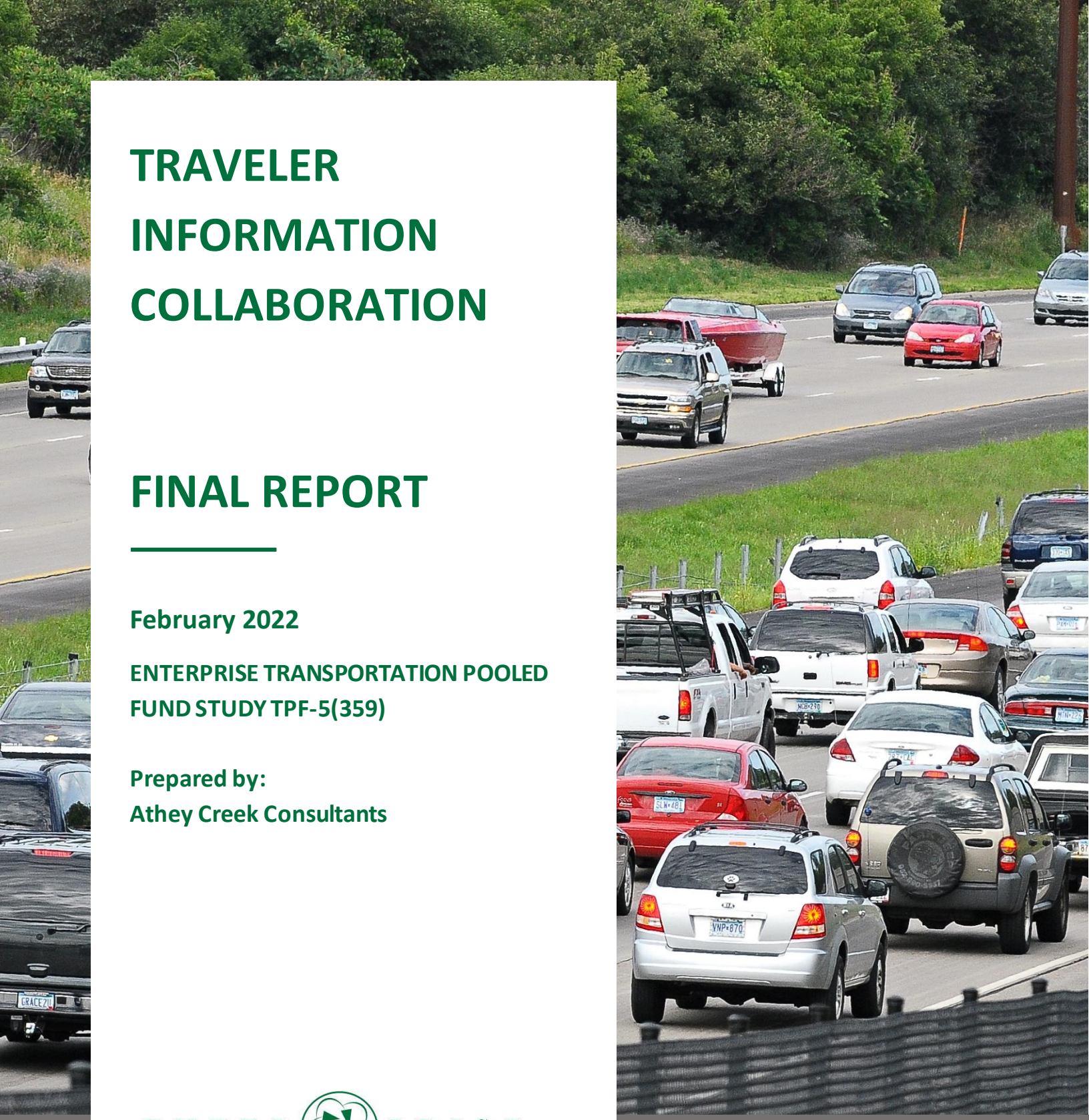

# TRAVELER INFORMATION COLLABORATION

# FINAL REPORT

**February 2022**

**ENTERPRISE TRANSPORTATION POOLED FUND STUDY TPF-5(359)**

**Prepared by:**
**Athey Creek Consultants**

ENTERPRISE

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The cover page image is courtesy of the Minnesota Department of Transportation.

## Project Champion

Sinclair Stolle from the Iowa Department of Transportation was the ENTERPRISE Project Champion for this effort. The Project Champion serves as the overall lead for the project.

## ENTERPRISE Members

The ENTERPRISE Board consists of a representative from each of the following member entities.

- Illinois Department of Transportation
- Iowa Department of Transportation
- Kansas Department of Transportation
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Ontario Ministry of Transportation
- Pennsylvania Department of Transportation
- Texas Department of Transportation
- Wisconsin Department of Transportation

## Project Input

ENTERPRISE would like to thank the many DOTs that provided input to the project through a project survey, and the American Association of State Highway and Transportation Officials (AASHTO) for their input.

# Table of Contents

# 1.0 Introduction

Traveler information has long been a management and operations strategy for transportation agencies. Used to inform travelers of events and conditions that may impact their trips, traveler information services have evolved considerably over the past 10 years.

**Project Objectives**

- To review the current state of traveler information practices focused on reporting weather events.
- To explore the concept of a traveler information community of practice (CoP).

The ENTERPRISE pooled fund study (PFS) program is a leader in the research, development, and application of intelligent transportation systems (ITS) innovations to advance transportation system management and operations. ENTERPRISE initiated this project to review the current state of traveler information practices focused on reporting weather events and explore the concept of a traveler information community of practice (CoP). The CoP could enable information sharing among traveler information coordinators who manage state and local department of transportation (DOT) traveler information systems, like the 511 Deployment Coalition. The 511 Deployment Coalition existed from 2000-2010 and supported transportation agencies as they developed and operated their initial 511 traveler information phone system and later traveler information websites and applications.

To accomplish the project objectives, an online survey was distributed to the traveler information contact(s) in each of the U.S. states as well as the Ontario Ministry of Transportation. The goals of the survey were to gather information about traveler information road weather reporting processes and activities and understand the current needs that might be met through a CoP. Based on the interest in a CoP gathered through the survey results, initial discussions were held with leadership from the American Association of State Highway and Transportation Officials (AASHTO) about the potential to accomplish a traveler information CoP, either by creating an activity or leveraging one or more existing activities. With interest from AASHTO on establishing a CoP, an activity has been added within AASHTO's Committee on Transportation System Operations (CTSO) focused on traveler information. While decisions about the operations of the traveler information CoP will be made by AASHTO, this document is intended to summarize the activities and findings of this research study and to provide input for consideration by AASHTO as they move forward with a CoP, as desired. This document describes the need for the CoP, the need for information exchanges (virtual and in-person) among traveler information coordinators/managers, and initial CoP topics to consider based on input received from this project.

This report includes the following sections:

- 2.0 Traveler Information Community of Practice Concept – Describes recommended concepts of a traveler information CoP and initial candidate CoP topics.
- 3.0 Road Weather Traveler Information Processes and Activities – Summarizes responses to an online survey conducted as part of this project that aimed to understand the road weather traveler information processes and activities used by state DOTs.

- 4.0 The Need for a Traveler Information Community of Practice – Describes the need for a Traveler Information CoP.
- 5.0 Project Summary and Next Steps – Provides an overall project summary and next steps.
- Appendix A – DOT Survey Distribution List
- Appendix B – DOT Survey Results
- Appendix C – CARS Consortium Poll Results

# 2.0 Traveler Information Community of Practice Concept

This section defines a concept for a traveler information CoP that is based on the project survey responses, industry research, and consultations with the ENTERPRISE PFS members, AASHTO, and other stakeholders. Based on the outreach and engagement with AASHTO for this project, AASHTO has included an activity to create a traveler information CoP within CTSO. It is important to note that decisions about the traveler information CoP will be made by AASHTO, however the information gathered and presented in this document is intended to provide input for AASHTO's consideration.

## 2.1 Recommended Concepts of a Traveler Information Community of Practice

Sections 3.0-5.0 of this document provide supporting information that led to the five recommended concepts of a traveler information CoP presented below:

1. **Traveler information coordinators' interactions are the highest priority for a Traveler Information CoP**

   Traveler information coordinators/managers in public agencies are responsible for making decisions and managing the traveler information systems that are continuously evolving. They need peer-to-peer direct communications with their counterparts in other organizations to ask questions, exchange ideas, and learn about emerging and best practices. Regular communications through emails and/or social media venues, supported by regular webinars with members of the CoP will create this exchange, but the most benefits will come if face-to-face meetings of the traveler information coordinators/managers are possible. Ideally, the CoP would benefit from support staff to support the CoP leadership, assist in the preparation of agendas, meeting facilitation, outreach to members, and preparation of meeting summaries.

   While the members and leadership of the CoP may define initiatives (e.g., projects focused on delivering a specific outcome such as industry recommended practices) for the CoP to undertake that go beyond member interaction, these interactions should remain a primary focus of the CoP.

2. **A broad range of technical and administrative topics should be discussed to ensure the Traveler Information CoP benefits all members**

   The roles of traveler information coordinators/managers in public agencies encompass many activities and require knowledge about multiple topics. A traveler information CoP should ensure that there is adequate opportunity for the coordinators/managers to select topics and to communicate about these topics in a way that is primarily influenced by the public sector members (i.e., what challenges they are facing, what experiences they can share, etc.). For example, the types of topics that traveler information coordinators/managers face include the following: specific software solutions, common operating procedures, integration of traveler information into a Traffic Management Center (TMC) or operations center, use of social media,

staffing, integration of control room staff with central communications, public record requests, in-house versus off-the-shelf software solutions, etc.

The time that members of the CoP will have the opportunity to interact (either in-person or by webinar) will be limited due to the demands of their current job. Therefore, advanced planning is recommended to reach out to members, understand the 'hottest topics' at the time, and then craft an agenda for each meeting that allows an appropriate level of discussion about challenges, sharing of best practice solutions, and forward-thinking about trends and direction of the industry.

3. **Travel information content discussed in the CoP should be decided, and regularly revisited, by CoP members**

   When the initial three-digit 511 phone systems launched around the year 2000, there was much discussion at the time about common content across all systems (e.g., highway travel, transit, commercial vehicle, etc.). Over the past twenty years, the content typically delivered on state DOT travel information systems has settled into mostly highway conditions, alerts, travel times, snowplow information, ferry and toll information, and others. Early versions of transit schedule information have often been replaced with transit trip planners operated by the city or Metropolitan Planning Organization (MPO) operating the transit services. Transit is identified as an example, but the concept is that there is likely to always be an evolution of new content types emerging and requiring more discussion until they stabilize, while other content may be removed or demand less discussion as it stabilizes. Therefore, this concept is that members of the CoP should collectively identify their priority focus areas and revisit these priorities periodically. The content priorities should not be determined by vendors or suppliers of road reporting systems or content.

