

The WeatherShare Project: Aggregation and Dissemination of Weather Information for Public Safety

National Rural ITS Conference 2006

Big Sky Montana

Monday, August 14th, 2006

12:30 pm

Session B4: Innovative Data Collection and Sharing

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Western Transportation Institute

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Caltrans District 2

Related Sessions:

The Application of Systems and Software Engineering Process Models for Development on Small to Moderate-Sized ITS Projects: WeatherShare and the Redding Responder Projects

Session G2: Using Existing Technology in New Ways

Tuesday, August 15th, 2:45 pm

Abstract:

In cooperation with the California Department of Transportation, Montana State University's Western Transportation Institute has developed a “proof-of-concept” data aggregation and dissemination system to collect and provide public safety officials with current and historical weather data.

Through the use of a rich, interactive user interface and customizable profiles, the system provides users with a flexible system for monitoring current conditions and evaluating sensor operation and prospective deployment. Users may also set custom alerts to indicate when certain events such as high winds or sub-freezing temperatures occur.

Quality control procedures have been implemented to flag questionable sensor readings.

This presentation will provide an overview of the system and anticipated system enhancements.

WeatherShare Background

- Covers a 20-county, Northern Calif. region with >2,000 miles of highways.
- 11 Caltrans RWIS stations and >700* other weather stations
- A component of the Redding Incident Mgmt. Enhancement (RIME) program.
- Phase I Stakeholders include:



