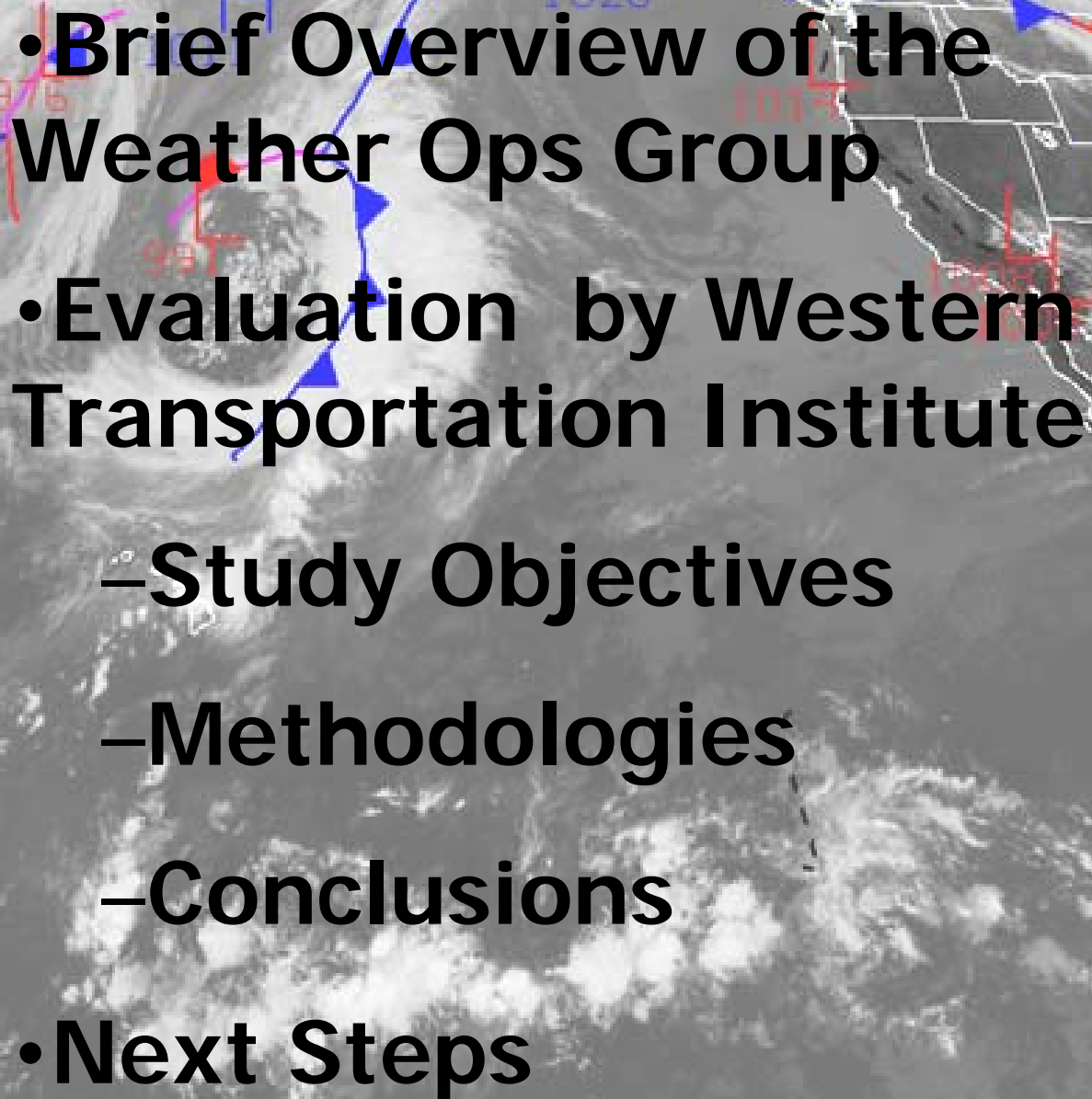




Evaluation of UDOT'S Weather Operations/RWIS Program

Ralph Patterson

Weather Operations/RWIS Manager

- 
- **Brief Overview of the Weather Ops Group**
 - **Evaluation by Western Transportation Institute**
 - **Study Objectives**
 - **Methodologies**
 - **Conclusions**
 - **Next Steps**