4. **Private sector engagement should be managed to provide fair access and benefits to both public and private participants**

   Private sector vendors and contractors bring a wealth of knowledge to coalitions, committees, and communities of practice. However, the public sector members of the Traveler Information CoP will also benefit if there are opportunities for public agency only discussions. The most benefits are expected if a CoP could include a balance of time for public agency discussion about self-selected topics, rounded out from input and information sharing with private sector vendors.

5. **The CoP should consider a focus on the future of traveler information**

   As topics for the CoP are considered, it is important to consider new technologies as they become available and are deployed for data collection and dissemination related to traveler information. For example, the proliferation of smartphones over the last decade created new data sources from third-party providers (e.g., INRIX, HERE Technologies, Google Maps, Waze) that are increasingly used by agencies and third parties for traveler information, while also providing new mechanisms and tools for travelers to receive information. Over the next decade,

connected and automated vehicles (CAVs) are examples of emerging technologies that may further change the function and role of traveler information in several ways:

- Traveler information systems may be expanded and adapted to populate portions of the digital infrastructure (a critical aspect to supporting CAVs) with both existing and new, more detailed data to support automated vehicles (AVs).
- Innovations in data collection, hosted mapping solutions, and third-party data continue to create opportunities for agencies to expand and improve services, reduce costs for existing services, or both. This includes deployment of new sensors and CAV technologies on agency fleet vehicles like snowplows to collect new data that supports traveler information, as well as new data sources that are expected from increased deployment of private-sector CAVs.
- Traveler needs are changing, and traveler expectations for receiving increased quality and detail of information via new and different mechanisms continue to evolve.

These are just examples of the types of emerging topics the CoP may discuss.

## 2.2 Traveler Information Community of Practice Initial Candidate Topics

The online survey conducted as part of this project in March 2021 provided an opportunity for respondents to give reactions and input to initial topics of interest for a traveler information CoP, which are presented in this section. The survey was distributed to each of the U.S. states as well as the Ministry of Transportation Ontario. See Appendix A: DOT Survey Distribution List. Twenty-nine (29) responses were received from 26 agencies. See Appendix B: DOT Survey Results for complete survey results. While the suggested topics are identified below and in the Appendix, the concept for the proposed CoP is that participants would be invited to select the topics that are of greatest interest to them. Based on the number of survey responses, initial topics that may be discussed within a CoP include:

**Technology Topics:**

- Best practice sharing for data collection, information generation, and information delivery
- Automated entry of work zone information and worker presence status
- Technology changes and approaches states are taking to adapt
- Leveraging new and innovative data sources for traveler information
- Interactions between ATMS, and ATIS systems and services
- Evolving role of interactive voice response (IVR) phone systems and transitions to mobile device information delivery
- Real-time data via connected vehicles (Do we want to communicate traveler information messages to connected vehicles? How to communicate to the vehicles?)

**Logistical/Tactical Topics:**

- Traveler feedback regarding the use of traveler information systems and engagement of the public
- Open-source software for traveler information delivery
- Roles of 3rd party traveler information service providers

- Use of social media (Social media for data collection and pushing data out to social media)
- Traveler Information staffing
- Public record requests
- Role of transit information in statewide traveler information systems
- Role of commercial vehicle information in statewide traveler information systems
- Where is traveler information located in DOTs (office of communications vs. operations)

## 2.3 Traveler Information Community of Practice Candidate Membership Invitees

Table 1 includes a list of candidate invitees for the traveler information CoP. The list identifies the traveler information coordinator/manager in each state gathered during this project.

**Table 1 Candidate Invitees for the Traveler Information CoP**

| State | Name | Email |
|---|---|---|
| Alabama | Chris Hilyer | hilyerc@dot.state.al.us |
| Alaska | Alicia Stevens | alicia.stevens@alaska.gov |
| Arizona | Caroline Carpenter | ccarpenter2@azdot.gov |
| Arkansas | Denise Powell | denise.powell@ardot.gov |
| California | Kien Le | kien.le@dot.ca.gov |
| | Saeed Valizadeh | saeed.valizadeh@dot.ca.gov |
| Colorado | Rob Bruening | rob.bruening@state.co.us |
| Connecticut | Hal Decker | harold.decker@ct.gov |
| Delaware | Gene Donaldson | gene.donaldson@state.de.us |
| Florida | Fred Heery | fred.heery@dot.state.fl.us |
| Georgia | Matt Glasser | mglasser@dot.ga.gov |
| Hawaii | Bryan Kimura | bryan.kimura@hawaii.gov |
| Idaho | Saran Becker | saran.becker@itd.idaho.gov |
| Illinois | Kevin Price | kevin.price@illinois.gov |
| Indiana | Matthew Cook | MCook@indot.in.gov |
| Iowa | Sinclair Stolle | sinclair.stolle@iowadot.us |
| Kansas | Tom Hein | tom.hein@ks.gov |
| | Dale Kirmer | dale.kirmer@ks.gov |
| Kentucky | Randi Feltner | randi.feltner@ky.gov |
| Louisiana | Rosalinda Deville | rosalinda.deville@la.gov |
| | Steve Glascock | stephen.glascock@la.gov |
| Maine | Colby Fortier-Brown | colby.fortier-brown@maine.gov |
| Maryland | Scott Yinger | syinger@mdot.maryland.gov |
| | Joey Sagal | jsagal@mdot.maryland.gov |
| Massachusetts | Lorenzo Parra | Lorenzo.Parra@dot.state.ma.us |
| Michigan | Joe Gorman | gormanj4@michigan.gov |
| Minnesota | Todd Fairbanks | todd.fairbanks@state.mn.us |
| Mississippi | Russell Cooke | rcooke@mdot.ms.gov |
| Missouri | Alex Wassman | alexander.wassman@modot.mo.gov |

| State | Name | Email |
|---|---|---|
| Montana | Mike Warren | mwarren@mt.gov |
| Nebraska | Jessica Sherwood | Jessica.Sherwood@nebraska.gov |
| Nevada | LaShonn Ford | lford@dot.nv.gov |
| New Hampshire | Susan Klasen | susan.klasen@dot.nh.gov |
| New Jersey | Susan Catlett | Susan.Catlett@dot.nj.gov |
| New Mexico | Charles Remkes | charles.remkes@state.nm.us |
| New York | Paul Krekeler | paul.krekeler@dot.ny.gov |
| North Carolina | Kelly Wells | kwells@ncdot.gov |
| North Dakota | Brandon Beise | bbeise@nd.gov |
| Ohio | John MacAdam | John.MacAdam@dot.ohio.gov |
| | Mike McNeill | Michael.McNeill@dot.ohio.gov |
| | William Welch | William.Welch@dot.ohio.gov |
| Oklahoma | Reina Wilson | rwilson@odot.org |
| | Marty (James) Farris | jfarris@odot.org |
| | Alan Stevenson | astevenson@odot.org |
| Oregon | Brent Atkinson | brent.d.atkinson@odot.state.or.us |
| Pennsylvania | David Gaffney | davgaffney@pa.gov |
| Rhode Island | Dan Herstine | daniel.herstine@jacobs.com |
| South Carolina | Jennifer Rhoades | rhoadesjo@scdot.org |
| South Dakota | Dave Huft | dave.huft@state.sd.us |
| Tennessee | Adam Moncivaez | Adam.Moncivaez@tn.gov |
| Texas | Sarah Berryhill | sarah.berryhill@txdot.gov |
| | Brent Eastman | Brent.Eastman@txdot.gov |
| | David Freidenfeld | David.Freidenfeld@txdot.gov |
| Utah | Lisa Miller | lisamiller@utah.gov |
| Vermont | Ryan Knapp | ryan.knapp@vermont.gov |
| Virginia | Scott Cowherd | scott.cowherd@vdot.virginia.gov |
| Washington | Jeremy Bertrand | BertraJ@wsdot.wa.gov |
| West Virginia | Jim Lambert | jim.e.lambert@wv.gov |
| Wisconsin | Stacey Pierce | Stacey.Pierce@dot.wi.gov |
| Wyoming | Vince Garcia | vince.garcia@wyo.gov |
| MTO | Steve Birmingham | steve.birmingham@ontario.ca |

# 3.0 Road Weather Traveler Information Processes and Activities

As noted in Section 2.0, a survey was distributed in March 2021, to traveler information contact(s) in each of the U.S. states as well as the Ministry of Transportation Ontario. See Appendix A: DOT Survey Distribution List. The contact list has been updated since the survey distribution as the project was informed of contact changes.

The purpose of the survey was to gather information about traveler information road weather reporting processes and activities. Another goal of the survey was to understand current needs that might be met through a community of practice that is presented in Section 4.0 Traveler Information CoP Concept.

Twenty-nine (29) responses were received from 26 agencies. The following bullets highlight survey responses received about road weather traveler information processes and activities. Complete survey responses are included in Appendix B: DOT Survey Results.

**Most Common Road Weather Events Reported**

- Winter driving conditions
- Flooding
- Weather warning/alerts
- ESS data

- The most **common road weather events reported** by survey participants were winter driving conditions (26 responses), flooding (21 responses), weather warning/alerts (19 responses), and data from Environmental Sensor Stations (ESS) (16 responses).
- Weather forecasts (22 responses) and weather warnings/alerts (24 responses) were most selected by survey respondents for **the types of weather events received from other entities**. Flooding (15 responses) and wind (15 responses) were also selected.
- When asked what the sources are for the weather events received from other entities, responders indicated several **entities that provide road weather information,** including forestry departments, citizens, contracted weather services, wildfire officials, National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS).
- Plow tracking (8 responses), images from cameras on plow or maintenance vehicles (7 responses), weather forecasts (4 responses), and radar (3 responses) are **road weather events** that have been **added by agencies in the past 3 years**. The reason for adding new features varies however as agencies update their traveler information websites additional options are considered. The new features provide the public with additional information to make better travel decisions and provide DOT staff with more information to, for example, improve proactive maintenance decision making.
- The **frequency of assembling road weather event information** provided by DOTs varied.
    - Staff observations – regular frequency during winter months (15 responses)
    - Staff observations – exception reporting during winter months (20 responses)
    - Data collected by ESS – year-round reporting of conditions (16 responses)

- **Dissemination mechanisms** operated by DOTs to share road weather information included traveler information websites (27 responses), traveler information phone (18 responses), Facebook (18 responses), Twitter (21 responses), and DOT app (17 responses).
- XML feeds (12 responses) and data portals (12 responses) were selected as the most used **mechanisms to share road weather events with private sector** traveler information providers.

