	160
Road Weather Management Update	January 11, 2006	210

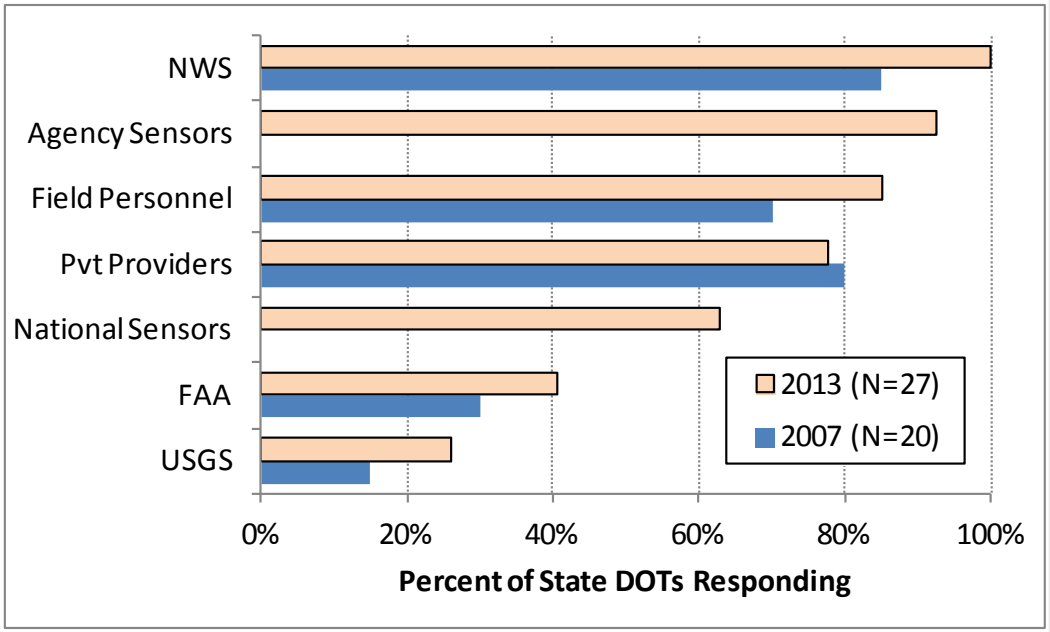
Measure: Agency Participation in NTOC Webinars

- Training courses offered by RWMP have increased. New certificate course in Road Weather
- NTOC webinars have shown strong sustained and diverse attendance
- RWMP Website usage continues to grow
- Mostly output measures. Need to figure out how to assess capability of the industry

Obj. 3 - Advance the Collection, Processing and Distribution of Fixed and Mobile Rd Wx Obs



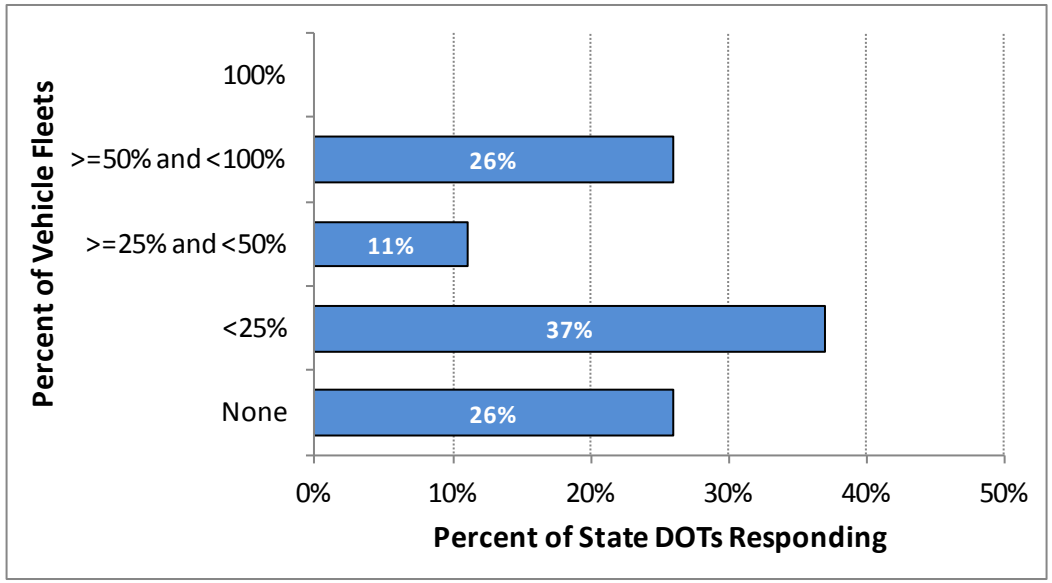
Measure: Agencies connected to *Clarus* System