Weather Operations

Two Main Components:

ITS/RWIS



Meteorologists





TOC Meteorologists

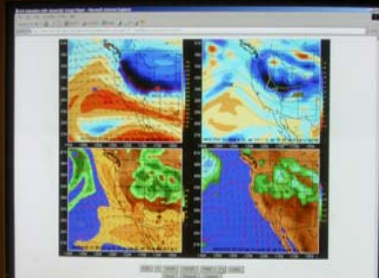
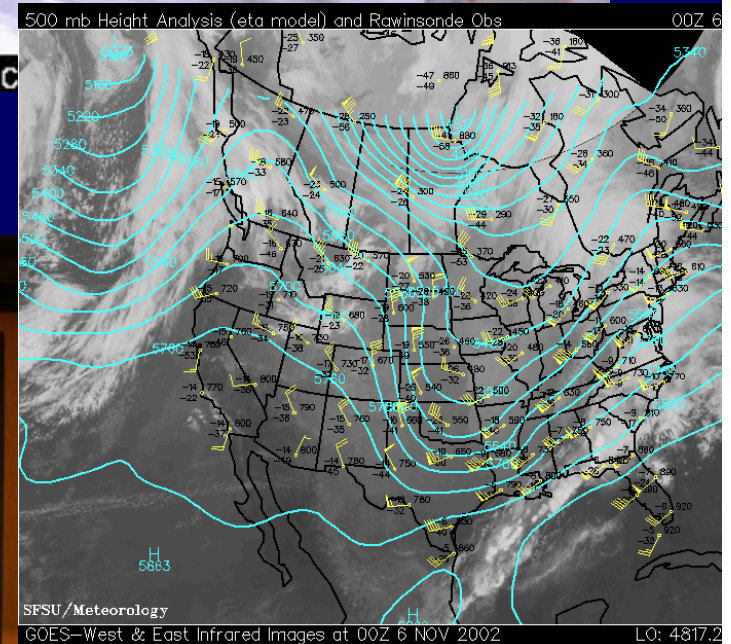
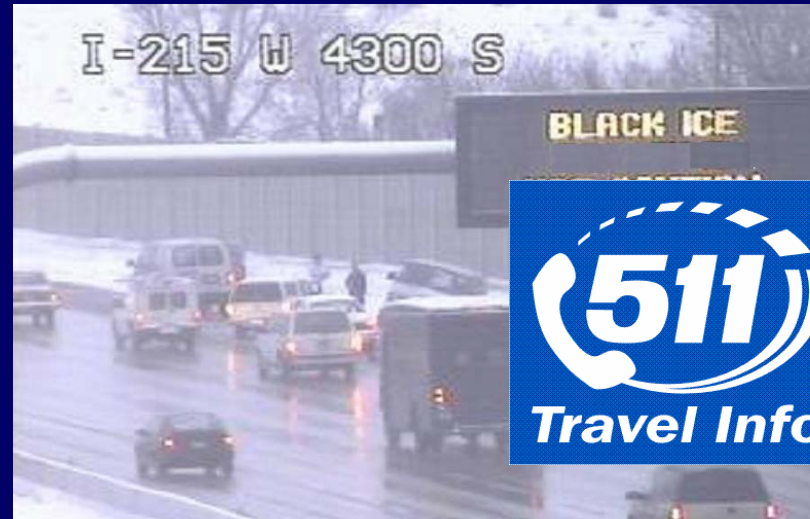
- On-site Consultant Meteorologists
- 24/7
- Handle over 3500 calls/season
- One on one communications



Weather Briefings



- TOC/ Operations Personnel
- Engineers/Managers
- Traveler Information
- Signal Engineers
- Field Operations
- Handle all weather related aspects of operations