**Dissemination Mechanisms to Share Road Weather Information**

- Traveler Information Websites
- Traveler Information Phone
- Facebook
- Twitter
- DOT application

- More than half of survey respondents (17 responses) **do not fuse together data**. Those that do fuse data together (8 responses) have different approaches. For example, Delaware DOT noted that they have a dedicated software development team. Internal and external web-based applications were developed that present data (historic and real time) from multiple sources. Another example by the Idaho Transportation Department is that whenever a winter road condition report is entered into the system by department personnel, the traveler information automatically queries the National Weather Service to construct a custom short-range weather forecast for that specific section of highway and attaches it to the winter road condition report viewed by the public.
- Approximately half of the survey respondents (14 responses) **do not coordinate with neighboring states for consistency** in disseminating road weather related content. Thirteen (13) of the respondents coordinate with neighboring states. Coordination may include contacting a neighboring TMC to post messages on dynamic message signs.

# 4.0 The Need for a Traveler Information Community of Practice

This section describes the need for a Traveler Information CoP. Three project activities were conducted to assess and document the need for a CoP:

- ***Industry survey.*** As noted in Section 3.0, the online survey distributed through this project included questions to understand current needs that might be met through a CoP.
- ***CARS Group poll.*** The Condition Acquisition Reporting System (CARS) Group was polled in May 2021 on questions related to this project. The CARS Group members include those transportation agencies that use CARS (a software product provided through Castle Rock Associates) for their traveler information system. The CARS Group meets monthly to exchange related traveler information topics. It is important to note that many respondents also completed the survey for this project. Seven (7) responses were received.
- ***Current sources.*** Research and documentation of current industry sources for traveler information coordinators.

## 4.1 Survey and Poll Findings on the Need for a Traveler Information Community of Practice

Several questions included in the online survey were intended to understand the need for and willingness to participate in a CoP, summarized as follows:

- Seventeen (17) agencies selected the option indicating a need for a national group comprised of travel information managers to share current ideas and concepts.
- When prompted on how the coordinators currently receive guidance or discuss travel information ideas and challenges, the most selected options were FHWA (16 responses) and a consortium of states using a common software system (13 responses).
- The majority of survey respondents indicated a need for additional guidance or input related to traveler information. In addition, there were also a number of challenges noted to managing traveler information as well as current and emerging traveler information needs that could be addressed with a national group.

Also, relevant to the consideration of a traveler information CoP, the survey asked questions about the extent to which agencies are implementing new features, functions, and emerging technologies to their traveler information systems.

- Responders indicated they are periodically updating their traveler information system to add new features. Within the last three years:
    - Eight (8) agencies that responded to the survey have added plow tracking,
    - Seven (7) agencies have added images from cameras on snowplows or maintenance vehicles,
    - Four (4) respondents have added weather forecasts, and
    - Three (3) agencies have added radar.

The new features provide the public with additional information to make better travel decisions and provide DOT staff with more information to, for example, improve proactive maintenance decision making.

Ten (10) of the agencies that responded to the survey indicated that they benefit from participation in an existing group that discusses traveler information topics. Thirteen (13) of the responders selected the option to indicate they participate in a consortium of states that use a common traveler information software solution. There are also several known groups formed around common software solutions that deliver considerable benefit. However, there is always the risk that these may represent solutions limited to the capabilities of the common system. Participation in a national group may allow the agencies that use different traveler information software to share what has worked well, lessons learned, new features planned in addition to many other topics.

The CARS Consortium members present at their May 2021 meeting were asked if they feel there is a need for a national group comprised of state traveler information coordinators to share current ideas and concepts (similar to the 511 Coalition from years ago). Four (4) attendees responded yes and 3 responded that the traveler information groups they currently participate in already fill this need. The CARS Consortium members were also asked where they get insight and support for their traveler information program (beyond the CARS Consortium). Two (2) respondents selected the FHWA Road Weather Program, 3 selected different consortiums/coalitions, and 2 selected other. As part of the poll, participants were also asked about their office position. If a position is outside of operations within their DOT it may limit exposure to some groups (e.g., AASHTO CTSO, NOCoE).

## 4.2 Current Sources of Traveler Information Support and Guidance

A review of the current availability of traveler information support and guidance was researched to help understand the extent to which traveler information is a topic that promulgates through existing technology transfer and/or education and outreach activities. A second reason for researching this was to help identify potential existing institutions and activities that may be positioned to support a CoP if it is determined to be needed.

Research into existing sources of traveler information support was not intended to be exhaustive, but rather representative of the current environment. The findings identified the following examples:

- The National Operations Center of Excellence (NOCoE) Knowledge Center[1] contains a considerable library of resources related to traveler information. The Case Studies[2] available on the website describe specific examples of advances in traveler information, such as:
    - New Jersey DOT's newer and improved 511NJ.org;[3]

[1] NOCoE. Knowledge Center. https://www.transportationops.org/knowledge-center/search?keyword=traveler+information.
[2] NOCoE. Case Studies. https://transportationops.org/case-studies
[3] 511NJ.org Newer and Improved. (2020) https://transportationops.org/case-studies/511njorg-newer-and-improved.

- Use of Florida 511 by evacuees during Hurricane Irma;[4]
- North Carolina's live 511 Call Center through a partnership between the DOT and Correctional Institute for Women;[5] and
- 511PAConnect as two-way direct emergency communication for stranded travelers.[6]

- The National Rural Intelligent Transportation Systems (NRITS) conferences have typically featured a variety of presentations, sessions, and workshops related to traveler information. The number of traveler information related presentations is lower than in the early 2000s, but examples of recent presentations include:
  - *The One-Stop-Shop for Rural Traveler Information – Serving Real-Time Traveler Information Across the Western States*[7] in 2020;
  - *TransView Traveler Information System*[8] in 2019; and
  - *The Future of 511 Phone in the North/West Passage States*[9] in 2018.
- Transportation Pooled Fund Studies (PFSs). Several of the PFSs have conducted projects that provide resources to their members and the entire industry. Some examples include:
  - The TMC PFS conducts studies related to traveler information, such as appropriate dynamic message sign (DMS) content[10,11] and next generation of traveler information systems.[12]
  - The North/West Passage PFS focuses on developing effective methods for sharing, coordinating, and integrating traveler information and operational activities across borders. Recently completed traveler information related projects include:
    - State Weather Messaging Coordination in 2021
    - DOT Traveler Information Website Crowdsourcing Practices in 2020

[4] Hurricane Irma Evacuees Use of Florida 511. (2019) https://transportationops.org/case-studies/hurricane-irma-evacuees-use-florida-511

[5] Live 511 Call Center Created Between North Carolina DOT and Correctional Institute for Women. (2019) https://transportationops.org/case-studies/live-511-call-center-created-between-north-carolina-dot-and-correctional-institute.

[6] 511PAConnect: Two-Way Direct Emergency Communication for Stranded Travelers. (2019) https://transportationops.org/case-studies/511paconnect-two-way-direct-emergency-communication-stranded-travelers.

[7] The One-Stop-Shop for Rural Traveler Information – Serving Real-Time Traveler Information Across the Western States. (2020) http://www.nationalruralitsconference.org/wp-content/uploads/2020/11/VR2CS3P2_Galarus.mp4.

[8] TransView Traveler Information System. (2019) http://www.nationalruralitsconference.org/wp-content/uploads/2019/01/2018-Pope-Transview-Traveler-Information-System.pdf.

[9] The Future of 511 Phone in the North/West Passage States. (2018) http://www.nationalruralitsconference.org/wp-content/uploads/2019/01/2018-Ernest-Future-of-511-in-NWP-States.pdf.

[10] Use of Color Changeable Message Signs - Current Practices and Research. https://tmcpfs.ops.fhwa.dot.gov/projects/guidecms.htm.

[11] Public Perception of Safety Messages and Public Service Announcements on Dynamic Message Signs in Rural Areas. (2016) https://ops.fhwa.dot.gov/publications/fhwahop16048/index.htm.

[12] Next Generation Traveler Information System-A Five Year Outlook. (2015) https://tmcpfs.ops.fhwa.dot.gov/projects/ngtis.htm.

        - DOT Traveler Information Website Features and Usage in 2020
        - Evaluation of Rural 511 Phone Service in 2018
        - Plow Camera and Location Sharing Practices in 2018
    - The Aurora PFS recent related traveler information projects include:
        - Optimal RWIS Sensor Density and Location in 2021
        - RWIS Life Cycle Cost Analysis in 2020
    - ENTERPRISE has also completed a number of traveler information related projects.
        - Real-Time Integration of Arrow Board Messages in Traveler Information Systems in 2020
        - Automated Classification of Winter Road Conditions in 2020
- The FHWA Road Weather Management Program (RWMP) leads initiatives that inform traveler information specific to road weather impacts, such as:
    - Pathfinder[13] (part of the Weather-Savvy Roads initiative) promotes increased collaboration between DOTs, National Weather Service, and private sector weather service providers for improved messaging and traveler information via DMS, traveler information websites, social media, and press releases.
    - Integrating Mobile Observations (IMO)[14] (part of the Weather-Savvy Roads initiative) and Weather Responsive Management Strategies (WRMS)[15] initiatives promote the use of technology and other data sources to improve capabilities, including the availability and quality of traveler information, such as plow cams for images or video and road condition reports.