Measure: Percent of States that Subscribe to Road Weather Products and Services by Providers: 2007 and 2013

- Increase in connectivity to *Clarus* but need to ensure transition
- RWMP Products and Services use has leveled off with high-degree of awareness and use of NWS, Agency sensors, Field personnel and Private Providers

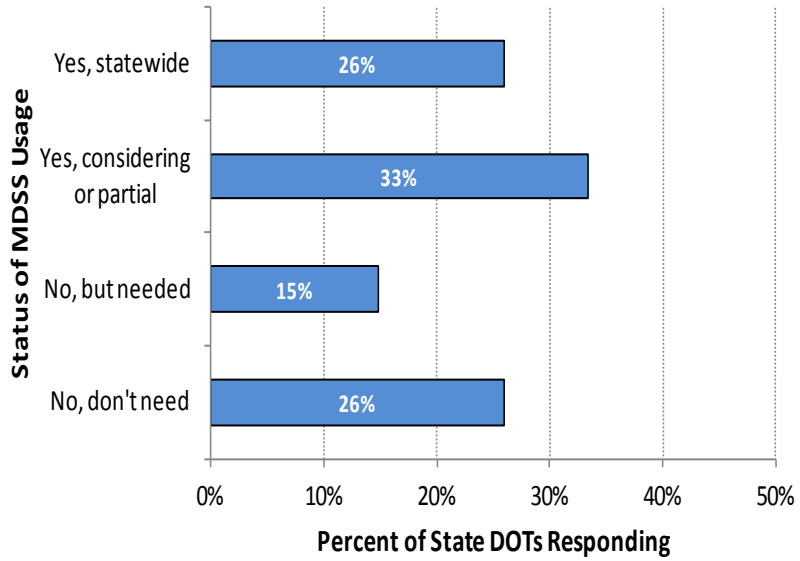
Obj. 3 - Advance the Collection, Processing and Distribution of Fixed and Mobile Rd Wx Obs



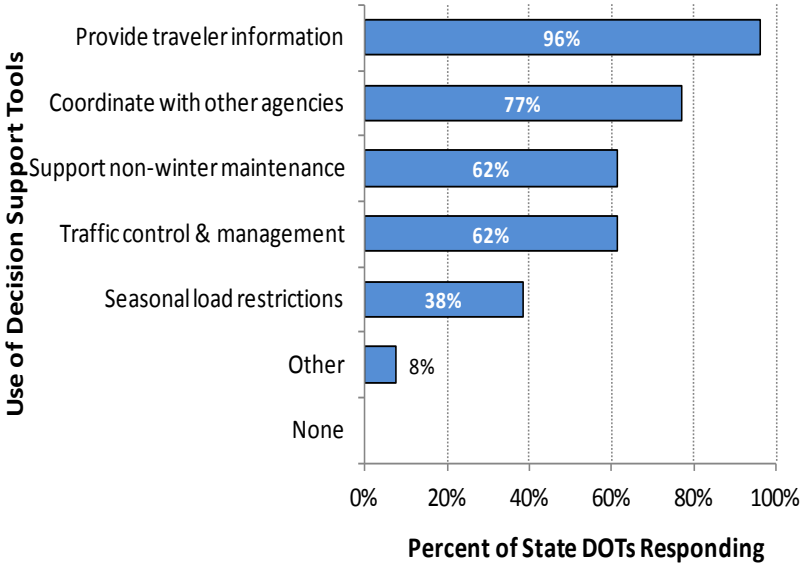
Measure: Percent of State DOTs Indicating the Percent of their Vehicle Fleets that are Used to Collect Weather and Road Weather Data in Real Time: 2013

- About a quarter of the DOTs said that half or more of their vehicle fleets collect maintenance, weather and road weather data
- 3 out of 4 State DOTs are using these road weather data collection strategies in at least some of their vehicles
- Unclear on State DOT's perspective of what constitutes mobile road weather data

Obj. 4 - Increase the Use of Weather-based Decision-support Tools and Dynamic Mobility Apps



