Synthesis of Western U.S. Automated Safety Warning Systems

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NRITS 2013
Session G2: Automated Safety Warning Systems
Wednesday, August 28, 2013

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Overview

- Introduction
- Motivation
- Approach
- States surveyed
- Systems
- Conclusions

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Introduction

- ITS evolution has produced site-specific systems
  - Address local safety and/or operational issues
  - Ex. – Ice warning, queue presence, etc.
- Systems often "self-contained"
  - Collect localized data, process it, perform specific task such as post warning message on CMS
- Systems typically roadside-based
  - All equipment and processing completed on-site (no TMC input or activation)

Introduction

- "Self-contained" safety warning systems exist throughout western United States
  - Deployed by wide range of entities
- Lack of documentation, specifically inventory/ synthesis of deployments
- Tracking down information on deployments is a challenge
- Absence of information prevents practitioners from learning about other systems prior to pursuing their own

Project Motivation

- Western States Rural Transportation Consortium pursued synthesis of safety warning devices in western U.S. to address information gap
  - http://www.westernstates.org/
- Identify past/present deployments, their function/purpose and other information
- Develop summaries that present practitioners with information on systems
- Information used to learn about benefits systems, provide contact information to learn more about specific sites/systems

Approach

- Interview agency contacts via telephone
- Discussions generally 5-7 minutes per system
- Document active and inactive systems
- Information of interest:
  - Type of system, problem addressed, location, deployment year, status, type of roadway/speed, system components, effectiveness, evaluation results, consideration of use elsewhere, future improvements/changes

States of Interest
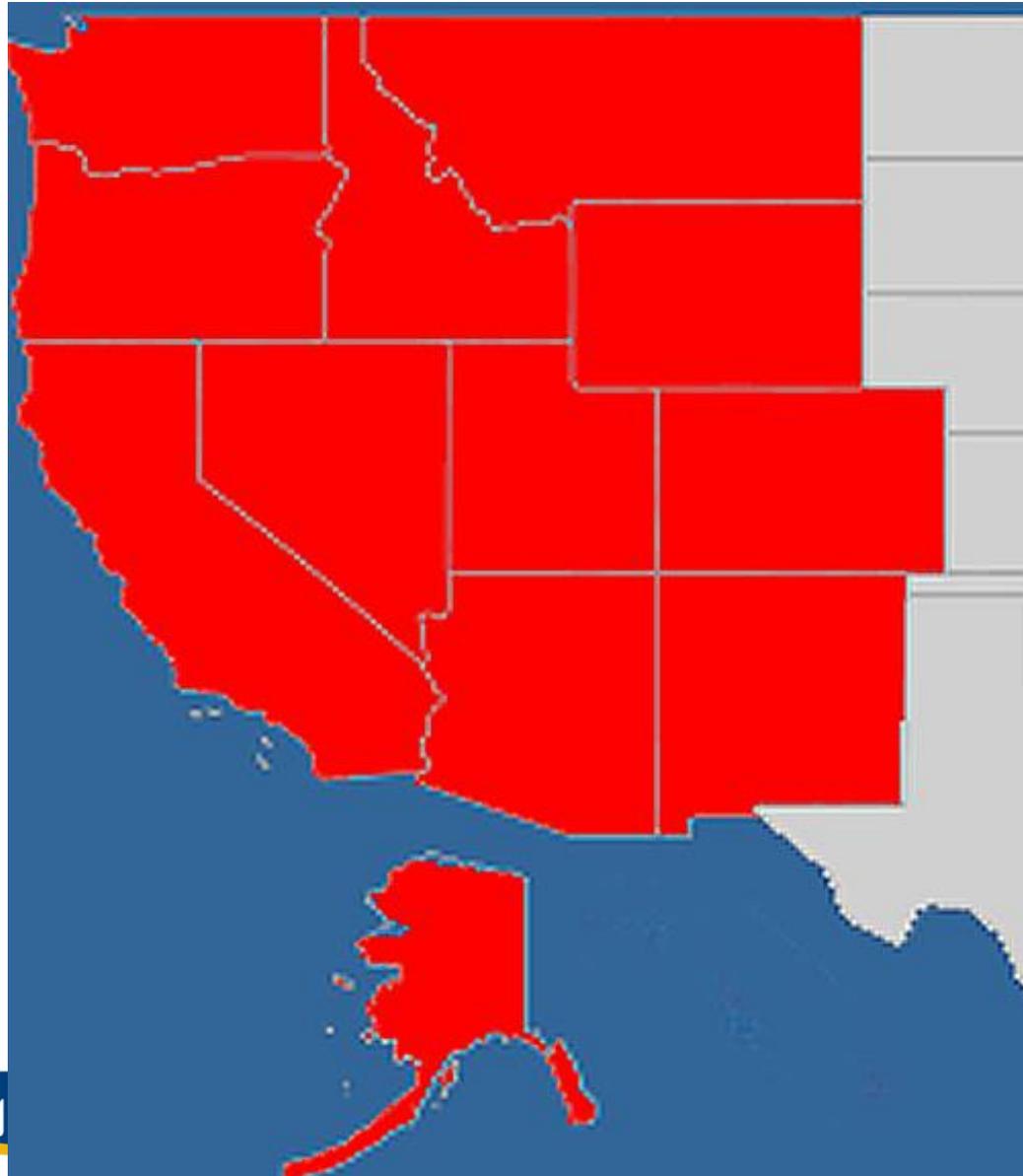
- Alaska
- Arizona
- California
- Colorado
- Idaho
- Montana
- New Mexico
- Nevada
- Oregon
- Utah
- Washington
- Wyoming