  A variety of outreach activities like the annual RWMP Stakeholder Meeting, Regional Roundtables conducted multiple times each year, and other summits and webinars inform stakeholders about best and current practices regarding traveler information.
- The FHWA Work Zone Data Initiative (WZDI)[16] and USDOT Work Zone Data Exchange (WZDx)[17] are complementary activities to standardize work zone event data, respectively for all use cases and the traveler information use case. The WZDI Data Dictionary is a foundational document for the efforts of the WZDx Work Zone Data Working Groups to prioritize data elements expand and

[13] FHWA Road Weather Management Program Publications, EDC-4/Weather-Savvy Roads: Pathfinder Resources. https://ops.fhwa.dot.gov/weather/resources/publications.htm#edc4.
[14] FHWA Road Weather Management Program Publications, EDC-4/Weather-Savvy Roads: Integrating Mobile Observations (IMO) Resources. https://ops.fhwa.dot.gov/weather/resources/publications.htm#edc4.
[15] FHWA Road Weather Management Program Publications, EDC-5/Weather Responsive Management Strategies. https://ops.fhwa.dot.gov/weather/resources/publications.htm#edc5.
[16] FHWA Work Zone Management Program, Work Zone Data Initiative. https://ops.fhwa.dot.gov/wz/wzdx/index.htm#wzdi.
[17] Work Zone Data Exchange Specification homepage https://github.com/usdot-jpo-ode/wzdx/blob/master/README.md.

incrementally expand and refine the WZDx data specification through a stakeholder, consensus-driven effort, enabling infrastructure owners and operators (IOOs) to make harmonized work zone data available for third party use. As of December 2021, WZDx Version 4.0 is the latest update available.

- The FHWA Non-Recurring Event Data (NRED) project aims to expand on the WZDx effort by developing a broader data specification to standardize reporting of incidents, special events, and road weather data for traveler information.

Based on the review of traveler information support and guidance it was found that the traveler information efforts continue to be highlighted through projects and initiatives as well as presentations at conferences.

# 5.0 Project Summary and Next Steps

The following bullets highlight key information that was gathered from the project to understand the current state of traveler information practices focused on reporting weather events and exploring the concept of a traveler information CoP.

- The traveler information managers are still actively advancing and improving traveler information data assembly and delivery for road weather reporting, with new content and sources of data being added. Plow tracking, images from cameras on plow or maintenance vehicles, weather forecasts, and radar are road weather events that have been added by agencies in the past 3 years.
- There are differences in the approaches used by states for road weather reporting. For example, only 8 survey respondents fuse together data.
- Half of the survey respondents coordinate with neighboring states on road weather information.
- There was no mention of connected and automated vehicle (CAV) activities nor any mention of digital infrastructure, however these were not specifically asked by the survey.
- The top three areas where additional guidance is needed included: best practices display of content on websites or applications, data feed standards, and best practices for 511 phone systems.
- There is a strong interest in a national group and many topics were noted of interest for discussion with a national group (e.g., challenges, best practices, integration). Coupled with the interest in a national group is that 13 respondents noted that they currently belong to a consortium of states that use a common traveler information system provider to share information.
- A variety of candidate options are available for the proposed traveler information CoP, ranging from simple approaches with minimal level of effort to a more complex and more engaged entity that will have higher costs.

Based on the strong interest from the survey results and discussions with FHWA and AASHTO, the proposed next steps to conclude this project effort and contribute towards exploring a national community of practice around traveler information are:

- Assemble a List of Traveler Information Coordinators – Completed (as used for the survey)
- Support AASHTO in a kickoff webinar
- Support AASHTO leadership in finalizing the Concept Paper to be shared with AASHTO and the CoP.

# Appendix A: Survey Distribution List

The following traveler information contact list was created in November 2020 and was updated as the project was informed throughout the duration of the project.

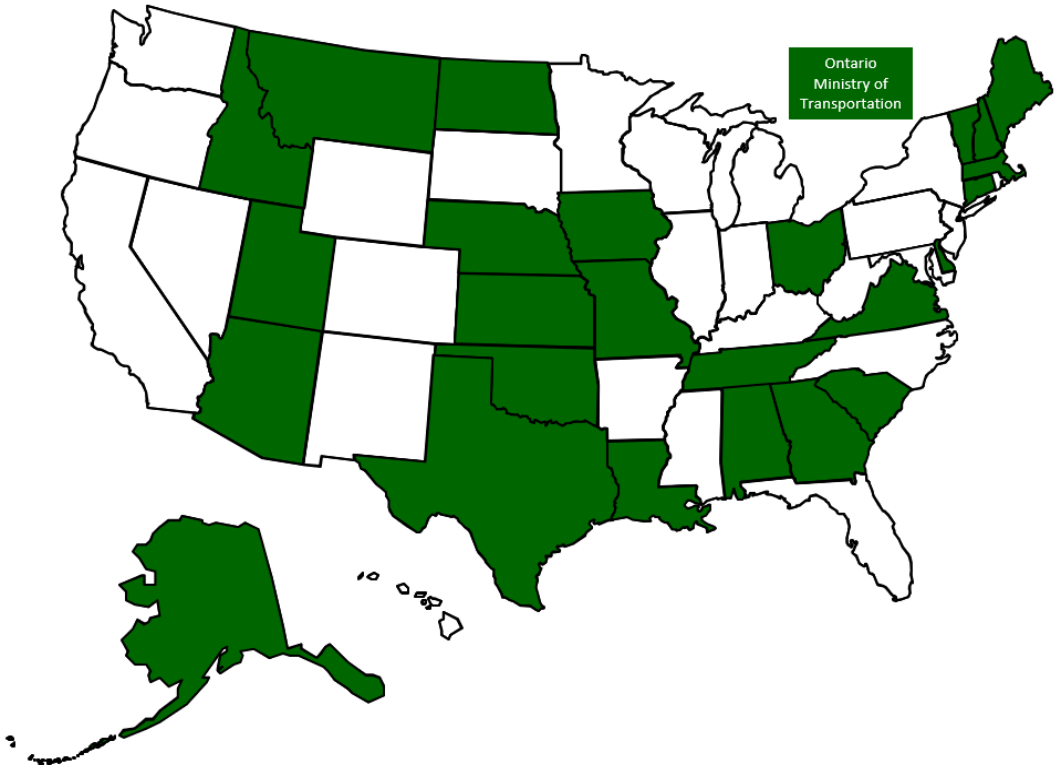
| State | Name | Email |
|---|---|---|
| Alabama | Chris Hilyer | hilyerc@dot.state.al.us |
| Alaska | Alicia Stevens | alicia.stevens@alaska.gov |
| Arizona | Caroline Carpenter | ccarpenter2@azdot.gov |
| Arkansas | Denise Powell | denise.powell@ardot.gov |
| California | Kien Le | kien.le@dot.ca.gov |
| | Saeed Valizadeh | saeed.valizadeh@dot.ca.gov |
| Colorado | Rob Bruening | rob.bruening@state.co.us |
| Connecticut | Hal Decker | harold.decker@ct.gov |
| Delaware | Gene Donaldson | gene.donaldson@state.de.us |
| Florida | Fred Heery | fred.heery@dot.state.fl.us |
| Georgia | Matt Glasser | mglasser@dot.ga.gov |
| Hawaii | Bryan Kimura | bryan.kimura@hawaii.gov |
| Idaho | Saran Becker | saran.becker@itd.idaho.gov |
| Illinois | Kevin Price | kevin.price@illinois.gov |
| Indiana | Matthew Cook | MCook@indot.in.gov |
| Iowa | Sinclair Stolle | sinclair.stolle@iowadot.us |
| Kansas | Tom Hein | tom.hein@ks.gov |
| | Dale Kirmer | dale.kirmer@ks.gov |
| Kentucky | Randi Feltner | randi.feltner@ky.gov |
| Louisiana | Rosalinda Deville | rosalinda.deville@la.gov |
| | Steve Glascock | stephen.glascock@la.gov |
| Maine | Colby Fortier-Brown | colby.fortier-brown@maine.gov |
| Maryland | Scott Yinger | syinger@mdot.maryland.gov |
| | Joey Sagal | jsagal@mdot.maryland.gov |
| Massachusetts | Lorenzo Parra | Lorenzo.Parra@dot.state.ma.us |
| Michigan | Joe Gorman | gormanj4@michigan.gov |
| Minnesota | Todd Fairbanks | todd.fairbanks@state.mn.us |
| Mississippi | Russell Cooke | rcooke@mdot.ms.gov |
| Missouri | Alex Wassman | alexander.wassman@modot.mo.gov |
| Montana | Mike Warren | mwarren@mt.gov |
| Nebraska | Jessica Sherwood | Jessica.Sherwood@nebraska.gov |
| Nevada | LaShonn Ford | lford@dot.nv.gov |

| State | Name | Email |
|---|---|---|
| New Hampshire | Susan Klasen | susan.klasen@dot.nh.gov |
| New Jersey | Susan Catlett | Susan.Catlett@dot.nj.gov |
| New Mexico | Charles Remkes | charles.remkes@state.nm.us |
| New York | Paul Krekeler | paul.krekeler@dot.ny.gov |
| North Carolina | Kelly Wells | kwells@ncdot.gov |
| North Dakota | Brandon Beise | bbeise@nd.gov |
| Ohio | John MacAdam | John.MacAdam@dot.ohio.gov |
| | Mike McNeill | Michael.McNeill@dot.ohio.gov |
| | William Welch | William.Welch@dot.ohio.gov |
| | Reina Wilson | rwilson@odot.org |
| Oklahoma | Marty (James) Farris | jfarris@odot.org |
| | Alan Stevenson | astevenson@odot.org |
| Oregon | Brent Atkinson | brent.d.atkinson@odot.state.or.us |
| Pennsylvania | David Gaffney | davgaffney@pa.gov |
| Rhode Island | Dan Herstine | daniel.herstine@jacobs.com |
| South Carolina | Jennifer Rhoades | rhoadesjo@scdot.org |
| South Dakota | Dave Huft | dave.huft@state.sd.us |
| Tennessee | Adam Moncivaez | Adam.Moncivaez@tn.gov |
| | Sarah Berryhill | sarah.berryhill@txdot.gov |
| Texas | Brent Eastman | Brent.Eastman@txdot.gov |
| | David Freidenfeld | David.Freidenfeld@txdot.gov |
| Utah | Lisa Miller | lisamiller@utah.gov |
| Vermont | Ryan Knapp | ryan.knapp@vermont.gov |
| Virginia | Scott Cowherd | scott.cowherd@vdot.virginia.gov |
| Washington | Jeremy Bertrand | BertraJ@wsdot.wa.gov |
| West Virginia | Jim Lambert | jim.e.lambert@wv.gov |
| Wisconsin | Stacey Pierce | Stacey.Pierce@dot.wi.gov |
| Wyoming | Vince Garcia | vince.garcia@wyo.gov |
| | | |
| MTO | Steve Birmingham | steve.birmingham@ontario.ca |