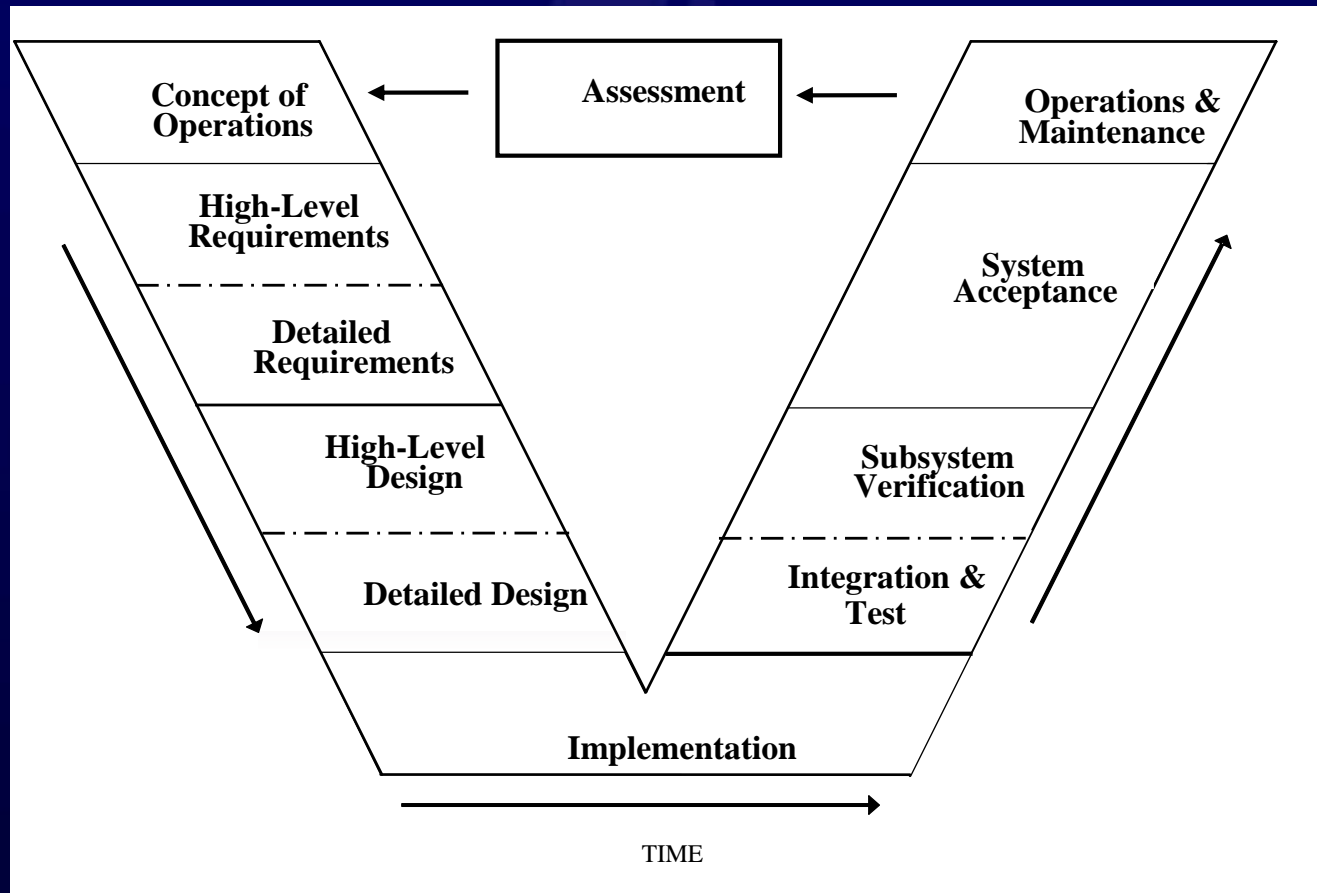
Goals of WeatherShare

- To streamline and integrate currently available road weather data from Calif. RWIS sites, Calif. Dept. of Water Resources (CDWR) stations, and other sources available into a single source, where relevant information is accessible by incident responders and the traveling public.
- This system will allow users to make informed and efficient assessment of current road weather conditions for: incident management, highway maintenance, emergency medical services (EMS), traveler information, and possibly homeland security applications.

