

Connected Vehicles for Winter Maintenance

Futuristic data
collection for
improved decision
making and traveler
information

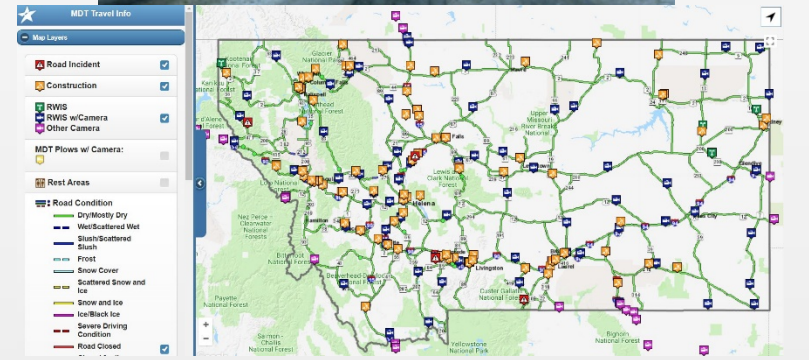
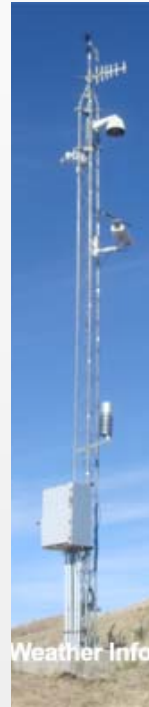
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Impacts of Winter Storms on Safety & Mobility

- Increased accidents and fatalities
- More severe crashes, particularly at the beginning of the winter season
- Reduced freeway speeds (16%) and traffic volume (29%)
- Snow, rain, wind and fog cost drivers 1 billion hours in delays
- In 2015 state DOTs spent \$2.3 billion and local agencies spent \$2.1 billion for snow and ice removal (Tables SF-4C and LGF-2, Highway Statistics)

Current Response to Winter Storms



USDOT Connected Vehicle Initiative

- Technology in cars that "talk" to each other and infrastructure
- Can provide specific warnings to drivers about unsafe conditions



USDOT Connected Vehicle Initiative

- Three large pilots underway, one along I-80 in Wyoming
- FHWA Weather Savvy Roads, Integrating mobile observations
 - Collect weather and road condition data from fleet vehicles
 - Windshield wiper status, anti-lock brake or traction control system activation

Connected Vehicles for Winter Maintenance

- Timely weather information can help decision-making for application rates
- RWIS doesn't cover entire road network
- Fleet vehicles could supplement weather data
- As CV is deployed in private vehicles, additional data will be available

CV4WM Survey

- What do you use to obtain road weather information, for either WM decision-making and/or providing traveler information?
 - RWIS
 - Cameras mounted at fixed locations
 - Manual patrolling
 - MDSS
 - Other?

CV4WM Survey

- How do you share road weather information/advisories to the public?
 - 511
 - Dynamic message signs
 - Mobile app
 - Agency website
 - Other?

CV4WM Survey

- Do you have sensors for pavement condition (ice, snow-covered, wet, dry)?
- Are they fixed or mobile?
- Do you measure friction? Fixed, mobile, or both?

CV4WM Survey

- What are the limitations to current methods?

| | RWIS | Patrol | Cameras | MDSS | Other |
|--------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Low data accuracy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Data delayed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Limited spatial resolution | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Limited temporal resolution | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Unreliable Equipment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Costly | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Labor-intensive | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Time-consuming | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Other | | | | | |

CV4WM Survey

- Do you have any smart snowplows (AVL, cameras, pavement condition reporting)?
- Does smart plow data improve your winter operations? How useful is it? Operational decisions, or post-storm/post-season analyses?
- Does smart snowplow data improve traveler information? How useful is it?
- How easily is smart snowplow data integrated with RWIS?

CV4WM Survey

- Suppose you have access to CV data – How useful would it be in improving WM operations and traveler information?
- Which scenarios could CV data beneficially supplement RWIS data?
 - Enhance decisions to anti-ice
 - Enhance decisions to deice
 - Improve spatial resolution of pavement condition
 - Improve quality and spatial resolution of traveler information

CV4WM Survey

- How concerned are you about the following issues?
 - Safety consequences of equipment or system failure
 - Legal liability for drivers/owners
 - System security (from hackers)
 - Vehicle security (from hackers)
 - Data privacy (location and speed tracking)
 - Interacting with non-connected vehicles
 - Learning to use CV
 - Increased driver distraction
 - System performance in extreme weather
 - Drivers relying too much on technology

CV4WM Survey

- Thanks for sharing!