# Appendix B: Survey Results

## Question 1: Responding Agencies

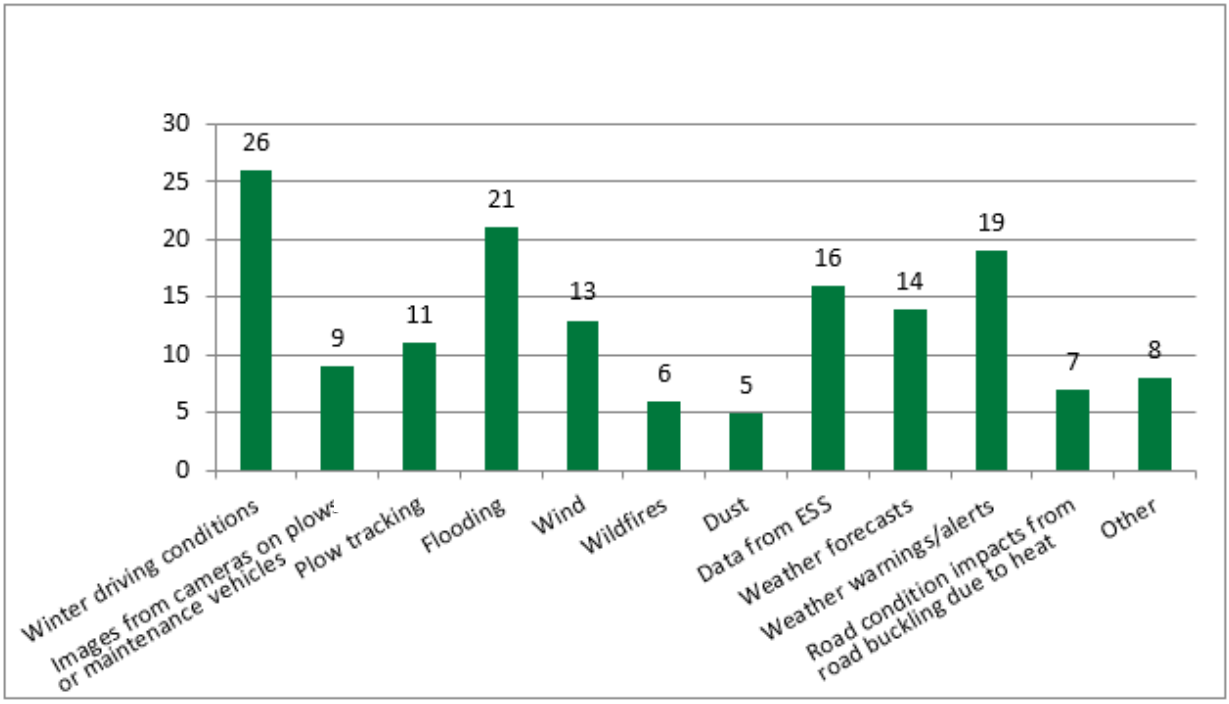
29 responses from 26 agencies




- Alabama DOT
- Alaska DOT&PF
- Arizona Department of Transportation
- Connecticut DOT
- Delaware DOT
- Georgia DOT (2 responses)
- Idaho Transportation Department
- Iowa DOT
- Kansas DOT
- Louisiana Department of Transportation & Development
- Maine DOT
- Maryland DOT State Highway Administration
- Missouri DOT
- Montana DOT
- Nebraska DOT
- New Hampshire DOT - TSMO Bureau - TMC
- North Dakota DOT
- Ohio DOT (2 responses)
- Oklahoma DOT
- Ontario Ministry of Transportation
- South Carolina DOT
- Tennessee DOT
- Texas DOT
- Utah DOT
- Vermont Agency of Transportation
- Virginia DOT
- Anonymous

**Question 2: What type of road weather events are COMMONLY reported by your agency? Select all that apply.**

28 responses

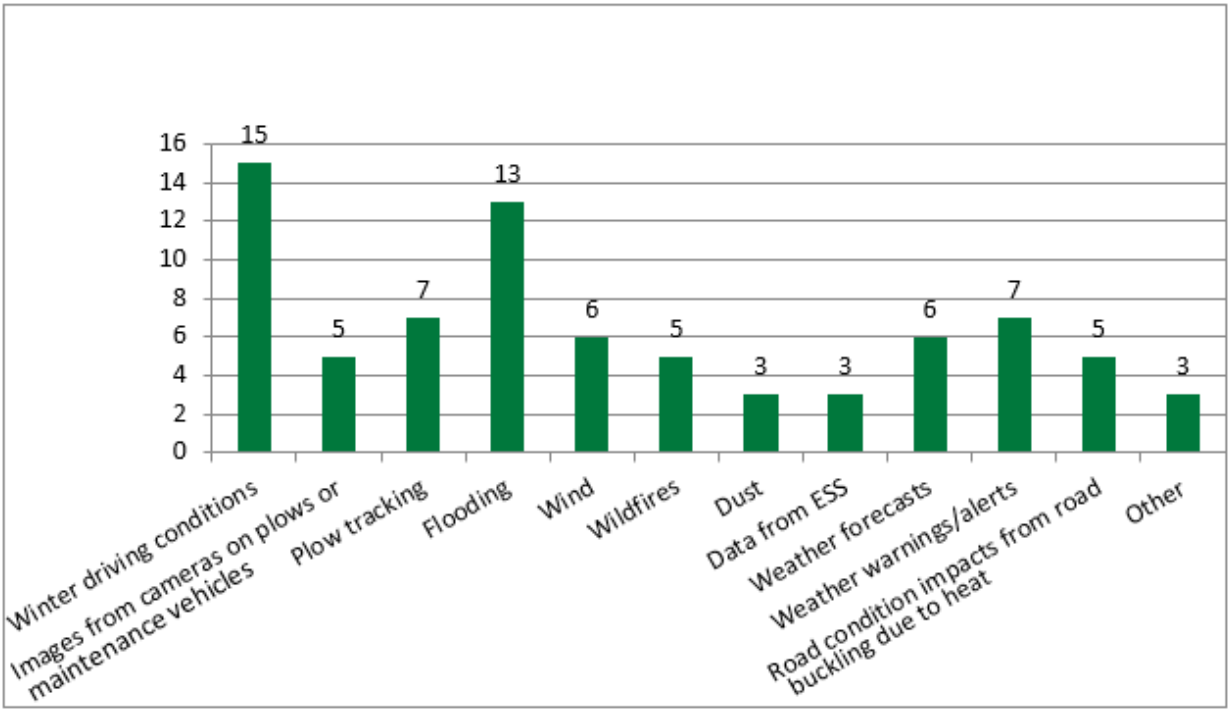



Other responses:

- Weather Radar (not really an "event" though)
- Images from roadside cameras
- Storm damage (debris, power lines, trees etc. in roadway)
- Plow Tracking is a service provided, however it is a separate website from our TIS/511.
- Images from cameras on RWIS. Weather radar. Also that last item of yours caught my attention... we report road condition impacts from frost heaves caused by repeated freeze/thaw cycles.
- Black ice warnings
- Weather Radar tiles from MDSS provider
- special events

**Question 3: What type of road weather events are EXCEPTIONALLY reported by your agency? Select all that apply.**

24 responses

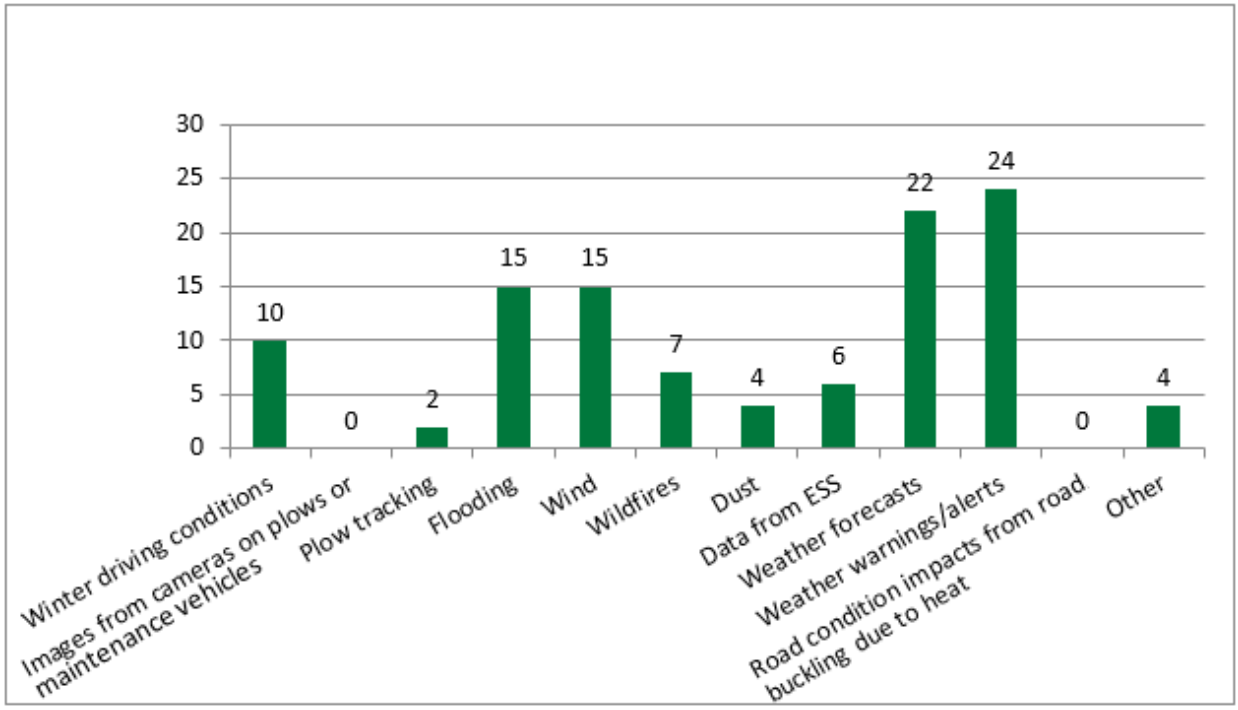



Other responses:

- Alternate Routes
- Plow Tracking is a service provided, however it is a separate website from our TIS/511.
- Total solar eclipse

**Question 4: What type of weather events do you receive information about from other entities (e.g., National Weather Service (NWS)? Select all that apply.**

27 responses




Other responses:

- Radar
- Weather radar
- Road Weather Forecasts
- Weather Radar tiles from MDSS provider