Year-round Meteorological Support

- Winter Maintenance
- Construction
- Road Rehab
- Landscaping
- Planning
- Highway Avalanche Safety Program
- Weed Abatement
- Training
- TOC Operations
- Hydrology/Flooding
- Fire Weather
- Signal Timing Group
- Forensic Work
- Risk Management
- UHP



Study Objectives

- Identify current practices in other states
- Assess effectiveness and benefits of the Weather Operations Program (in a nut shell... Justify our existence)
- Suggest studies/enhancements for future use

The Big Questions

1. Is the information provided by the program accurate, reliable, and easy to use?
2. Is the program delivering the products it is supposed to?
3. Are the customers satisfied with the service provided by the program?
4. Is the information provided by the program changing users' behavior, and if so, how?
5. Is the information provided to UDOT personnel valuable in their operations, beyond what is available from other weather information providers?
6. What are the benefits of the UDOT weather service to winter maintenance personnel?

Methodology

- Personnel Interviews
 - Qualitative (survey findings)
- Investigated Factors
- Modeling
 - Quantitative (cost modeling)

Personnel Interviews

- Interview groups
 - Maintenance engineers, area supervisors and shed supervisors
 - Resident engineers (construction)
- Areas of inquiry
 - Use of weather forecasting
 - Awareness of program
 - Experience with using UDOT'S Meteorologists

Investigated Factors

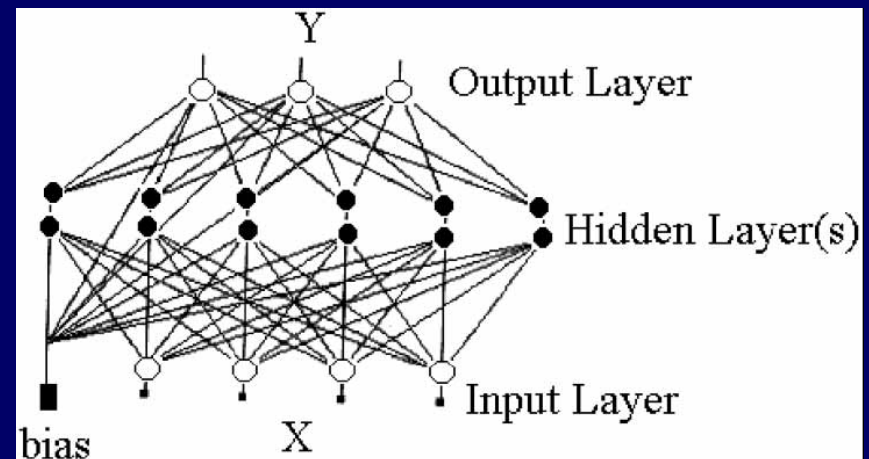
$$LMC = f(USE, EVLN, ANTI, LOM, VMT_a, WSI)$$

- LMC = the shed-level labor and materials cost for winter maintenance annually
- USE = overall usage of the UDOT service in winter season by the shed
- $EVLN$ = overall evaluation of the UDOT service by the shed
- $ANTI$ = the level of anti-icing practice
- LOM = the level-of-maintenance of the winter roadways the shed manages
- VMT_a = the vehicle-miles traveled on the winter roadways the shed manages
- WSI = winter severity index for the area managed by the shed