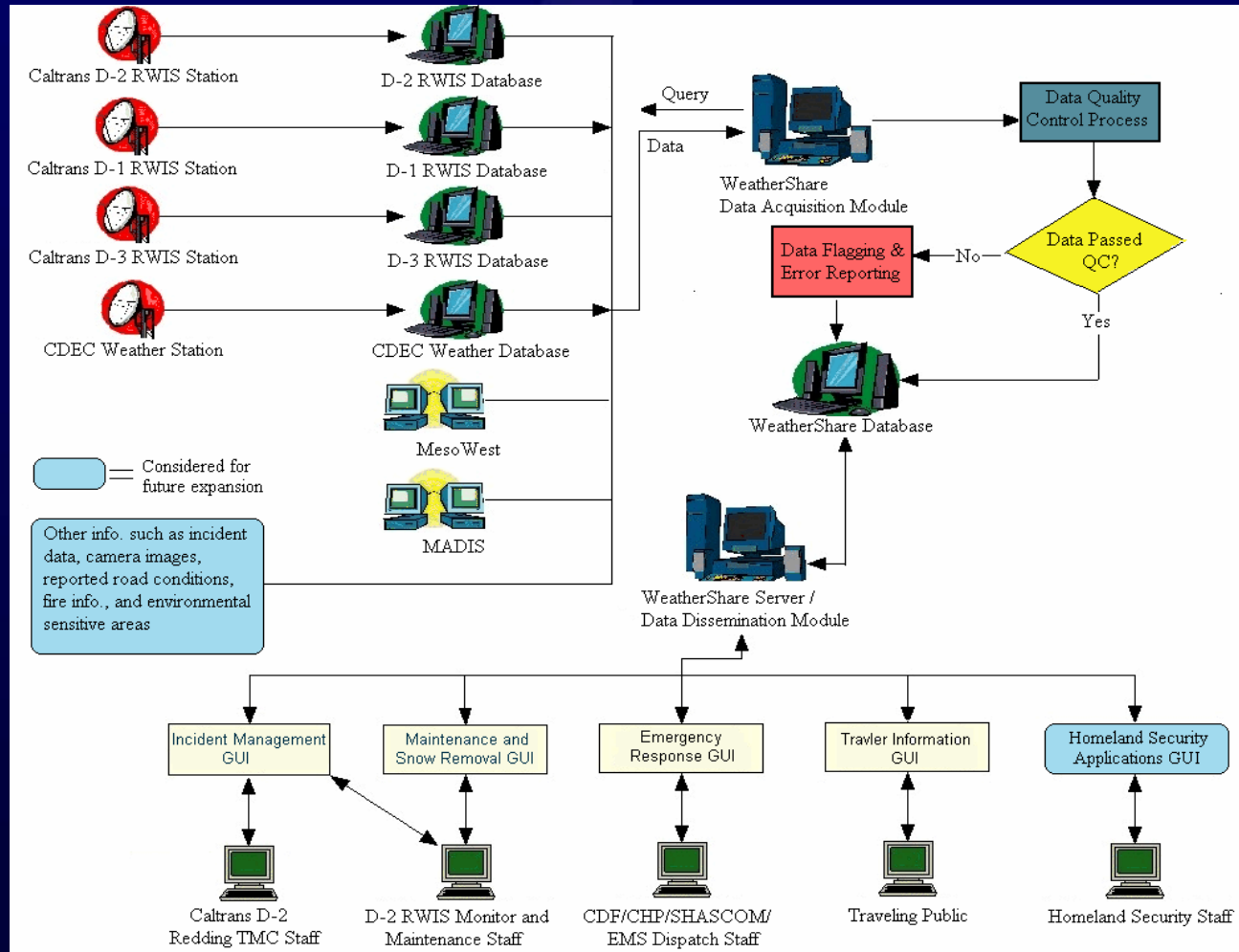
Systems Engineering Process

- Phased approach
 - Phase I: Prototype system
 - Phase II: Full system
- Follow the V model on a small scale

V Model



WeatherShare Concept / Information Flow



Data Sources, Update Frequency & Sensor Readings

- **CDEC(420 stations): every 15 minutes**

Air Temperature, Relative Humidity, Avg Wind Speed, Avg Wind Direction, Max Wind Gust Speed, Max Wind Gust Dir, Atmospheric Pressure, Solar