### Question 5: Please note which entity provides the road weather information.

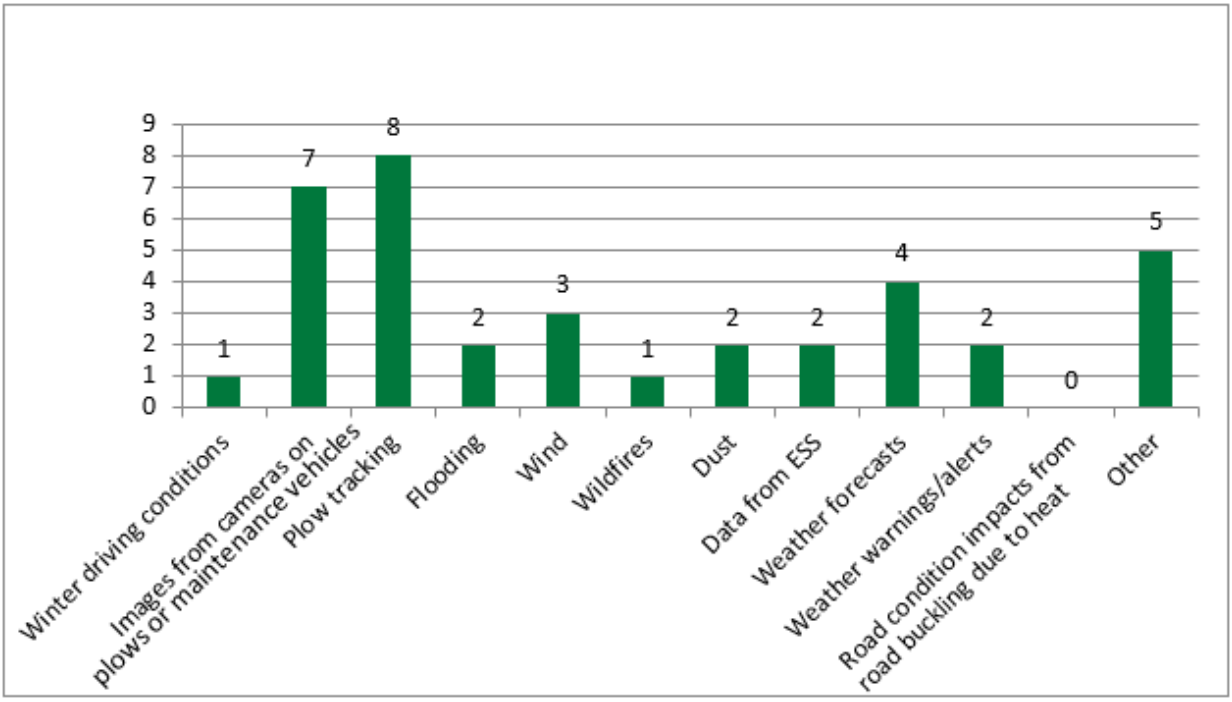
26 responses

Responses:

- Baron Weather
- Citizens
- ClearPath
- Contracted weather services
- DTN
- Forestry Department
- Geotab
- Internal to SCDOT
- Local municipalities
- National Weather Service
- NOAA
- NOAA River Observation: Steam Gauges
- Northern Vermont University
- NWS public info
- ODOT
- Our highway maintenance contractors (3rd party)
- Plow crews
- SOC
- Still government agency – by different Ministry
- Telematics companies as part of our privatized highway maintenance
- Weather sensors
- Wildfire officials
- Wood

**Question 6: What type of road weather events have been added in the past 3 years? Select all that apply.**

19 responses




Other responses:

- Radar
- These are not new in the last 3 years, but we have expanded access to ESS and plow tracking drastically in the last 3 years.
- Nothing added recently
- Weather radar
- Weather Radar

### Question 7: What was the reason for adding the new mechanism for reporting road weather events?

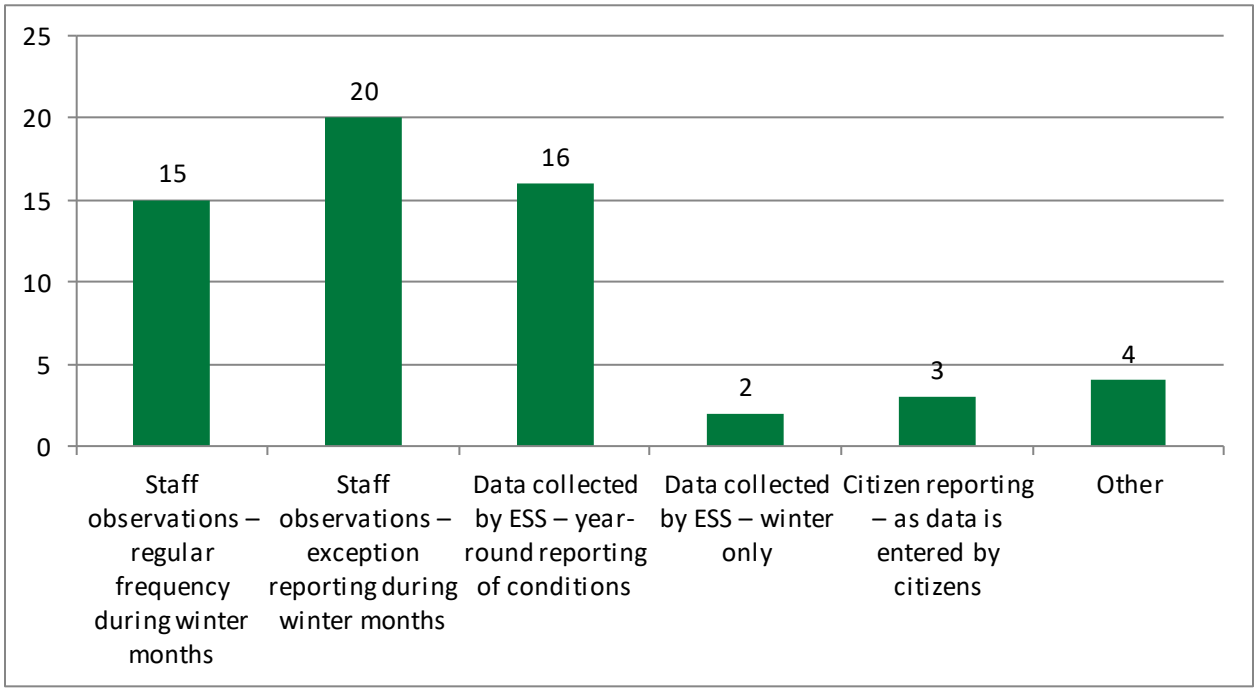
27 responses

Responses:

- Data from pilot and smaller projects was promising so use was expanded to cover the whole state.
- Assessing roadway conditions on each snow plow route
- Available internally easy enough to provide externally
- AVL was added to our trucks
- Became technically feasible; better information to the public
- Need to facilitate short term travel planning.
- Developed Plow Tracker Website that is public-facing ("S.T.O.R.M.")
- Efficiency during snowstorms
- Free availability
- Repeated large scale incidents in the north country - extreme gusts causing tractor trailer units to tip
- Provided basic radar for many years and found out DTN could provide a more detailed radar
- Management request during flooding events
- Technology became available
- Added safety value to motorists and enhanced highway operations
- New website, capable of improved features
- Information for maintenance crews and the public to increase safety
- Provide more information to the public
- public demand
- This helps to add to the "story" of what's happening and allow for users to make better travel decisions.
- Improved fleet and resource management, driver feedback on road conditions
- MARWIS (images not public yet)
- Public info
- To give the public a visual of actual road conditions
- To improve proactive maintenance decision making
- Valuable info from nws and easy enough to provide through the travel info map
- Upgraded public website
- To increase safety for the public

**Question 8: What reporting processes are used to assemble the road weather event information for information provided by the DOT and what is the frequency of the reports? Select all that apply.**

27 responses

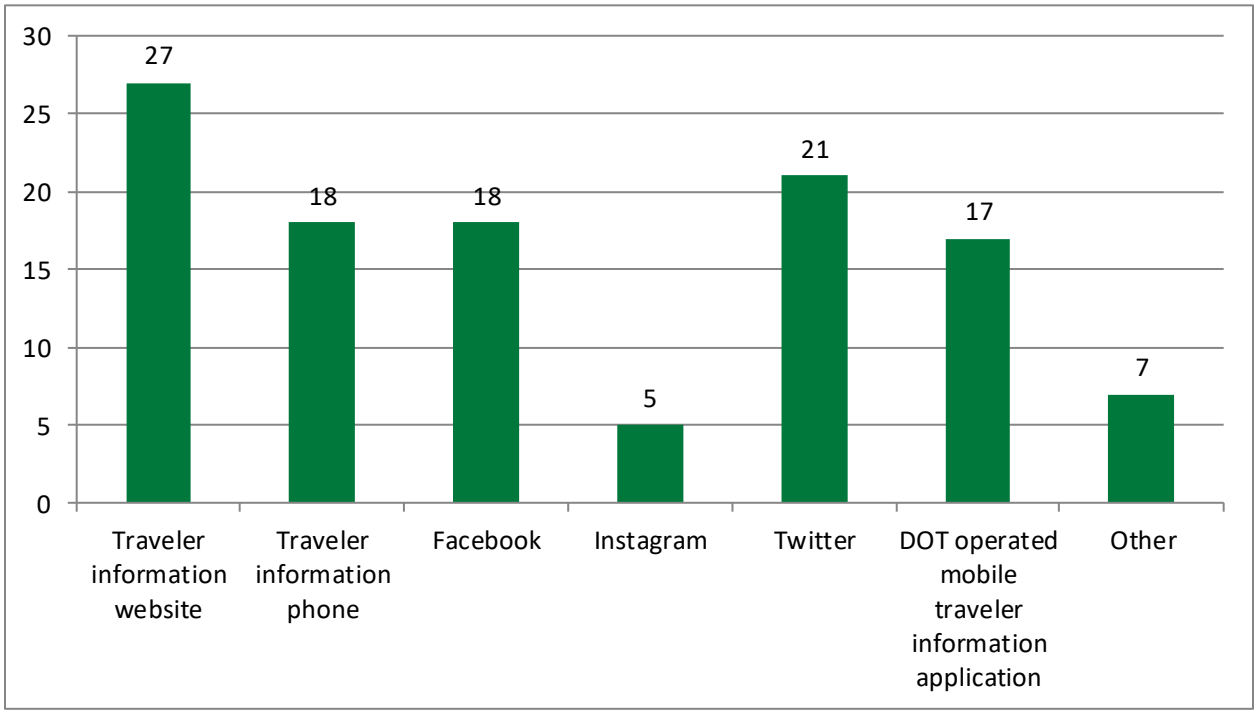



Other responses:

