

Citizen Reporting of Current Road Conditions

Experiences at Five State Departments of Transportation

Objective

This best practices document reviews, compares, and contrasts citizen reporting programs that capture current weather and road conditions at five state departments of transportation—Wyoming, Utah, Idaho, Iowa, and Minnesota.

General Description

Many departments of transportation that contend with recurring snow and ice events during winter months provide updated road condition reports to the traveling public through traveler information outlets, including web- and smartphone-based visuals and 511 phone line information. Because the condition reports are updated manually by field crews, the reports are subject to work-related and other delays, which can render the information stale or inaccurate. In response to this, the five departments of transportation reviewed in this document have taken steps to gather road condition reports through the growing practice of crowdsourcing. In much the same way as the National Weather Service uses trained weather spotters to source weather reports from the field,¹ these departments of transportation use “citizen reports” (termed as such to distinguish them from field crew reports) to acquire weather and road condition information from travelers on their road system. The information is then released to the public via traveler information outlets.

It is important to note the distinction between the crowdsourcing performed by the citizen reporting programs discussed herein and other crowdsourcing techniques that rely on social media or Global Positioning System-based smartphone applications (apps). The term “crowdsourcing” refers to any process of gathering information from the public at large, as opposed to personnel within an organization. Most departments of transportation use social media as another way (beyond traditional traveler information outlets) to share information with the public, and many have developed methods for gathering information from the public through those same venues.² Smartphone crowdsourcing traffic apps, such as Waze, use Global Positioning System to track a vehicle and allow a user to report traffic conditions and hazards from the road.³ While social media and external apps can provide a wealth of crowdsourced information for a department of transportation, their ad hoc structures make it more difficult for the department of transportation to use and quality control the information. Department of transportation-managed citizen reporting programs allow the agencies to build the data collection application to suit their needs, funnel the information into pre-existing traveler information architectures, and train the reporters to ensure high-quality information. This document focuses on the department of transportation-built, department of transportation-managed programs that collect trained citizen reporter information. Methods to gather, process, and use crowdsourced information from social media and Global Positioning System-based apps are not discussed herein (see References for more details).

Table 1 summarizes the background of each department of transportation program. Note that the Wyoming Department of Transportation established its program nearly a decade ago. Other departments of transportation are now catching on quickly, having seen the success at preceding departments of transportation. The Wyoming Department of Transportation’s program is Enhanced Citizen-Assisted Reporting; the Idaho Transportation Department calls its program “CARS-Vox” (“CARS” for their 511 system—explained later—and “Vox” for *vox populi*); and the Utah Department of Transportation, Iowa Department of Transportation, and Minnesota Department of Transportation refer to their programs simply as “Citizen Reporting.”

Table 1. Basics of State Department of Transportation Citizen Reporting Programs

Department of Transportation	When Established	Motivation	Role of Citizen Reports
Wyoming	2005, pilot 2006, full launch	Need for timelier, more accurate road condition information	Previously maintenance crews only, now citizen reports supplement maintenance reports
Utah	Fall 2012, pilot November 2013, full launch	Need for timelier, more accurate road condition information	Supplement both maintenance and meteorologist reports, but lesser priority than either
Idaho	September 2013	Need for timelier, more accurate road condition information	Supplement maintenance reports (twice/day on weekdays, once/day on weekends/holidays, as conditions change)
Iowa	November 2014, pilot	Need for timelier, more accurate road condition information	Supplement maintenance reports; Previously highway patrol, who are now citizen reporters
Minnesota	April 2015, trial <i>October 2015, planned launch</i>	Need for timelier, more accurate road condition information	Supplement maintenance and state patrol reports (twice/day, as conditions change)

All of the departments of transportation reviewed herein report being motivated to start their programs because there was a need for timelier, more accurate, more spatially extensive road condition reports for traveler information outlets. All departments of transportation but one require their field crews to enter road condition updates twice daily (the Iowa Department of Transportation requires updates every 2 hours) and as conditions change, but due to demands of the job and rapidly changing weather, these reports often become stale and outdated. Therefore, the motivation was to increase the timeliness and accuracy of the information available to the public from traveler information outlets.

