Presentation Goals

You MUST account for weather in your Traffic Management program

Provide you with information on proven tools and strategies

You NEED a meteorologist in your TMC or TOC!!!
Annual reaction of commuters...

A SNOWFLAKE!
Weather & Travel – Why Do We Care?

Fiscal Impacts

- **$5.7B** in property damage
- **$3.1B** in medical care
- **$8.2B** in lost productivity

23% of auto crashes associated with weather

- Over **6,000** Deaths
- Over **480,000** Injured
- Over **1,000,000** People Involved
Weather & Travel – Why Do We Care?

Up to

50%

of PM commute traffic is discretionary
Weather and Travel Time Reliability

Travel Time Index (systemwide)

- Road snow (both commutes)
- Freezing rain event
- Road snow/ice (AM commute)
- All day snow
- Road snow (AM commute)
- Heavy valley rain / mountain snow
- Parleys Summit road snow

Dates:
- 5/6/2013
- 6/25/2013
- 8/14/2013
- 10/3/2013
- 11/22/2013
- 1/11/2014
- 3/2/2014
- 4/21/2014
- 6/10/2014
- 7/30/2014
Why Have A Transportation Meteorologists?

Understands physical processes between atmospheric, road surface, & soil conditions

Knowledge of maintenance challenges

- Frosty shaded canyons
- Thermal differences of concrete and asphalt
- Areas of flood potential/mudslides
- Blowing snow areas
- Fog prone areas
- Downslope wind areas affecting roads

Understands limitations of mitigation materials

- Pretreatment (rain before snow?)
- Operational limitations
- Location resources
Why Have A Transportation Meteorologists?

Western Transportation Institute
UDOT Weather Operations Evaluation
2007

Benefit-Cost Ratio
11:1
Based on winter maintenance cost savings
($2.75 Million)

UDOT Maintenance Personnel
80%
changed maintenance approach based
on road weather forecasts
For Fun

![Cartoon Image]

**Signs of a Bad Winter Driver**

- Snow from last 3 storms
- Fishtails
- Once car heats up, ice will melt
- Porthole (defroster will get it eventually)
- Beep!
- Tailgates

Bald isn't just a hairstyle

Won't heat from lights melt snow?
UDOT/Weather.net Structure

UDOT Weather Program Manager
UDOT Research Meteorologist

Road Weather Operations (Weather.net)
- Maintenance
- Traffic Management
- Utah Highway Patrol
- Incident Management
- ATMS Maintenance
- Construction
- Traffic Signals
- Emergency Response

Travel Weather Information (Weather.net)
- Salt Lake City
  - NWS Collaboration
- Grand Junction
  - NWS Collaboration

- UDOT Traffic Website/App
- UDOT Communications
- UDOT Traffic Website/App
- TV/Radio/Media

RWIS Weather Stations (Weather.net)
- Installation
- Maintenance
- Programming
- Research
- Development

Univ. of Utah/MesoWest
UDOT Traffic Website/App
Contract Operational and Travel Weather Forecast Services

$325,000 Annually

RWIS installation

$35,000 to $50,000 Per Site

RWIS maintenance

$2,200 Per Site Annually
UDOT Weather Program Model

- **Contract Transportation Meteorologists**
  - Allowed to do business with outside entities:
    - Forecast for runways for several major airports, and local municipalities
    - Keeps UDOT costs down; increases hours of coverage
  - 24/7 support

- Over 5,000 logged interactions a year

- Alerting service

- **Yes/No deterministic approach, no probabilities**
  - Update forecast as needed
  - Timing of road weather impacts to the nearest hour
  - Snow intensities in inches per hour

- Forecast VMS messaging with timing to the hour

- Seasonal climate outlooks
Weather Briefings

• 1-5 days prior to road weather event

• Several departments participate
  – TOC managers
  – Incident Management Team
  – Traffic Signals
  – UDOT Communications
  – UDOT District Engineers
  – Utah Highway Patrol
  – Motor Carriers
  – ATMS Electronics
  – Maintenance Area Supervisors
  – State and DOT Emergency managers

• Regional Maintenance Specific Conference Calls
Other Benefits

- **Traffic Signals**
  - Snow timing plans
  - Snow covering traffic signals
  - Twisted heads

- **Specialized Alerts**
  - Wildfire alerts to suspend field work
  - Concrete blowup forecasts

- **UDOT Communications**
  - Anticipate weather news stories
  - Push pre-storm messaging to traveling public

- **ATMS Electronics**
  - Prioritize maintenance
  - Variable Speed Limits

- **Department of Safety, Incident Management, UHP**
  - Determine staffing requirements due to weather
UDOT Pathfinder Project

• UDOT, Weathernet, and Salt Lake City / Grand Junction NWS offices

• Unified message out to the public about road weather impacts
  – Modify commuter behavior that leads to improved mobility and safety

• Collaboration
  – Pre-storm messaging strategies
  – Specific areas to highlight
  – Observations

• Communication Methods
  – NWSChat
  – Daily phone briefings
UDOT Pathfinder Benefits