- Reporting is based on event impact not by time of year
- CCTV and Grip (friction) sensors from our RWIS (ESS) stations. Survey 123 filled out twice per day by Maintenance Supervisors during Winter storms.
- News Media ATMS access I-95
- roadway and air temperature/relative humidity information from snow plow vehicles

**Question 9: What dissemination mechanisms does your agency operate to share road weather event information to the public? Select all that apply.**

27 responses

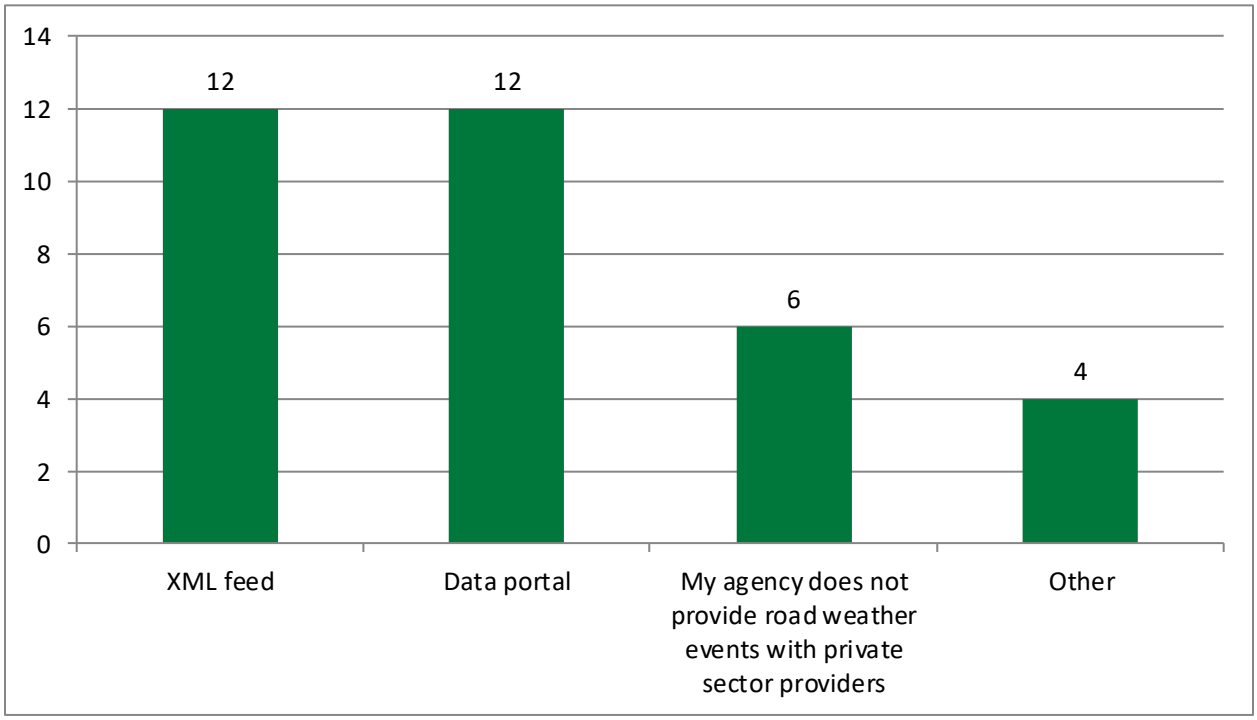



Other responses:

- Our WeatherView site for weather-specific data weatherview.iowadot.gov
- WTMC 1380 AM and CQ98.5 FM
- DMS, Email and Text Alerts
- The TMC publishes Road Condition Reports twice per day during the winter months. The publication is sent to all of VT's media outlets for them to report on. The goal is to provide general driving conditions for the morning and evening commutes.
- Variable message signs
- Live notification push, especially for weather closures.
- Electronic message boards along state highways

**Question 10: Please select the mechanism used to share road weather events with private sector traveler information providers. Select all that apply.**

25 responses




Other responses:

- Data from ESS, road weather forecasting, and NWS is fused together for use in the decision making process.
- RSS
- API (XML & JSON)
- API for emergency response agencies

### Question 11: Does your traveler information system fuse together data (e.g., combining manually entered reports with National Weather Service (NWS) weather data or data from nearby snowplows and presenting them as one overall event) from different sources?

27 responses

- 8 responses – Yes
- 17 responses – No
- 2 responses – I'm not sure

### Question 12: Please describe how your traveler information system fuses together data from different sources.

6 responses

- On our public traveler information website.
- We have developed internal and external web based applications which present data from multiple sources. Historical and "real time' data. As part of DelDOT's transportation management program we have a dedicated software development team.
- All weather related road conditions are reported to the public via the OKRoads Mapping platform. OKRoads includes data entered by Field District maintenance staff, snow plow images from the plow trucks and NWS current weather conditions. RWIS data is being integrated in the near future.
- The data is not automatically fused. We use reports from our maintenance bureau, RWIS/ESS data, forecasts, and volume of incidents/road treatment requests to generate a picture of road conditions.
- Whenever a winter road condition report is entered into the system by department personnel, the traveler information automatically queries the National Weather System to construct a custom short range weather forecast for that specific section highway, and attaches it to the winter road condition report viewed by the public.
- maintenance decision support system (MDSS) supported by DTN

### Question 13: Does your agency coordinate with neighboring states for consistency in road weather related content or dissemination approaches.

27 responses

- 13 responses – Yes
- 14 responses – No

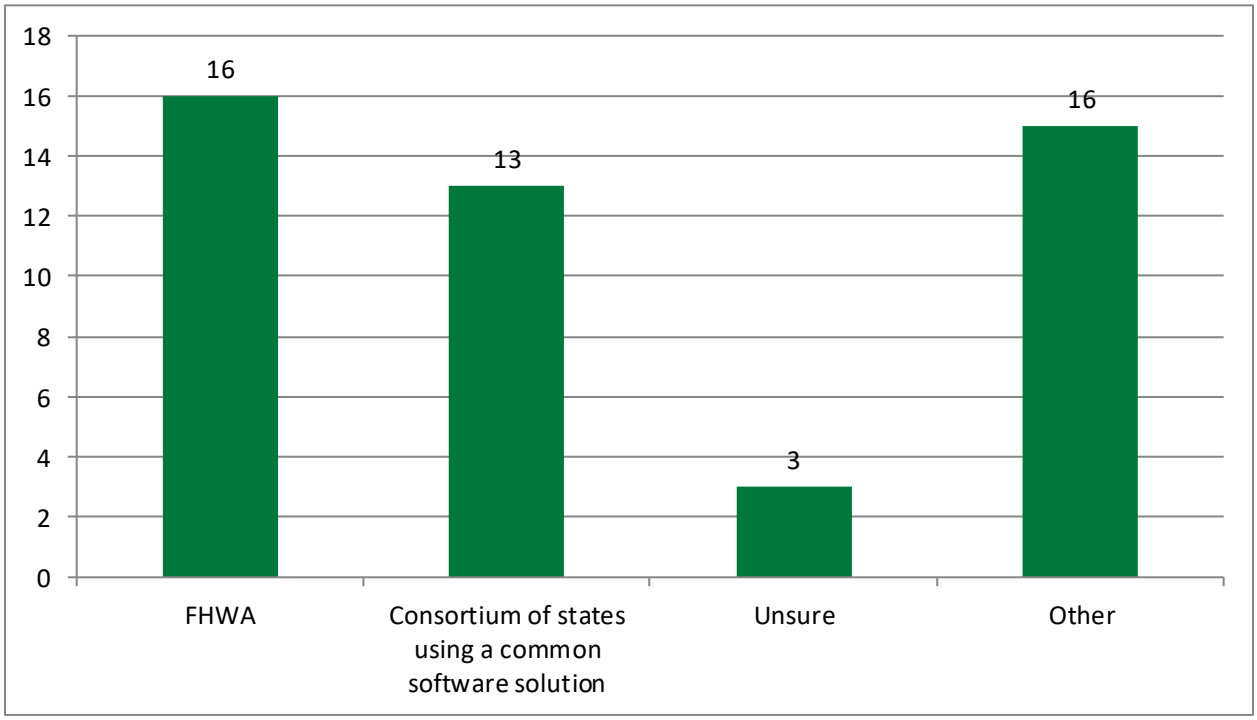
### Question 14: Please describe how your agency coordinate with neighboring states for consistency in road weather related content or dissemination approaches.

13 responses

- Each information between adjoining states' TMCs. Mainly info about any type of event which may impact an adjoining state. Continue to discuss integration of systems.
- LADOTD or TMCs coordinate with neighboring states via phone or emails, the majority is posting messages in dynamic message signs (DMS)
- VT, NH, and ME are partnering in our ATMS project. We have standard language for representing "Good, Fair, Difficult, or Hazardous" driving conditions on the TIS/511 site.
- GDOT's weather software shows data from neighboring states' ESS to help give the full picture of what to expect in oncoming inclement weather.
- Sometimes posting messages on our digital message boards for events across state borders is necessary if restrictions are in place (i.e. no semis on highway due to high winds)
- There has been some coordination of vocabulary and definitions (e.g. "snow covered" "slush" "reduced visibility") to enhance consistency of reporting for the benefit of inter-state travel.
- Shared ATMS/TIS with New Hampshire and Vermont
- Center-to-center communications
- phone from control room, email, listservs
- Phone
- Emails and phone calls to neighboring states when conditions may cause issues across lines, such as interstate closures
- "NH, VT, ME have a tri-state 511 website that pushes weather related events/data through the same platform, and essentially in the same manner.
- NH was once part of (what was once called) The I-95 Corridor Coalition. Through the coalition we created a multi-state workbook that contained a Weather Message Library. The goal was to foster consistency amongst states - in terms of how and what messages were displayed during weather events."
- Phone calls with adjacent State DOT's, conference calls with TRANSCOM for weather response coordination in the tri-state 9CT-NY-NJ area)

**Question 15: Please select where you receive guidance or discuss traveler information ideas, challenges, etc. Select all that apply.**