System Components and Operation

A citizen reporter may be anyone that wants to help the department of transportation report road conditions. It is often someone who drives the department of transportation’s road system fairly routinely and is familiar with certain routes. Commuters and commercial vehicle operators are ideal candidates. Department of transportation personnel and state highway patrol officers that are not already tasked with updating road conditions may also sign up to be citizen reporters. Recruitment for

reporters may be done through traveler information websites, press releases, or outreach to specific community organizations.

Prospective citizen reporters are required to complete training, although the training method varies slightly at each department of transportation. The Wyoming Department of Transportation conducts training in person or via a web conference and supplies each reporter with an illustrated handbook. The Idaho Transportation Department requires the prospective reporter to call the 511 manager for phone-based instruction. The Utah Department of Transportation, Iowa Department of Transportation, and Minnesota Department of Transportation require online training (Utah Department of Transportation's may also be in person), followed by a short assessment. Once candidates complete the training and assessments, they are granted permission to report.

The Idaho Transportation Department, Iowa Department of Transportation, and Minnesota Department of Transportation use the Condition Acquisition and Reporting System Program⁴ for their 511 system infrastructure. Thus, the reporters input their data the same way in each of these states—through the full-featured/"high-bandwidth" 511 website. Once trained and accredited, a reporter can log onto the website after making a trip and input the road conditions, weather conditions, and optional free text for road segments within their route (which is also saved to their profile – part of the system's functionality). Figure 1 provides a visual from the Minnesota Department of Transportation's reporting system. The report passes through a language filter and then into the public-facing 511 system. The report becomes visible as a citizen report on the state road condition maps (available via the website and, where applicable, smartphone app). See the [Idaho 511](#), [Iowa 511](#), [Minnesota 511](#) websites and visuals in Figure 2.

In Utah, trained reporters use a smartphone app, "Utah Department of Transportation Citizen Reports" (see Figure 3), to login and input road conditions, weather conditions, and optional free text for any of the over 140 road segments throughout the state. The segments are pre-defined by maintenance shed boundaries. Citizen reports are spot-checked by Utah Department of Transportation-contracted traveler information meteorologists, who also input road condition reports throughout the day and as they notice stale data. The source of the report is not externally identified as coming from a citizen reporter, but the internal Utah Department of Transportation system is set up to give preference to plow crews, followed by traveler information meteorologists. This functionality recognizes the plow crews as the best source for road condition information, and allows them to maintain some control over the data for their responsible road segments. If there is no active report from Utah Department of Transportation personnel for the same segment, the citizen report goes directly to the [Utah Department of Transportation traffic website](#) and smartphone app. At the time of this writing, the Utah Department of Transportation had 300 participating reporters, with another 300 that had gone through the training and been approved.

Trained reporters in Wyoming call into the transportation management center and communicate with an operator about the weather conditions, road conditions, other maintenance issues or other threats to safety, and the operator updates the information in the traveler information system. Reports are accepted year-round. Road conditions are visible via all of the Wyoming Department of Transportation's pre-trip and roadside 511 information systems (see [Wyoming Travel Information Map](#)), and the source of the report is not identified as coming from a citizen.

