Welcome to Utah

State of Utah

• 3,216,857 (2019)
  • Highest population growth in the country (2010-2018)
  • 80% of population along Wasatch Front

• Varied Terrain
  • Highest: Kings Peak (13,527’)
  • Lowest: Beaver Dam Wash (2,179’)

• Five National Parks
  • 15.2 million visitors a year
  • Arches
  • Bryce Canyon
  • Canyonlands
  • Capital Reef
  • Zion (4th highest nationally)

• Ski Resorts
  • 5.13 million visits last winter
  • 151 ski lifts handling 163,000 skiers per hour
Utah Weather Challenges

State of Utah

• Varied Snowfall
  • Alta – 508” per year, record is 910” (1983)
  • Wasatch Front - 40-120” per year
  • St George – 3” per year, Wendover 5” per year
  • Shaded canyons

• Lake Effect Snowfall
  • Great Salt Lake never freezes

• Downslope wind events
  • 113 mph along I-15 @ Brigham City on 4/24/99

• Monsoon
  • Frequent flash flooding in southern Utah

• Wildfire burn scars
  • Can impact highways up to 5 years
  • Fire size does not determine impacts
Alta – Comparison of last two winters

June 20, 2018

June 19, 2019
Weather and Travel Time Reliability

Travel Time Index (systemwide)

- Road snow (both commutes)
- Freeze rain event
- Road snow (AM)
- Road snow/ice (AM commute)
- All day snow
- Road snow (AM commute)
- Heavy valley rain/mountain snow

Legend:

- Regular data points
- Red dots indicate specific weather conditions

Date Range:
- 5/6/2013 to 7/30/2014
Economic Impact of Road Weather Events

Economic impact in Utah for a 24 hour statewide winter storm

Total Economic Impact
$66.36 million

- Wages & Salaries
  - $42.81 Million

- Retail Sales
  - $18.26 million

- Federal Taxes
  - $3.32 million

- State and Local Taxes
  - $1.98 million

Source: American Highway Users Alliance performed by IHS Global Insight (2009)

States and provinces covered by the study include:
Illinois, $400 million lost per day
Indiana, $157 million lost per day
Iowa, $70 million lost per day
Kentucky, $96 million lost per day
Maryland, $184 million lost per day
Massachusetts, $265 million lost per day
Michigan, $251 million lost per day
Minnesota, $167 million lost per day
Missouri, $162 million lost per day
New Jersey, $289 million lost per day
New York, $700 million lost per day
Ohio, $300 million lost per day
Pennsylvania, $370 million lost
Utah, $66 million lost per day
Virginia, $260 million lost per day
Wisconsin, $149 million lost per day
Ontario, $474 million lost per day
Quebec, $250 million lost per day
UDOT Weather Operational Design

- **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/year**

- **Alerting service**

- **Operations Weather Briefings**

- **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**
Transportation Meteorologists Benefit

UDOT Weather Operations Evaluation
Western Transportation Institute, 2007

Benefit-Cost Ratio
11:1
Based on winter maintenance cost savings
(only labor and materials considered)
($2.75 million)

UDOT Maintenance Personnel
80%
Changed maintenance approach
based on road weather forecasts
Non-Maintenance Operational Benefits

• Traffic Signals
  • Snow timing plans
  • Wet snow covering traffic signals
  • Twisted heads

• Specialized Alerts
  • Wildfire alerts to suspend field work
  • Concrete buckling forecasts
  • Burn scar debris flows
  • Concrete buckle forecast

• 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
RWIS Network Statistics

- 123 total RWIS sites
  - 5 trailers
  - 4 tripods
  - 1,349 tracked devices
    - 4-18 devices per site
  - Communication:
    - 53% cellular
    - 44% UDOT private fiber network
    - 3% radio to fiber/other sites, DSL
  - Power:
    - 59% solar powered / lithium ion batteries
    - 41% AC powered
  - Backbone of real-time road weather messaging
  - Basis for the Snow and Ice Performance Measure
UDOT Snow and Ice Performance Measure

- Developed in-house by Jeff Williams and Cody Oppermann
- 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
Travel Weather Services

- Forecasting for post-mitigated road snow and associated travel impacts via a variety of public products

- Coordinate with the National Weather Service to create a unified message
  - Salt Lake City, UT
  - Grand Junction, CO

- Road weather alert

- Road condition forecasts

- Current road conditions

- Quality control citizen reporters

- UDOT social media (road weather)

- Pre-storm travel weather videos

UDOT
Keeping Utah Moving
Weather Responsive Traffic Management (WRTM)

**Pathfinder**
- Pioneers
- Statewide – NWS Salt Lake / Grand Junction

**Road Segment Warning System**
- Provo Canyon (US-189)
- Fish Creek Bridge (I-70)
- Cottonwood Canyons (4 ski resorts)

**Connect Vehicles / Spot Weather Warnings**
- Panasonic

**Truck Rollover Warning System (Winter 19/20)**
- Taggart (I-84)
- Weber Canyon (I-84)

**Variable Speed Limits**
- Parleys Canyon (I-80)
- Baker Canyon (I-15 – coming soon)
Pathfinder / Coordination with the NWS

• Salt Lake City and Grand Junction NWS

• Unified message out to the public
  • 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
January 2013 Case Study

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

- Two events were surveyed
  - Heavy snow, PM commute (January 10)
  - Freezing rain, AM commute (January 24)

- 400 surveys completed per event
  - Awareness of weather forecast
  - Sources of weather and road information
  - Modification of travel plans
Heavy Snow During PM Commute

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

Weather Conditions
On Snow Event Day

\begin{align*}
\text{Noon:} & \quad 49 \text{ F, dry and partly sunny} \\
\text{2 PM:} & \quad 36 \text{ F, dry conditions} \\
\text{5 PM:} & \quad 2" \text{ per hour snowfall rates}
\end{align*}

Key Observations:
\begin{itemize}
\item Commute peak shifted by 2 hours
\item 43\% less volume during typical peak
\item Peak occurred before it began snowing!
\end{itemize}

Blue - Snow Event \hspace{2cm} Red – Dry Conditions
2018 President’s Day Storm Pathfinder Results

Pre-Storm

President's Day Weekend 2017 vs. 2018
Friday and Saturday Southbound Travel
I-15 SB MP 250 (Scipio) - MP 0 (St. George)

Friday
+18.3%

Saturday
+17.1%

VMT - Vehicle Miles Traveled. It is a sum of the total miles that were driven in a certain area.
2018 President’s Day Storm Pathfinder Results Post-Storm

President’s Day Weekend 2017 vs. 2018
Sunday-Tuesday Northbound Travel
I-15 NB MP 0 (St. George) - 250 (Scipio)

VMT - Vehicle Miles Traveled. It is a sum of the total miles that were driven in a certain area.
Thank You!

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