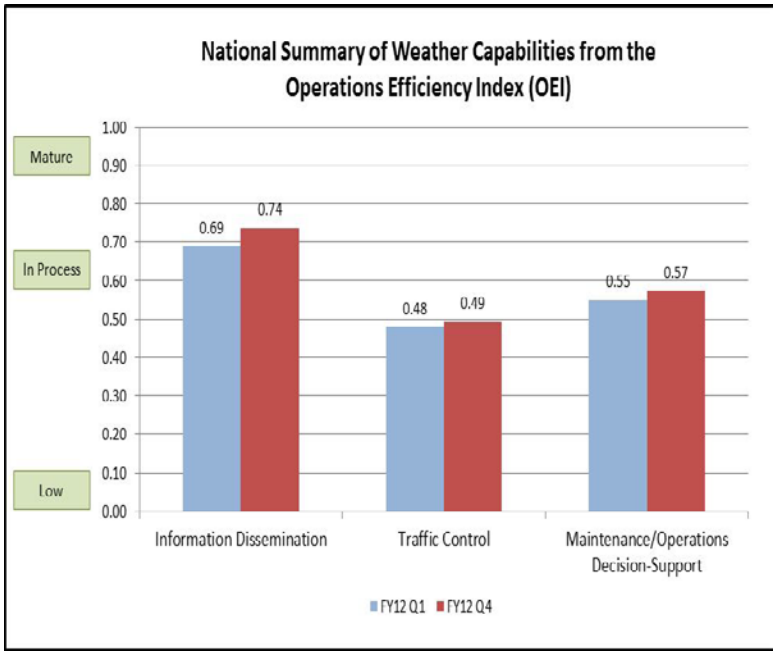
Measure: MDSS Use Reported by States



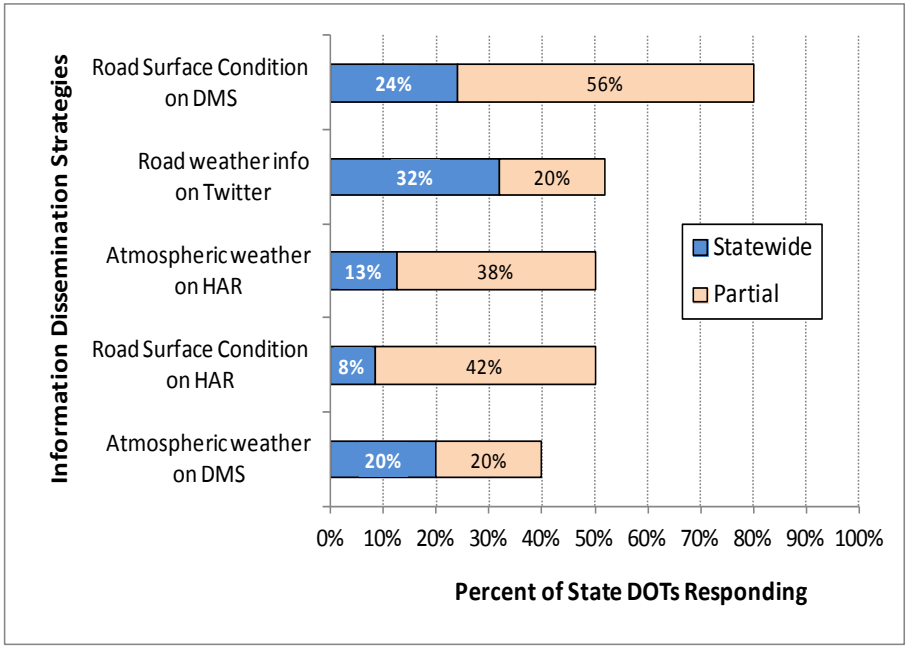
Measure: Use of Other Decision Support Tools

- Almost three-quarters (74 percent) of the State DOTs responding to the 2013 survey said they either have in place (fully or partially deployed), are considering, or need an MDSS
- State DOTs are using a wider array of decision support tools now to support their road weather management practices, and the use of some of these tools is becoming increasingly widespread

Obj. 5 - Develop and Support Operational Deployment of Advanced Road Weather Management Strategies