- **Unified Message**
  - Better-informed travelers

- **Sharing Resources**
  - Weather Observations
  - Tools

- **Improved Safety, Mobility, and Economy**
  - Impact-based reporting

- **Negligible costs**
January 2013 Case Study

Study of Driver Awareness and Response to Winter Storms
Partnered by UDOT, NWS, & University of Utah

• **Two events were surveyed**
  – Heavy snow - PM commute
  – Freezing rain - AM commute

• **400 surveys completed per event**
  – Awareness of weather forecast
  – Sources of weather & road info
  – Modification of travel plans
Behavior Changes Reported:

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed schedule</td>
<td>62%</td>
</tr>
<tr>
<td>Changed route</td>
<td>26%</td>
</tr>
<tr>
<td>Did not travel</td>
<td>13%</td>
</tr>
<tr>
<td>Used mass transit</td>
<td>6%</td>
</tr>
</tbody>
</table>

Reported Sources of Information:

Personal sources – 59%
Local TV – 57%
Local radio – 43%
Government sources – 27%
Winter Storm During PM Commute

PM Commute Travel Data Comparison – Salt Lake County
Jan 10th, 2013 (Snow Event) vs Jan 17th, 2013 (Dry Conditions)

Weather Conditions On Snow Event Day

Noon: 49 F, dry and partly sunny

2 PM: 36 F, dry conditions

5 PM: 2” per hour snowfall rates

Key Observations:

- Commute peak shifted by 2 hours
- 43% less volume during typical peak
- Peak occurred before it began snowing!
SNOW COMMUTE DRIVING STYLES
A STATISTICAL ANALYSIS:

49.5%
DANGEROUSLY
MADDENINGLY
OVERCAUTIOUSLY
PARALYZED

49.5%
DANGEROUSLY
RECKLESSLY
OVERCONFIDENTLY
OBLIVIOUS

YOU

HONK!!!
GRRRR
*

HONK
REV

SPIN SPIN
Public Travel Weather Information

- NWS/UDOT collaboration
- VMS forecast messages
- Road Weather Alert
- Road/weather conditions updated every 3 hours
- Road condition forecasts every 3 hours up to 24 hours
- Quality control of citizen reports
- Pre-storm YouTube videos
- UDOT social media accounts
• Post-mitigated road weather concerns

• **Green/yellow/red** cautionary levels

• Winter meteorological criteria:
  - Wind gusts > 45 mph
  - Road snow/ice, blowing snow
  - Standing water
  - Dense fog
  - Inversion snow

• Lead time:
  - Low impact: ~24 hours
  - Medium impact: ≥ 24 hours
  - High impact: 48+ hours
Current Road Conditions

- 142 road segments, Nov. 1 – Apr. 1

- Three sources:
  - Plow operators via the Travel Advisory Telephone System (TATS)
  - Citizen reporters
  - Traveler Information Meteorologists

- Algorithmically combine all three to produce one product on the UDOT Traffic website/app

- Green/yellow/red condition levels:
  - Green: dry, wet
  - Yellow: slushy, patchy snow, icy spots
  - Red: snow covered, restrictions

- Weather conditions:
  - Clear, partly cloudy, overcast, rain, mixed rain and snow, snow, fog, blowing snow
Road Condition Forecasts

- 74 road segments, year round
- 3-hour road condition forecasts out to 24 hours
- Green/yellow/red condition levels:
  - Green: dry, wet
  - Yellow: slushy roads, areas of road snow/ice, patchy fog, blowing snow, blowing dust, gusty winds, thunderstorms, smoke, standing water, patchy ice
  - Red: snow covered, icy roads, dense fog, blowing snow, flooded roads, high winds, thick smoke, blowing dust
Enlists and trains citizens to accurately report road conditions (99% accuracy observed)

Approaching 800 citizen reporters

Largest benefit: Rural road information
Social Media Alerts

Twitter

Weather Alert: A major winter storm will impact routes across the state of Utah Thu. and Fri. #utsnow @uttrucking

3:46 PM - 9 Jan 2013

Facebook

Utah DOT

Southbound I-15 will be reduced to two lanes between 2100 North and Main Street in Lehi from Friday, Sept. 27, at 8 p.m. to Monday, Sept. 30, at 6 a.m. for bridge maintenance work. Drivers should plan ahead and allow extra travel time, as heavy delays of up to 45 minutes are expected on Saturday afternoon and Sunday evening.
UDOT Traffic App

- Road weather alerts
- Current road conditions
- Road condition forecasts
- Snow plow locations
UDOT Snow and Ice Performance Measure

• Developed in-house by UDOT meteorologists
• Performance measure by RWIS data
• Real-time storm intensity/road friction comparison
• Web GUIs:
  – State/Region Performance Dashboard
  – Storm Management Dashboard
  – Real-time graphs
Storm Management Dashboard
Thank you!

Jeff Williams
UDOT Weather Program Manager
JeffWilliams@utah.gov
(801) 887-3735