Summary of Systems

- Ice/Weather warning (9)
- Animal warning (8)
- Curve Speed warning (15)
- Traffic/Queue warning (5)
- Variable Speed Limit (3)
- Wind warning (7)

- Runaway Truck Ramp (2)
- Flood warning (3)
- Visibility warning (2)
- Tunnel warning (2)
- Seismic warning (2)
- "Other" (8) [vehicle overlength detection, travel time, downhill speed]

Ice/Weather Warning

- Eight systems identified
  - CA (3), OR (1), NV (1), WA (1), AZ (1), ID (1)
- Purposes – ice warning (tangents, curves, tunnels), general storm warning

Image: WTI

- Components - pavement sensors, RWIS, controller, CMS, CCTV, power, communications
- Experiences – systems work to differing extents (reduce speeds and crashes), sensor placement and accuracy critical to operations

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Animal Warning Systems

- Eight systems identified
  - WA (3), NM (1), MT(1), WY (1), AZ (1)

Image: Ontario Ministry of Transportation

- Purpose – provide animal presence warning

- Components – animal sensors (radio collars, infrared, laser, body heat or microwave sensors, video detection), receivers, controller, static signs with beacons, portable VMS

- Experiences – detection is difficult, varying effectiveness in meeting goals

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Curve Warning Systems

- Fifteen systems identified
  - CA (8), OR (3), WA (3), NV (1)
- Purpose – provide curve and/or speed warning
- Components – Speed sensors (radar or microwave vehicle detection systems), controller, signage (CMS, DMS, VMS, static signs with beacons or chevrons w/ flashing LEDs)
- Experiences – Components straightforward, generally effective in addressing speeds/crashes

Image: Oregon Department of Transportation

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Traffic/Queue Warning Systems

Image: Caltrans

- Five systems identified
  - CA (3), OR (2)
- Purpose – Provide warning of slowed or stopped traffic
- Components – Loop detectors, controller, CMS, DMS or overhead warning signs with beacons
- Experiences – Generally effective in addressing rear end crashes

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Variable Speed Limit Systems

Image: Warren, D. "Variable Speed Limits". Presented at the Federal Highway Administration Speed Management Workshop, Dallas, Texas, March 6, 2000.

- Three systems identified
  - WA (2), OR (1)
- Purpose – Adjust speed limits based on traffic levels or weather conditions
- Components – Loop detectors, sidefire radar, RWIS, controller, CMS or VMS
- Experiences – Effective in reducing speeds, some reduction in crashes

Wind Warning Systems

Image: Phillip Graham/Caltrans

- Seven systems identified
  - OR (2), AZ (1), WA (1), NM (1), NV (1), CA (1)

- Purpose – Provide drivers warning of high winds at point and segment locations

- Components – Loop detectors, sidefire radar, RWIS, controller, CMS or VMS

- Experiences – Very effective in alerting drivers to presence of winds

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Runaway Truck Ramp Systems

- Two systems identified
  - CA (1), AZ (1)
- Purpose – Notify truck drivers that a runaway ramp is occupied

Image: FHWA

- Components – Loop detectors, presence sensors, CCTV, controller, DMS, static metal signs with beacons
- Experiences – Very effective in providing information on ramp use, reduced truck crashes

Flood Warning Systems

Image: Oregon DOT

- Three systems identified
  - OR (3)

- Purpose – Notify drivers of water over roadway surface

- Components – Ultrasonic or float sensors, controller, static metal signs with beacons

- Experiences – Generally effective and reliable, straightforward in design

Additional Systems of Interest

- Additional systems documented
  - Visibility warning (CA – 1)
  - Tunnel warning (WA – 2)
  - Downhill truck speed warning (OR – 1, CO – 1)
  - Overheight/length detection (OR – 3)
  - Travel time – (WA -1, AZ – 1, CO - 1)
  - Seismic warning (WA – 2)

Conclusions

- Variety of different systems deployed
  - Address many site-specific conditions
- Some states deploy more systems than others
  - Some agencies not comfortable with automation, prefer operator input
- As technologies improve, components have changed

Conclusions

- Some systems operate better than others
  - Animal warning systems less reliable
- Most systems met intended objectives
- Work wrapping up, always interested in new study state contacts
  - Report is a living document, so additions can be made
- For more information:
  - http://www.westernstates.org/

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Acknowledgements

- California Department of Transportation
- Nevada Department of Transportation
- Oregon Department of Transportation
- Washington Department of Transportation
- The numerous contacts that took the time to discuss their respective system(s)

Questions