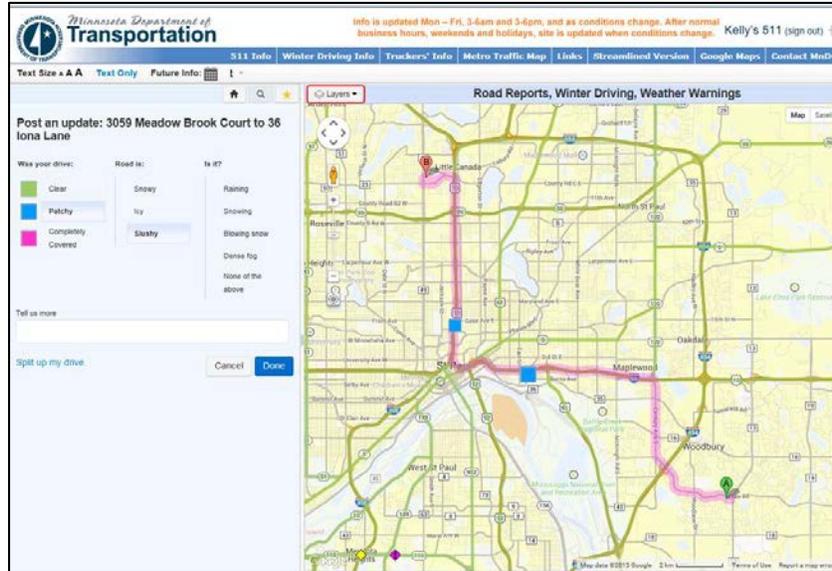


Figure 1. Screenshot of Minnesota Department of Transportation Citizen Reporting Input Page
(Source: Minnesota Department of Transportation)

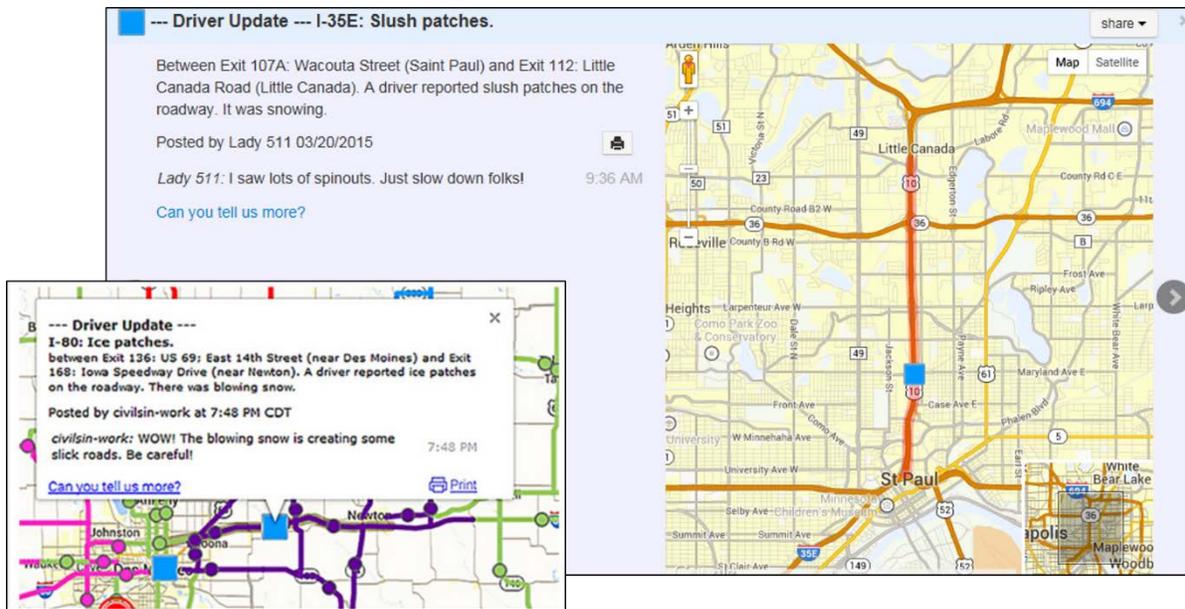


Figure 2. Screenshots from Minnesota Department of Transportation (above) and Iowa Department of Transportation (inset)
(Sources: Minnesota Department of Transportation and Iowa Department of Transportation)

