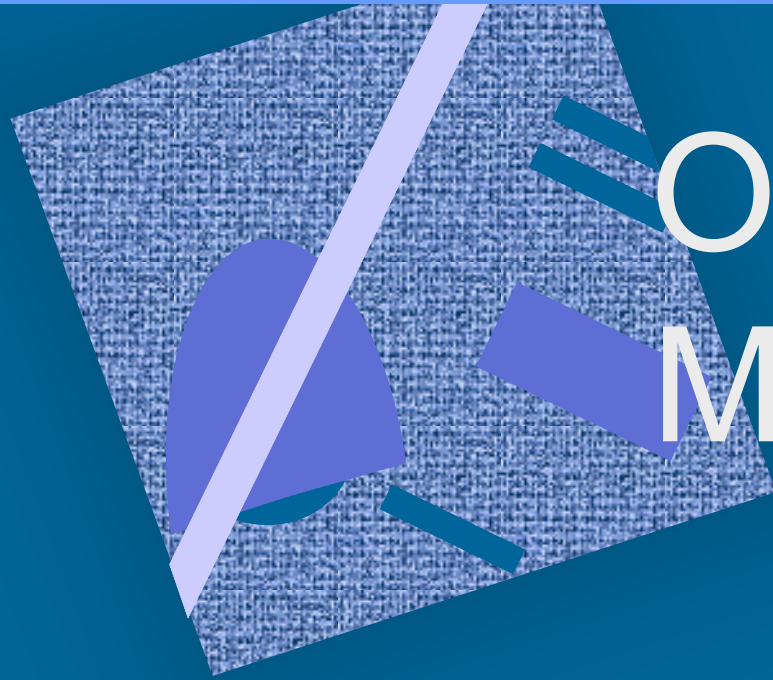


# Module 7



## Operations & Maintenance

# Operations & Maintenance

## User Needs

- Infrastructure Management
- Roadway Condition Monitoring
- Safety Management
- Resource Management
- Security
- Public Fleet Management
- Data Collection & Sharing

# Stakeholder Partners

## Who are they?



# Applicable Technologies

- Road Weather Information System
- Inter-Agency Coordination
- Automated Vehicle Location
- Computer Aided Dispatch
- Collision Warning Devices
- Lane Positioning Devices
- Automated Deicing System

# Projects

- Bridge Deicing
- Advanced Snowplow
- Advanced Rotary Blower
- Telerobotic Trash Collector
- Automated Litter Bag/Debris Collector
- Highway Cone Placement & Retrieval Vehicle
- Teleoperated Maintenance
- Frontier Lighting Monitoring System

# Bridge Deicing



**Curb & Wall**



**Flush in Pavement**



**Guard Rail**



# Advanced Snowplow



- Lane Positioning
  - Tolerance Edge
  - Current lateral position
  - Prediction marker
- Collision Warning
  - Forward
- Partners
  - Caltrans
  - ADOT
  - UC - Berkeley
  - UC - Davis
  - WTI/MSU

# Advanced Rotary Blower



- Full Automation
  - Steering
  - Throttle
  - Brake
- Forward Collision Warning
- Current Partners
  - Caltrans
  - AHMCT, UC - Davis
  - PATH, UC - Berkeley



# Telerobotic Trash Collection



- Collect trash telerobotically using vacuum nozzle system
- Advanced human interface
- High-capacity trash collector
- Customizable for commercially available machines
- Rural/freeway/urban capabilities



Courtesy of MadVac ↑

# Automated Litter Bag/Debris Collector



- Pickup litter bags and large debris, such as tires, from roadside.
- Hydraulic clam shell operated with joy stick using preset locations and automatic return.