Radiation, Fuel Moisture, Fuel Temperature, Precipitation, Reservoir Elevation, River State, water temperature.

- **MADIS(39 stations): every 30 minutes**

Air Temperature, Relative Humidity, Avg Wind Speed, Avg Wind Direction, Max Wind Gust Speed, Max Wind Gust Dir, Dewpoint Temp, Atmospheric Pressure, Fuel Moisture, Fuel Temperature, Precipitation Rate, Precipitation in 24Hours.

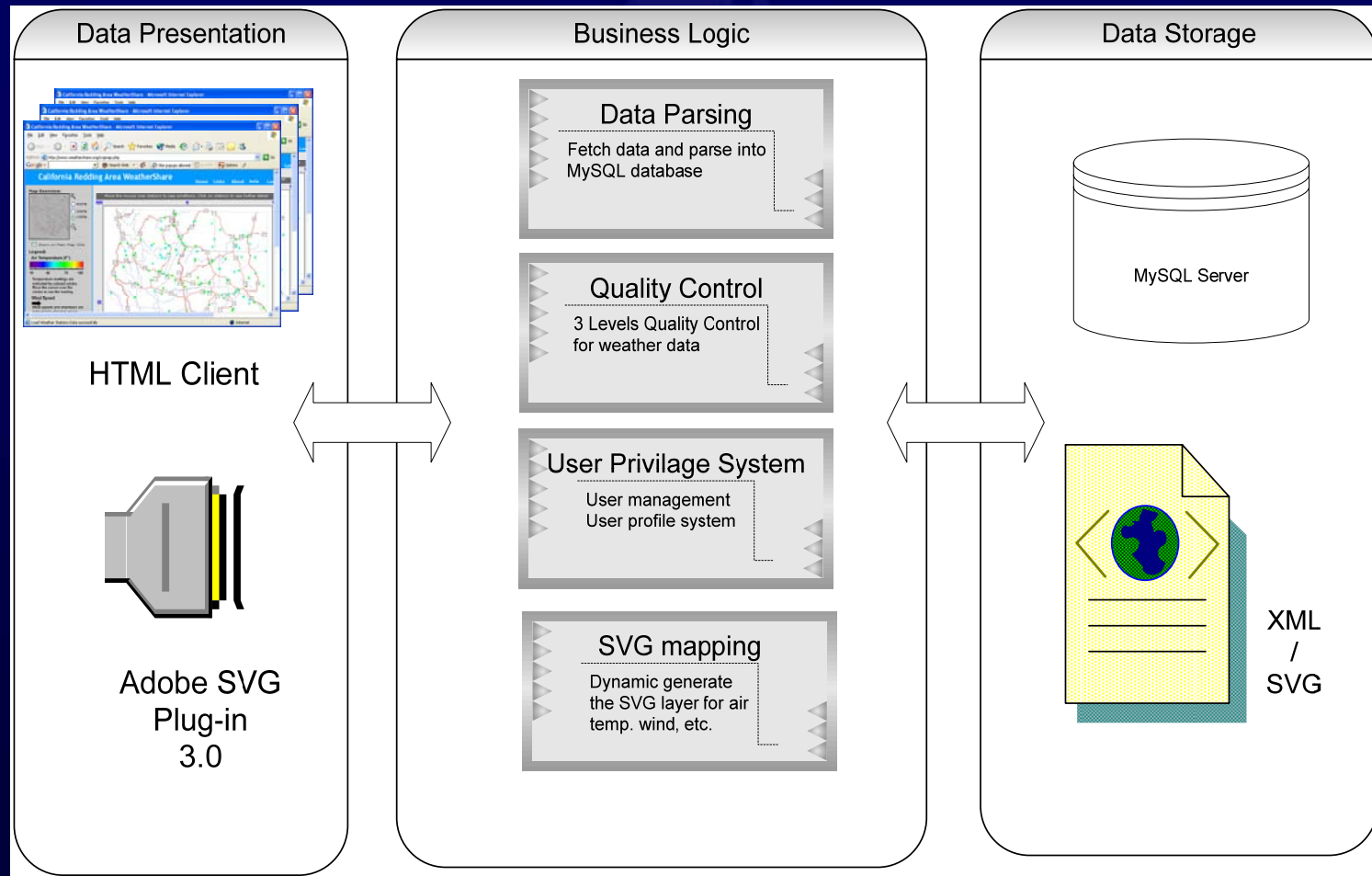
- **MesoWest(229 stations): every 15 minutes**