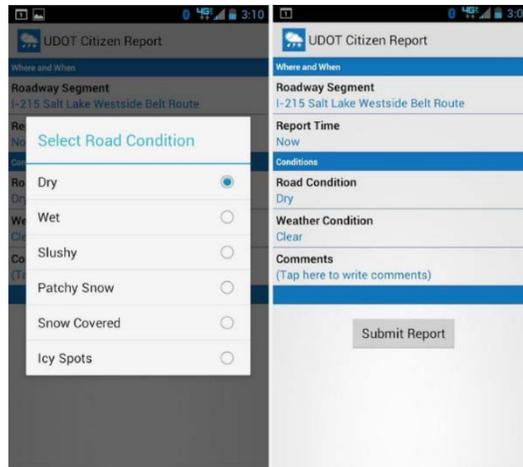


Figure 3. Screenshots of Utah Department of Transportation Citizen Report Smartphone App (Source: Utah Department of Transportation)

Table 2 summarizes the program details covered in this section.

Table 2. Citizen Reporting System Components and Operation

Department of Transportation	Who	Training	Seasonality	Report Elements	Quality Control	Location Identifiers	Reporting Medium	Outlets That Include Data from Reports	Reporter Identified?
Wyoming	Any member of the public	Mandatory In-person or web conference; illustrated handbook	Year-round	<ul style="list-style-type: none"> ● Road conditions ● Weather conditions ● Other maintenance issues ● Other threats to safety 	<ul style="list-style-type: none"> ● Training/accreditation ● Filtered through operator 	Flexible (descriptive or specific)	Call in to transportation management center operator	All pre-trip and roadside information systems	Identified internally, but not to public
Utah	Any member of the public	Mandatory Online or in-person training plus quiz	October - April	<ul style="list-style-type: none"> ● Road conditions ● Weather conditions ● Free-form text 	<ul style="list-style-type: none"> ● Training/accreditation ● Spot-checked by traveler information meteorologists 	Pre-defined segments coordinating with plow routes	Smartphone app	Utah Department of Transportation Traffic website and smartphone app	Identified internally, but not to public
Idaho	Any member of the public	Mandatory Speak directly with manager	Mostly winter; year-round functionality	<ul style="list-style-type: none"> ● Road conditions ● Weather conditions ● Free-form text 	<ul style="list-style-type: none"> ● Training/accreditation ● Spot-checked by traveler information personnel ● Language filter 	User-defined based on created route in system	Full-featured 511 website	Full-feature 511 website, low-bandwidth website, trucking page	Yes; Identified to public
Iowa	Any member of the public	Mandatory Online training plus quiz	October - April	<ul style="list-style-type: none"> ● Road conditions ● Weather conditions ● Free-form text 	<ul style="list-style-type: none"> ● Training/accreditation ● Language filter 	User-defined based on created route in system	Full-featured 511 website	Full-feature 511 website (<i>plans to expand</i>)	Yes; Identified to public
Minnesota	Any member of the public	Mandatory Online training plus assessment	October - April	<ul style="list-style-type: none"> ● Road conditions ● Weather conditions ● Free-form text 	<ul style="list-style-type: none"> ● Training/accreditation ● Spot-checked first few reports ● Language filter 	User-defined based on created route in system	Full-featured 511 website	Full-feature 511 website, low-bandwidth website, trucking page	Yes; Identified to public

Implementation Issues and Solutions

Most departments of transportation report some internal apprehension for the program when initially proposed. Maintenance crews at some departments of transportation felt ownership over the reports, and were concerned that other sources of information would be inaccurate or reflect poorly on their maintenance. Their reservations were allayed by meeting directly with the crews and explaining that the reports were informational for travelers and supplementary to their own reports—not intended, for example, as a venue for the public to vent about lacking maintenance. The crews were told that all reporters would be trained and the quality of the reports would be controlled. These quality control safeguards would also ensure that the plow crews would not have to spend extra time checking the reports coming in for their routes.