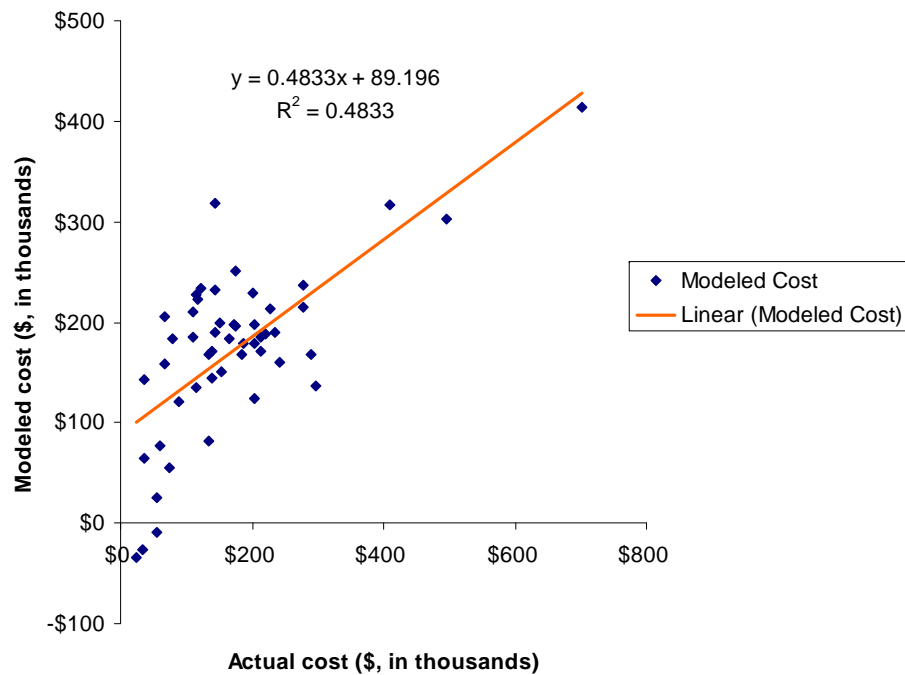
Modeling

Artificial Neural Networks (ANN)

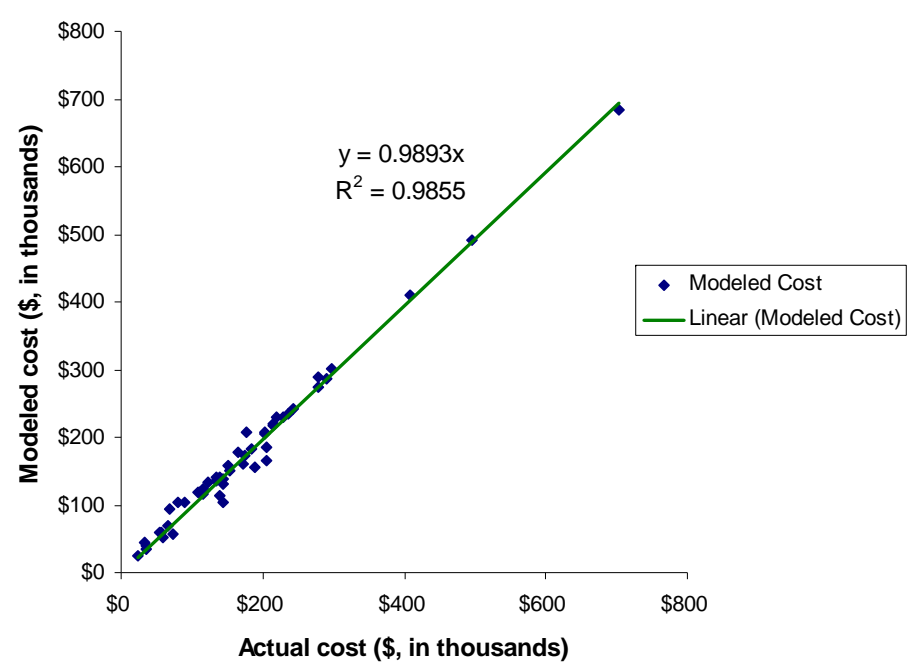
- Non-linear, analytical, computational method involving learning
- Handles “noisy” data well
- Flexible to handle relationships where functional form is unclear



Comparison of Modeling Alternatives



Multi-variable Linear Regression



Artificial Neural Network

Conclusions

The Big Questions

1. Is the information provided by the program accurate, reliable, and easy to use? **YES**
 - High levels of satisfaction with reliability and usability among maintenance personnel
 - Request from the maintenance sheds for an increase in TOC Meteorologist coverage
2. Is the program delivering the products it is supposed to? **YES**
 - Unanimous awareness among respondents
 - Time horizons are good
 - E-mail, telephone, radio and Internet are best methods

Conclusions

The Big Questions (cont.)