27 responses

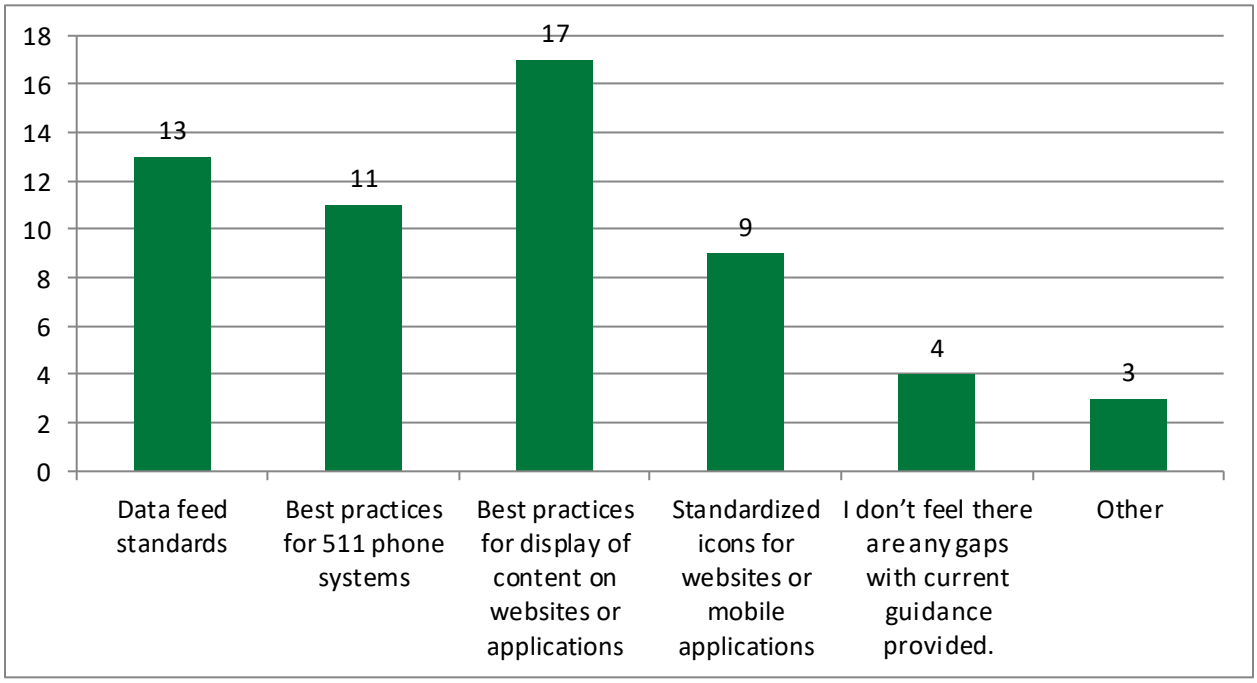



Other responses:

- TMC Pooled Fund Study
- The Eastern Transportation Coalition
- Vendors and consultants
- VT, NH, ME - given our partnership with our ATMS project, we often converse regarding traveler info ideas. To a larger degree, The Eastern Transportation Coalition (formerly I-95 Corridor Coalition) facilitates workshops and information gathering and dissemination.
- I-95CC
- I-95 Corridor Coalition provides that platform
- North/West Passage and other pooled fund programs.
- North/West Passage pooled fund.
- Used to be a member of the 511 Coalition. Currently a member of TETC. And in forums like this.
- Institute of Transportation Engineers (ITE),
- Aurora Group
- other pooled funds and road weather management groups
- pooled funds, citizen requests, conferences
- Rarely - ITS Canada-Traveller Information Subcommittee
- FHWA hosts the Road Weather Management Stakeholders Meeting each year. This has always been a great resource, and has provided many outlets/contacts for future initiatives.
- ClearRoads, MDSS pooled fund study. ITS Connecticut Chapter and New England ITS

**Question 16: Are there any specific areas that you would like to receive additional guidance or input related to traveler information. Select all that apply.**

26 responses




Other responses:

- Leveraging crowdsourcing data and information.
- What unique messaging and/or tools of communication are being utilized by other states
- Off the shelf product to combine multiple feeds that has more features than a simple ESRI Operations Dashboard that could (in part) be eventually shared with the public after a 2 year pilot period.

**Question 17: Do you feel there is a need for a national group comprised of state travel information coordinators to share current ideas and concepts.**

27 responses

- 17 responses – Yes
- 0 responses – No
- 10 responses – The traveler information groups I currently participate in already provide this need.

### Question 18: Please describe what you would like to discuss with a national group of state travel information coordinators.

12 responses

- I think a lot of what you asked in this survey... what are the challenges, new things coming up, what are other states doing in general with TI, technology changes and how states adapt (e.g. deprecating Flash).
- Current practices, opportunities for coordination, sharing technology solutions, asking questions about current challenges.
- What is the future of 511? With the emerging smartphone technologies and traffic applications, does the state needs to keep the IVR and Mobile App modules? Is it a viable solution to combine ATMS and ATIS?
- Traveler information best practices. Adoption techniques. Integration/APIs
- What each state provides and how.
- What states are working on. New features. Common problem areas. Public complaints.
- Peer-to-peer meetings have always been extremely beneficial to attend to share between states.
- Common practices, providers, new technology
- Ways to improve all types of current practices and standardize/ reduce effort/cost.
- Best practices and where do we go from here?
- Standardization of data formats, automation, event-specific messaging, closing events
- Common software availabilities, open source software, best practices, corridor coalitions, ongoing use of 511 phone line systems, ATMS/ATIS refurbishment, etc etc etc
- Nationwide consistency in forecasting, reporting, and displaying traveler information for all platforms

### Question 19: What are your primary challenges related to managing traveler information?

23 responses

- Making sure we are producing timely and accurate information that the public will actually use..
- Availability of field staff
- Providing up-to-date traffic information since roadway conditions are manually entered.
- Have none at this time
- Since we started archiving event data, the number of public records requests, data requests, and data integrations projects are becoming very time-consuming.
- Getting information to as many users as possible.
- Public complaints on cameras and RWIS stations working properly
- Keeping up with technology and adapting to new ways of doing business - who takes the time to go to a website to preplan trips? General public is using navigation apps. Finding the line between too much information and not enough.
- Technology changes all the time

- Reliability and coverage of real time data
- Preventing drivers from becoming numb to messaging, and utilizing DMS messaging specifically in ways that get a unique message across while still limiting drivers distraction from the roadway visually.
- Accurate, timely information updates.
- Lack of resources/staffing - the need for an affordable off the shelf software solution that automates most of the data
- Good, timely data DURING a winter weather event
- Aging TIS, standardizing messaging, closing events, implementing and trusting automation, reaching the right audiences
- Updating and disseminating information in a timely manner. getting the information to the public in formats that are usable.
- Dedicated resources to focus on an ever-changing technical landscape to provide value added services to motorists.
- Consensus and buy in from leadership, keeping up with trends
- Current road conditions
- "Human error - Around the clock QC/QA can be a challenge when managing a 24/7/365 operation.
- System design - Developing a more robust ATMS with features that would promote (not in all areas) more automated, and simplified reporting."
- Timeliness and accuracy of information, adapting to consumer changes and needs
- Accuracy with fast changing conditions
- Staffing

### Question 20: What are your current/emerging needs related to managing traveler information?

21 responses

- Timely and accurate information
- How to integrate with 3rd party providers.
- Data sharing to and from third party data generators and providers.
- Have none at this time
- Our current contract will end on May 2023 so we are currently in the process of developing the SEA for 511 ATIS system replacement.
- Integrating with other sources of information
- New platforms and managing those.
- Updating the TIS/511 website to be more user friendly and mobile device friendly. Marketing our services - the public doesn't know about key features such as text/email alerts for road closures. Improving working relationships with law enforcement agencies other than State Police. If State Police doesn't respond to an incident (or see an incident through from start to finish) lines of communications do not always reach the TMC.

- Understanding where the DOT fits with all of the 3rd party companies.
- Replacing older technology (HARs), keeping our 511 system new and fresh to appeal to younger users
- Next level 511 ... what will that look/sound like
- TIS change, standardizing messaging, closing events, implementing and trusting automation, reaching the right audiences
- NDDOT does not yet have a TMC. central coordination of the data can be troublesome without a TMC.
- Relevance and differentiation from private sector services (ie.. Waze, Google, Apple, etc..)
- New ATIS system, partnerships with third party vendors
- Understanding how best to provide mobile (on-the-go) notifications to the public, how to garner interest in our services...while also taking into consideration which services are still truly necessary (what state DOT's need to provide Vs. what is already being provided by other (more popular) navigation services)
- 1. Providing real-time and predictive roadway information during winter events. We hope to make progress with our Department's IMO road weather project. 2. Getting more timely information on road events such as crashes from enforcement.
- Currently we are testing new communication tools to more quickly and consistently engage with the traveling public during major traffic events.
- Montana is in the process of upgrading our Travel website to a vendor hosted solution.
- MARWIS integration with other weather management sources and automated notifications/reporting internally to multiple stakeholders.
- Keeping up with technology

**Question 21: Please provide any additional information you would like the project to consider as information on agency's current road weather reporting and dissemination is documented as well as a need for traveler information community of practice is understood.**

5 responses

- http://traveler.modot.org/map/index.html
- We would participate in further discussion, but at this time we have developed and implemented the capabilities to provide travel related information to include weather. We have implemented a system architecture that is adaptable to change.
- LADOTD is currently participating in the evaluation of the potential benefits for deploying the USDOT/FHWA research project called "Integrated Modeling for Road Condition Prediction" (IMRCP).
- VT, NH, ME are in the process of overhauling our TIS and the plan is to publish a read only and limited version of the back end ATMS. This is still in the development and planning stages.
- When looking at standardizing data feeds, please consider the inconsistency in the management of linear networks between states and 3rd party providers.

# Appendix C: CARS Consortium Poll Results

***May 2021 CARS Consortium Poll Responses Regarding Traveler Information Support and CoP Interest:***

**1. Do you feel there is a need for a national group comprised of state traveler information coordinators to share current ideas and concepts (similar to the 511 Coalition from years ago)?**

| | |
|---|---|
| Yes | (4) 57% |
| No | (0) 0% |
| The Traveler Info groups I currently participate in already fill this need. | (3) 43% |

**2. Where do you get insight and support for your Traveler Information program (beyond the CARS Group)?**

| | |
|---|---|
| FHWA Road Weather Program | (2) 29% |
| FHWA WZDI | (0) 0% |
| Different Consortiums/Coalitions (e.g. North/West Passage, Aurora, Clear Roads PFS, The Eastern Transportation Coalition (TETC), TMC PFS) | (3) 43% |
| NOCoE | (0) 0% |
| NRITS Conferences | (0) 0% |
| Nowhere | (0) 0% |
| Other | (2) 29% |

**3. What office is your position in?**

| | |
|---|---|
| Operations | (5) 71% |
| Communications | (0) 0% |
| IT | (1) 14% |
| Other | (1) 14% |