Within the Idaho Transportation Department, there was some administrative resistance to citizen reporting because of the fundamental shift in historical policy to gather and release information from the public. Indeed, for decades, department of transportation personnel have been the most-trusted source of roadway information. However, the benefits of crowdsourcing have been realized, and trust in public information is growing.

As discussed in the section above, the Utah Department of Transportation implemented a prioritized posting routine in their data management software whereby the maintenance reports are given precedence over citizen reports. This method sought to allay concerns in maintenance sheds and administrative offices alike, by recognizing plow crews as the best source for road condition information, but still allowing citizen reports to fill in informational gaps.

Quality of reporting is almost never an issue, likely because citizen reporters volunteer out of a desire to assist the department of transportation and their fellow drivers, and because a number of safeguards have been established to discourage false or malicious reports. However, report quantity can be a challenge for the department of transportation. There is no required frequency for volunteers to report, and so the reporting can vary greatly depending on the day of the week, the weather, and reporters' personal schedules. The Utah Department of Transportation stresses the importance of sending in a report even when the weather is clear, to keep reporters in the habit and to maintain consistently updated traveler information, no matter the weather. Even still, citizen reporters largely report during adverse weather.

Moreover, reporting may be concentrated in metro areas. Some of the departments of transportation have taken particular steps to recruit citizen reporters in rural areas to increase reports where they are lacking. However, departments of transportation still report needing more citizen reports and are working on ways to advertise the program, thank the reporters (through gifts, recognition, etc.), and keep volunteers reporting consistently. In some regards, the program may sell itself, as potential volunteers may want to sign up when they see citizen reports show up on 511.

All departments of transportation have taken measures to ensure their reporters do not engage in distracted driving by asking them to submit their report when they arrive at their destination or from a safe pull-out (if on a long trip). While reporter safety is always prioritized over the reports themselves, this provision can result in a lag of a few minutes between when the road was traveled and when the report is submitted. This lag does not usually contribute to inaccuracy, except in the cases of long trips or rapidly changing conditions. For these cases, the Utah Department of Transportation implemented

additional functionality to its reporting system, whereby a reporter can set the time of the report to when the road was viewed (i.e., the report is distributed to traveler information outlets when it is submitted, but its timestamp will reflect the time the road was viewed).

Beneficial Outcomes

Departments of transportation report both internal and external benefits. The Idaho Transportation Department has seen positive outcomes already from its young program. The way the data are reported on the Idaho Transportation Department's 511 website allows the public to see that the information is being sampled from a variety of sources, enriching their utilization of the information. The Utah Department of Transportation reports receiving fewer complaints from the public that the road condition information is old. Additionally, the Utah Department of Transportation's contracted meteorological support has benefited from the increased granularity of road and weather condition data, increasing the information they can use for forecasts, "nowcasts," and alerts to field crews. The Wyoming Department of Transportation reports that the benefits of the increased information far exceed the costs, which are minimal to the department of transportation.

The programs at the Iowa Department of Transportation and Minnesota Department of Transportation are still very new. While the programs show great promise, the benefits have not yet been realized.

The nature of the citizen reporting programs (i.e., they are custom-built and managed by the departments of transportation) enhances the trustworthiness and quality of the information. It allows the department of transportation to quality control the information at the reporter end, rather than having to sift through social media reports, which can be of variable quality. Moreover, the reporting of weather and road conditions is somewhat subjective. Training helps to establish standards for reporting, so that each report of patchy snow, for example, means the same thing.

Finally, having the opportunity to participate in a department of transportation's traveler information as a trained reporter is empowering for the public. Citizen reporters help to improve the safety and mobility of their local roadways and communities.

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- Minnesota Department of Transportation: Kelly Kennedy Braunig, 511 System Coordinator, 651-234-7026, kelly.braunig@state.mn.us

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