# Highway Cone Placement and Retrieval Vehicle



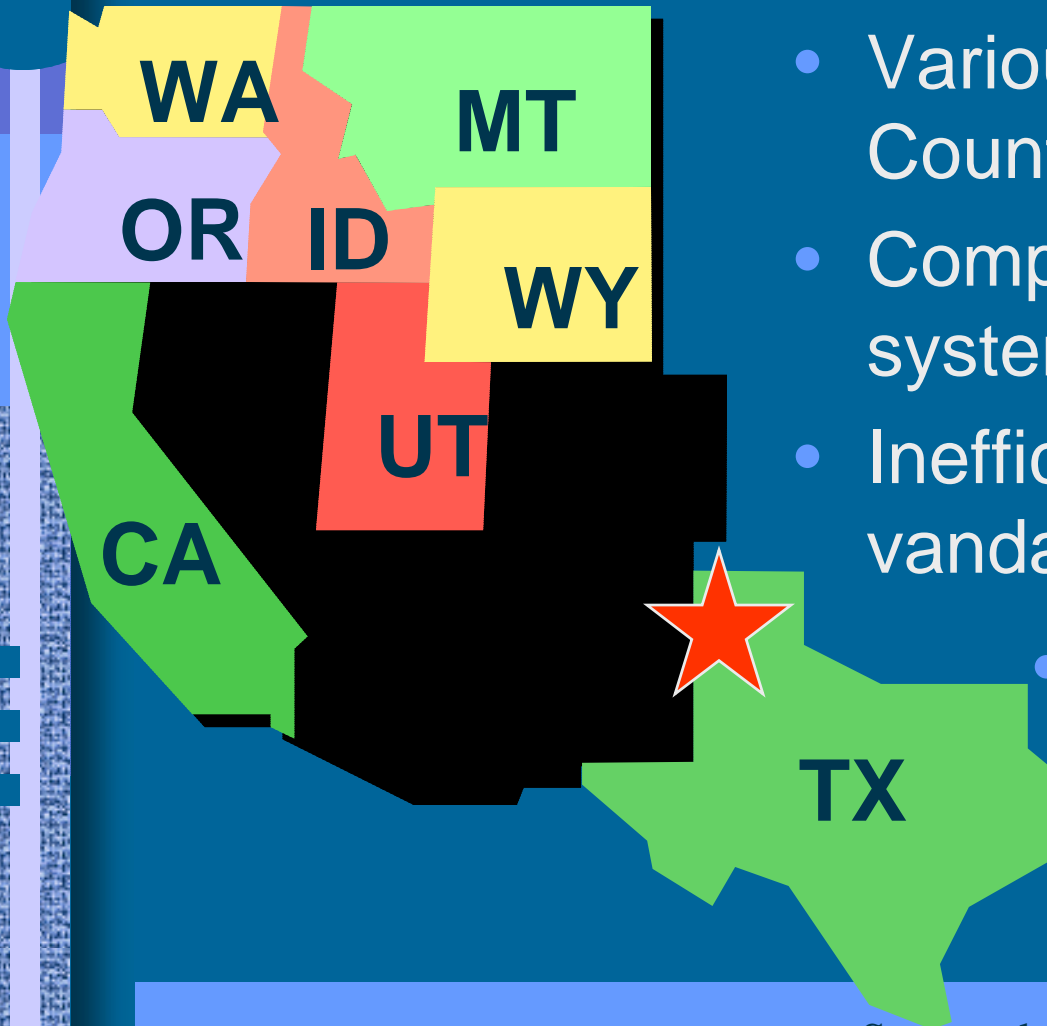
- One person, in-vehicle, totally automated placement and retrieval of highway cones
- Multiple stacking system extends range up to five miles

# Teleoperated Maintenance

- Normal or remote operation of maintenance equipment of all types.
- Uses either backpack or truck-mounted control system.
- Suitable for dangerous situations, such as mudslides and hazardous material spills.



# Frontier Lighting Monitoring System



- Various sites, Oldham County
- Component failure causes system failure
- Inefficiency, safety, vandalism
- Intelligent Outdoor Lighting Control System