3. Are the customers satisfied with the service provided by the program? **YES**
 - 90% indicated better level of service than competitors
 - Respondents indicated program is efficient
4. Is the information provided by the program changing users' behavior, and if so, how? **YES**
 - 80% change their approach to winter maintenance with aid of forecasts
 - Construction engineers use information to improve scheduling
5. Is the information provided to UDOT personnel valuable in their operations, beyond what is available from other weather information providers? **YES**
 - Greater level of specificity related to operations

Conclusions

The Big Questions (cont.)

6. What are the benefits of the UDOT weather service to winter maintenance personnel?
 - Conservative Benefit to Cost Ratio of 10-1, With an Estimated Savings to UDOT of \$2-3 Million Annually ... real dollars
 - UDOT's Weather Operations Program provides a net benefit to the state solely from a winter maintenance perspective
 - Benefit analysis focused only on cost savings from reduced staffing and chemical usage

Conclusions

- **Limitations in Analysis**
 - Did not include benefits of RWIS
 - Did not include other benefits associated with weather operations program
- **Secondary Benefits**
 - Opportunity for self evaluation
 - Increased awareness from Senior Leaders
 - ITS America 2007 Award for Best Return on Investment



Next Steps

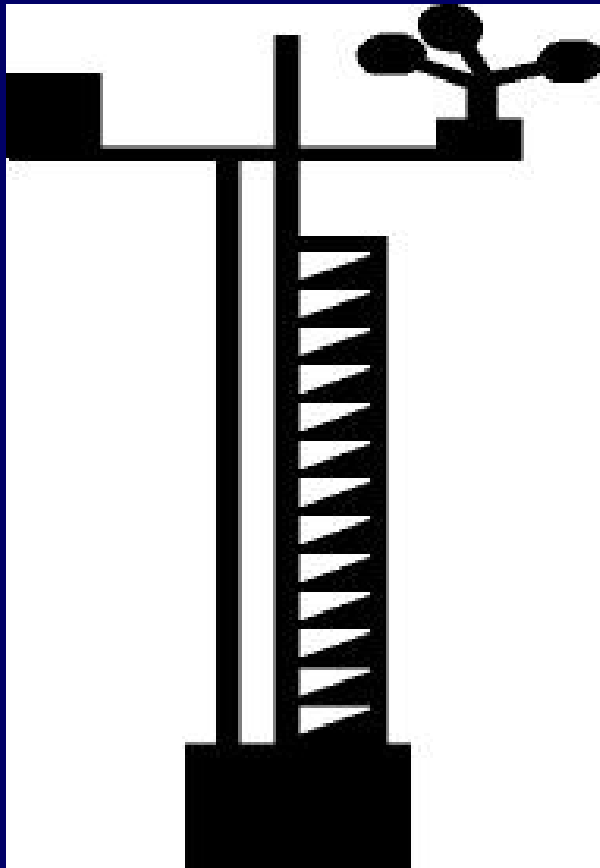
- What is the benefit-cost of UDOT's RWIS program?
- What are the indirect effects of improved maintenance from enhanced weather forecasts?
 - Reduced delay?
 - Improved safety?
- What are other benefits to UDOT from its Weather Operations Program?
- TOC/TMC Weather Integration (AURORA)
- MDSS Forecast Integration (AURORA)

Thanks...

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Partnerships



- NorthWest Weathernet
- National Weather Service
- USDA Avalanche Forecast Center
- River Forecast Center
- Dept of Energy
- Tooele County EOC
- Aurora Group
- University of Utah
- Utah State University
- Montana State University
- SLC International Airport
- FHWA
- ITS/AMS
- Myriad of Private Sector Companies



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