Air Temperature, Relative Humidity, Avg Wind Speed, Avg Wind Direction, Max Wind Gust Speed, Atmospheric Pressure, Solar Radiation.

- **District II RWIS(11 stations): every 30 minutes**

Air Temperature, Dewpoint Temp, Max Temp, Min Temp, Avg Wind Speed, Max Wind Gust Speed, Avg Wind Direction, Max Wind Gust Dir, Relative Humidity, Precipitation Intensity, Precipitation Rate, Accumulate Precipitation, Visibility.

Multi-tier System Architecture



System Hardware Configuration

- Dual Intel(R) Xeon(TM) CPU 2.40GHz
- Hard drives: 80 GB x 2
- 1 GB memory

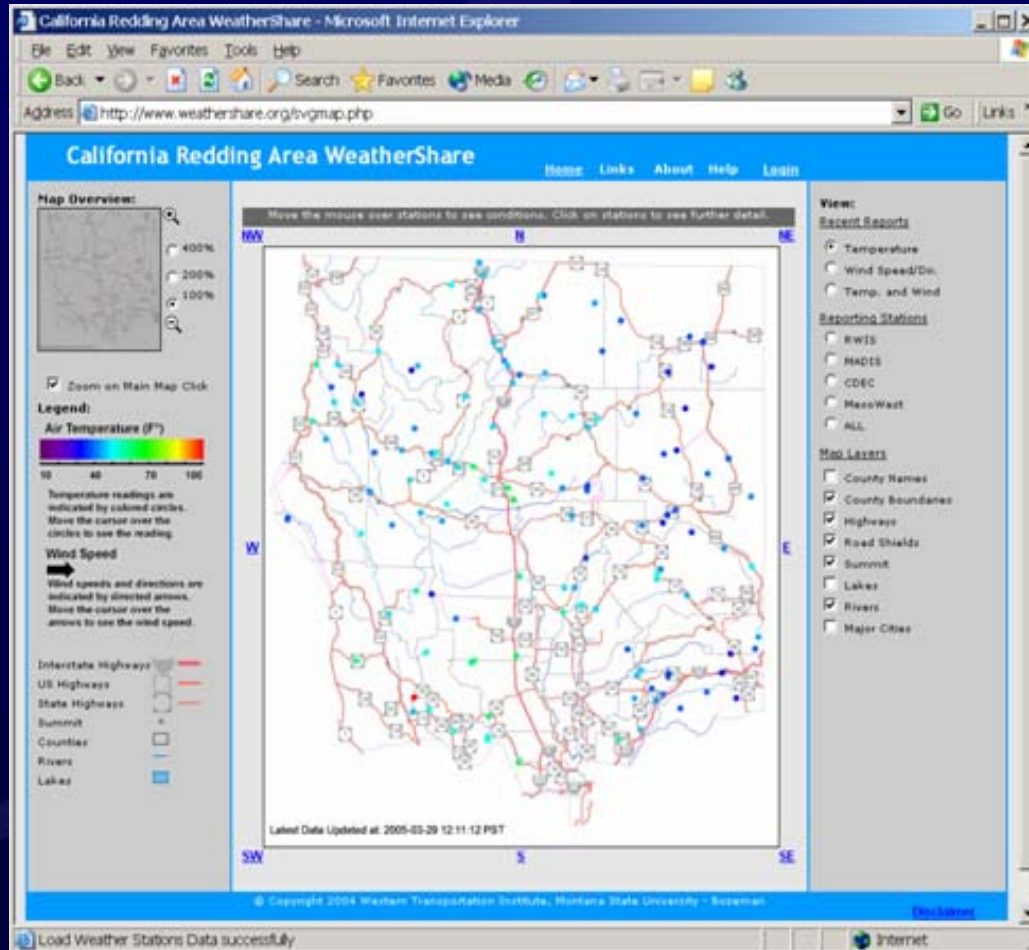
System Software Configuration

- Debian Linux (kernel 2.4.25)
- Apache v 1.3.33-2
- MySQL v 3.23.49-8.8
- Perl v 5.8.4-5
- PHP4 v 1.3.10-2
- SSH v 3.4p1-1

The WeatherShare Interface

- HTML
- JavaScript
- SVG (Scalable Vector Graphics) – requires Adobe SVG plug-in
- Broadband connectivity preferred

WeatherShare URL: www.weathershare.org



The WeatherShare User Interface

California Redding Area WeatherShare

Home Profile Links About Help Logout [caltrans]


Map Overview:

400%
200%
100%

Zoom on Main Map Click

Legend:


Air Temperature (F°)



10 40 70 100

Temperature readings are indicated by colored circles. Move the cursor over the circles to see the reading.

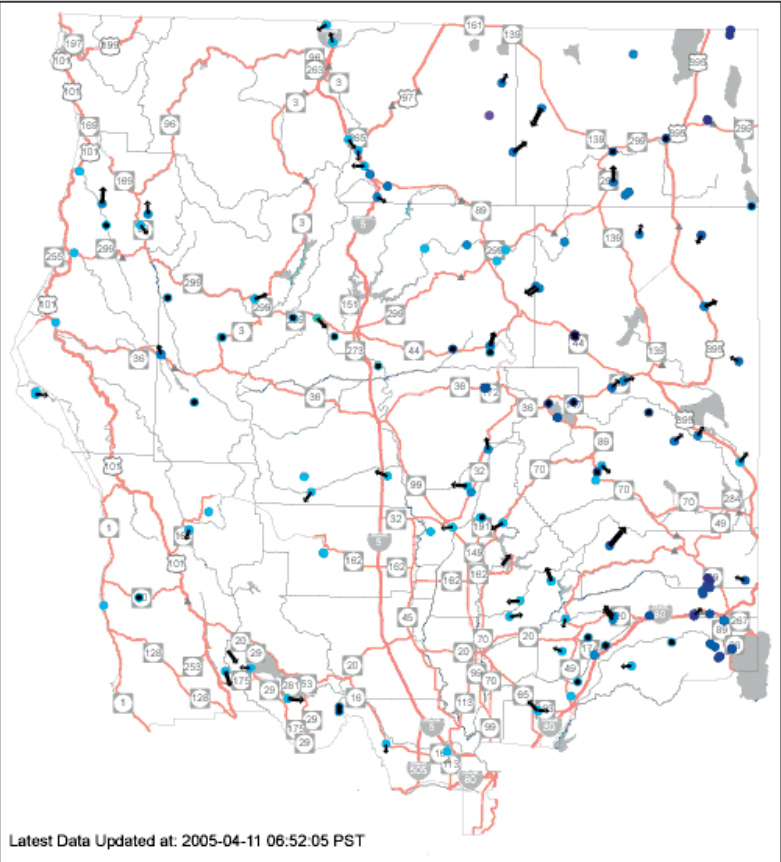
Wind Speed



Wind speeds and directions are indicated by directed arrows. Move the cursor over the arrows to see the wind speed.