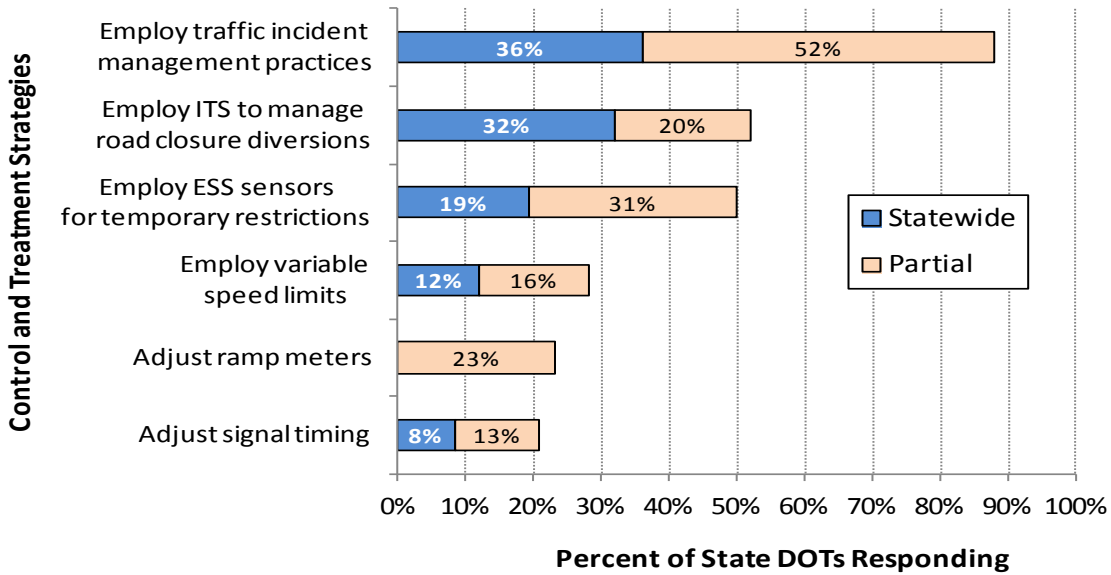
Measure: Weather Capabilities Assessment in Top 40 Metro Areas



Measure: Percent of State DOTs Indicating Extent of Deployment of Selected Information Dissemination Strategies: 2013

- Further progress since 2007 in the deployment of road weather information to the traveling public, though direct comparisons are difficult given differences in the surveys conducted in 2007 and 2013 and the response rates for these surveys
- Several strategies are still in partial deployment and not deployed Statewide (where needed)

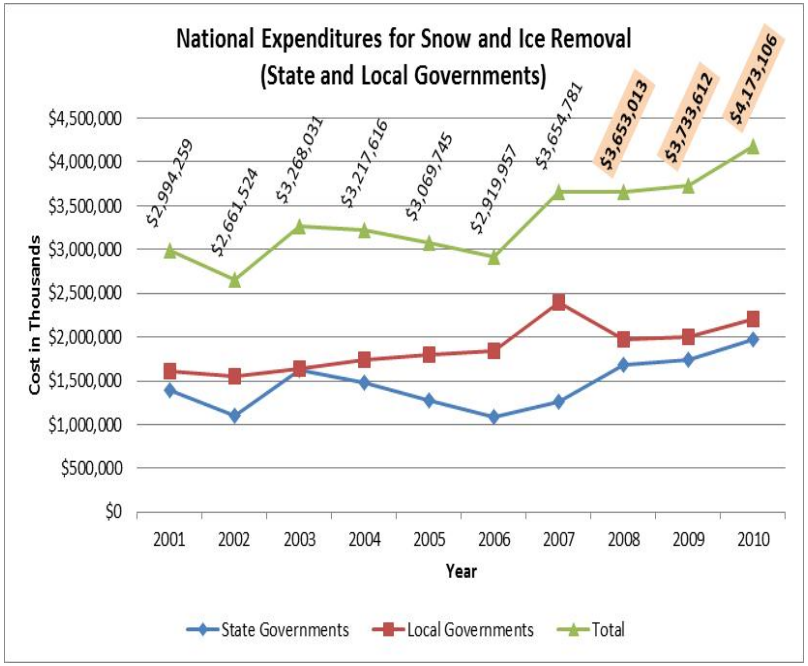
Obj. 5 - Develop and Support Operational Deployment of Advanced Road Weather Management Strategies



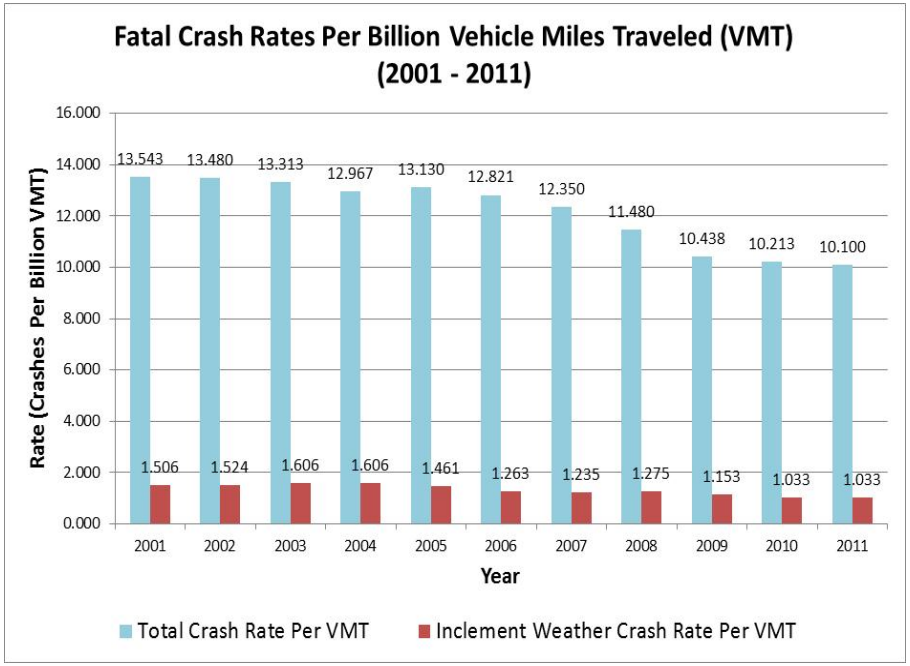
Measure: Percent of State DOTs Indicating Extent of Deployment of Selected Control and Treatment Strategies: 2013

- Most widely deployed, either partially or Statewide (88 percent of State DOTs), are traffic incident management practices in response to inclement weather
- Adjusting signal timing at intersections in response to weather remains relatively rare, with twenty-one (21) percent of State DOTs deploying this strategy either partially or Statewide
- The use of the other control and treatment strategies falls in between these two strategies

Obj. 6 -Improve Overall System Performance during Weather Events (Agency Cost, Fatalities)



Annual Expenditures for Snow and Ice Removal



Fatal Crash Rates during Inclement Weather per Billions of Vehicle Miles Traveled

- Nationally, agency costs for snow and ice removal have been trending upward
- Fatal crash rates due to weather have mirrored national-level decreases in overall fatalities
- Several new evaluations point to significant agency cost reductions due to MDSS, winter maintenance practices

Obj. 6 -Improve Overall System Performance during Weather Events (Capacity, Reliability)

Strategies	Traffic Flow Impacts	Reporting State
Low Visibility Warning Systems	More uniform traffic flow reduced speed variability by 22 percent speeds increased 11 percent.[1]	Salt Lake City, Utah
Highway Advisory Radio	1/3 of Commercial Vehicle Operators (CVOs) reported (when interviewed) that they would change routes based on road weather information provided.[2]	Washington
High Wind Warning System	90 percent of motorists surveyed indicated they would slow down in response to messages displayed .[3]	Oregon
Road Weather Information Systems and Highway Advisory Radio	56 percent agreed the information helped them avoid travel delays.[4]	Washington
Weather Related Signal Timing	Reduced vehicle delay by 8 percent and vehicle stops by over 5 percent.[5]	Minneapolis/St. Paul
En-Route Weather Alerts and Pavement Condition Information	Average vehicle speeds decreased by 23 percent when traffic managers displayed condition data during high winds (i.e., wind speeds over 20 mph).[6] Average speeds were 12 percent lower when the system was activated during high wind events occurring simultaneously with moderate to heavy precipitation.[7] Average speeds declined by 35 percent when warnings were displayed on the signs when the pavement was snow-covered and wind speeds were high.[8]	Idaho
	In light rain condition, the 85th percentile speed decreased by 8 percent and speed variance was reduced from 6.7 mph to 5.7 mph.[9] During heavy rain, the 85th percentile decreased by 20 percent and speed variance was reduced from 6.1 to 5.6 mph.[10]	Florida

- Limited examples of capacity and reliability improvements observed in the literature
- Reliability improvements have mostly been attributed to pre-trip and en-route traveler information
- Very few agencies track reliability measures, and even the ones that do, do not distinguish between the various causes of reliability

Obj. 6 -Improve Overall System Performance during Weather Events (Salt Use)

Year	Percentage of Total Salt Use[1]	Total Tons Used (millions)	Change in Consumption from Previous Year
2006[2]	29%	12.4	-
2007[3]	39%	20.8	68%
2008[4]	43%	22.6	09%
2009[5]	38%	16.9	(25%)
2010[6]	38%	18.7	11%
2011[7]	41%	19.6	05%