Interstate Highways
US Highways
State Highways
Summit
Counties
Rivers
Lakes

Move the mouse over stations to see conditions. Click on stations to see further detail.



Latest Data Updated at: 2005-04-11 06:52:05 PST

View:

Recent Reports

Temperature
 Wind Speed/Dir.
 Temp. and Wind

Reporting Stations

RWIS
 MADIS
 CDEC
 MesoWest
 ALL

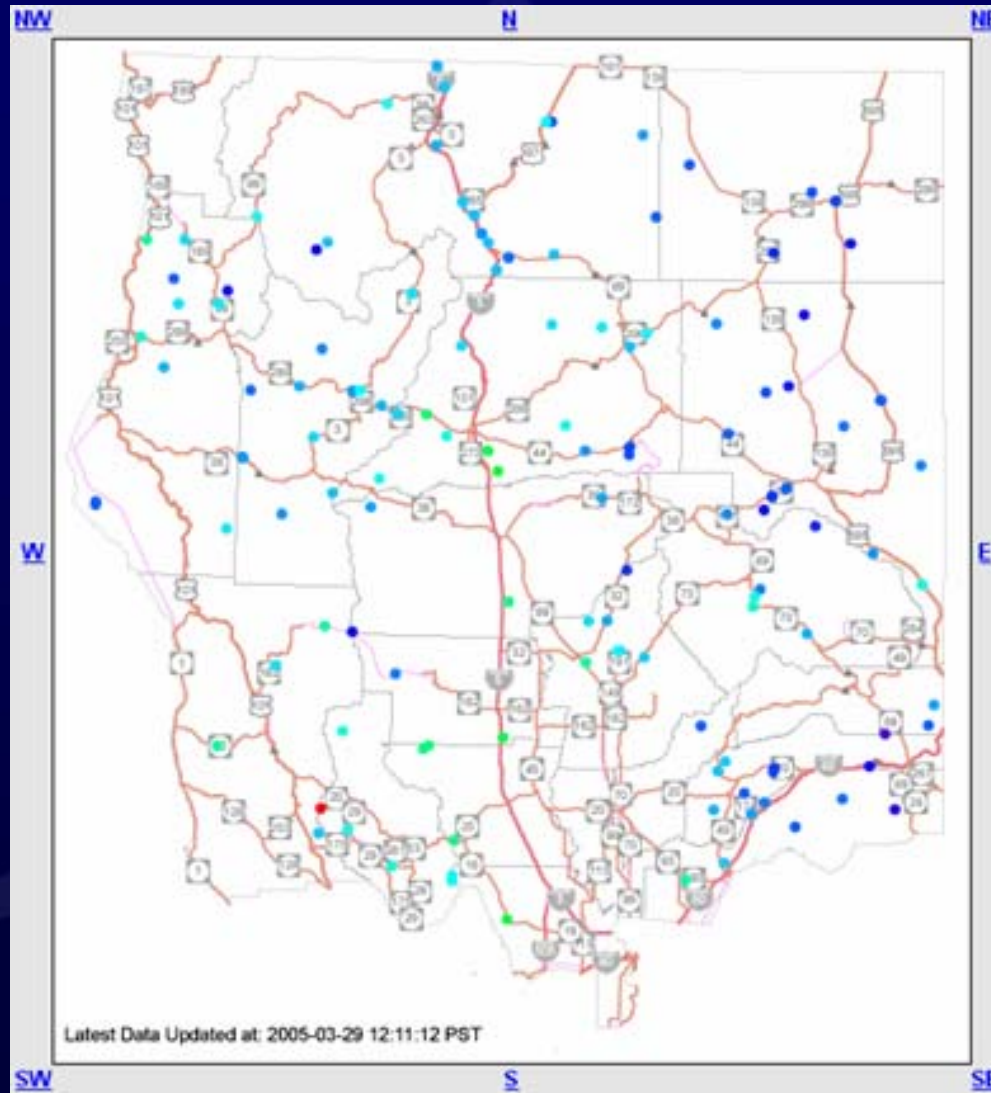
Map Layers

County Names
 County Boundaries
 Highways
 Road Shields
 Summit
 Lakes
 Rivers
 Major Cities