National Salt Consumption for Road Deicing

State	Year	Snowfall Range* (inches)	Salt Used (tons)	Average Statewide Winter Severity Index
Minnesota[1]	2009 - 2010	30 - 53	180,252	44.8
	2010 - 2011	67 - 89	267,860	57.1
Wisconsin[2]	2009 - 2010	23 - 204	408,523	26.6
	2010 - 2011	63 - 273	573,253	38.5
Massachusetts[3]	FY10	No data reported	367,436	10.9
	FY11	No data reported	556,839	27.2

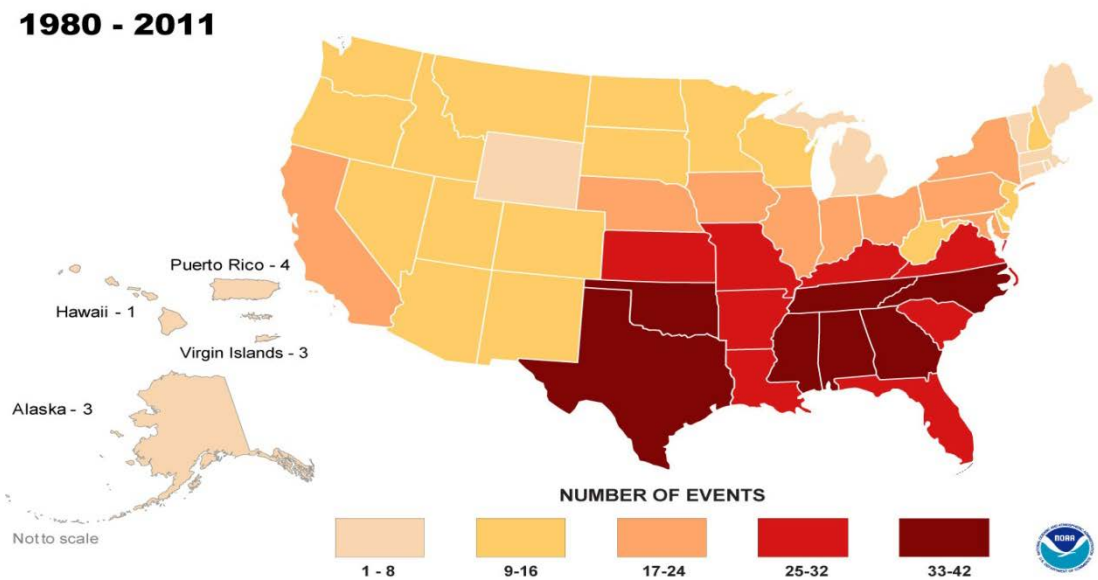
*Minnesota and Wisconsin snowfall range sourced from DOTs. Massachusetts snowfall range sourced from the National Climatic Data Center, sensor station data.

Source: State DOTs, National Climactic Data Center.

Examples of Salt Usage by State

- Important to track for both cost and environmental reasons
- Significant annual variability in salt usage. Several State DOTs are trying to create a winter severity index to normalize. No common approach yet
- Several case studies reporting reductions in salt use in the literature. Benefits come from MDSS use and other treatment strategies (anti-icing, pre-wetting etc)

Obj. 7 -Engage the Climate Change Community in Transportation Maintenance and Operations



Billion Dollar Disasters (1980-2011)

- An emerging area for the RWMP. Performance Measures are still being refined. Currently, track how agencies are doing on road-weather capabilities with respect to FHWA's developed INVEST Criteria
- State DOTs, especially the northern-tier States, meet many if not all of the programmatic criteria identified in INVEST such as having a road weather program, having RWIS and the use of MDSS
- The major weaknesses pertain to performance measurement, use of SOPs and material management, which are more sporadic in its use across the nation

Conclusions

- With the sunset of SAFETEA-LU and implementation of MAP-21, the past two years have seen several major changes in RWMP direction and objectives.
- Resulted in modifications to the performance measures that were established for the initial assessment five years earlier.

Conclusions (cont.)

- Shows continuing adoption of advanced technologies and decision support tools, and greater implementation of advanced road weather management strategies.
- Includes various strategies for addressing non-winter weather problems including rain, flooding, wind and fog, and their impacts on road operation and maintenance activities all year round.

Recommendations for Future Updates

- Maintain core set of measures
- Work with States to establish methods to account for seasonal variability in reporting performance
- Continue to monitor and evaluate best practices
- Influence SHRP2 Implementation to obtain road weather impacts on capacity and reliability

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