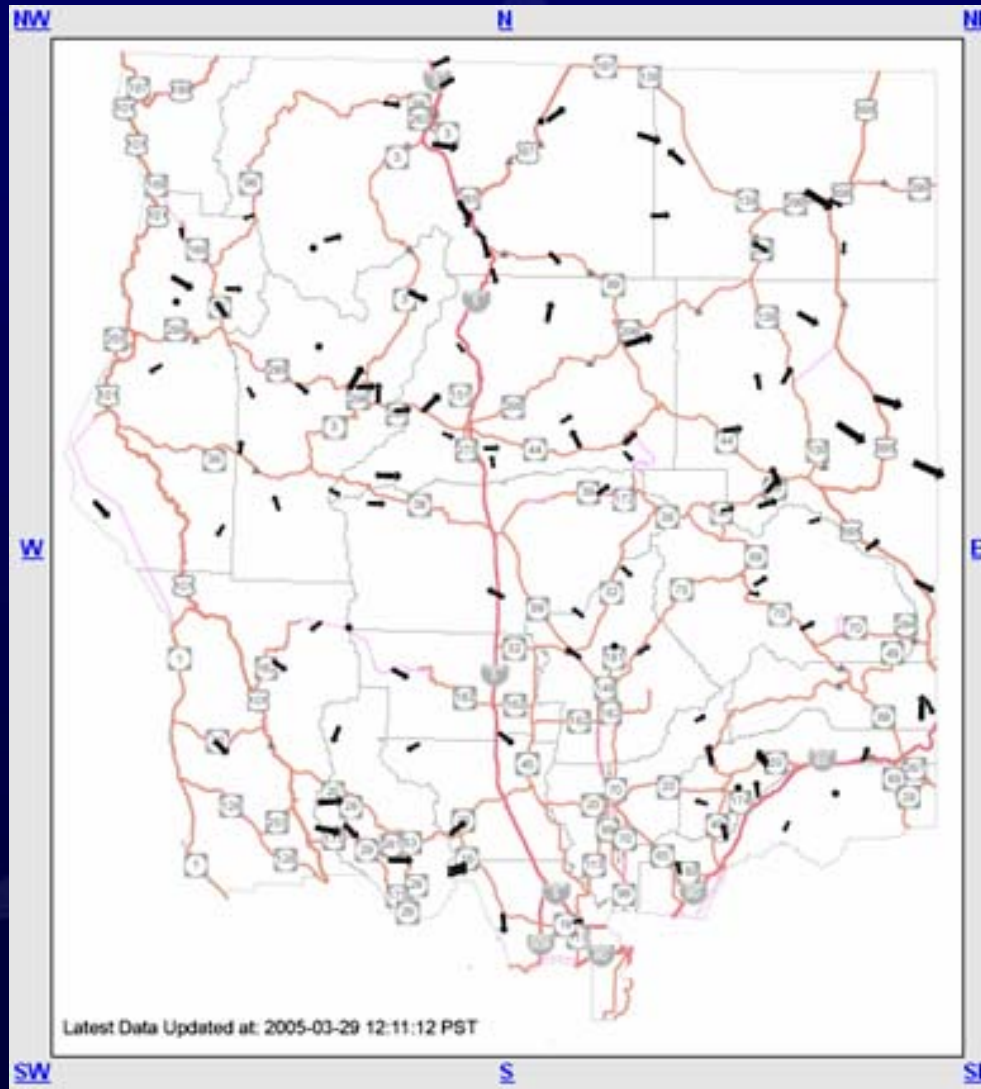
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[Disclaimer](#)

Primary Map: Recent Temperature Reports



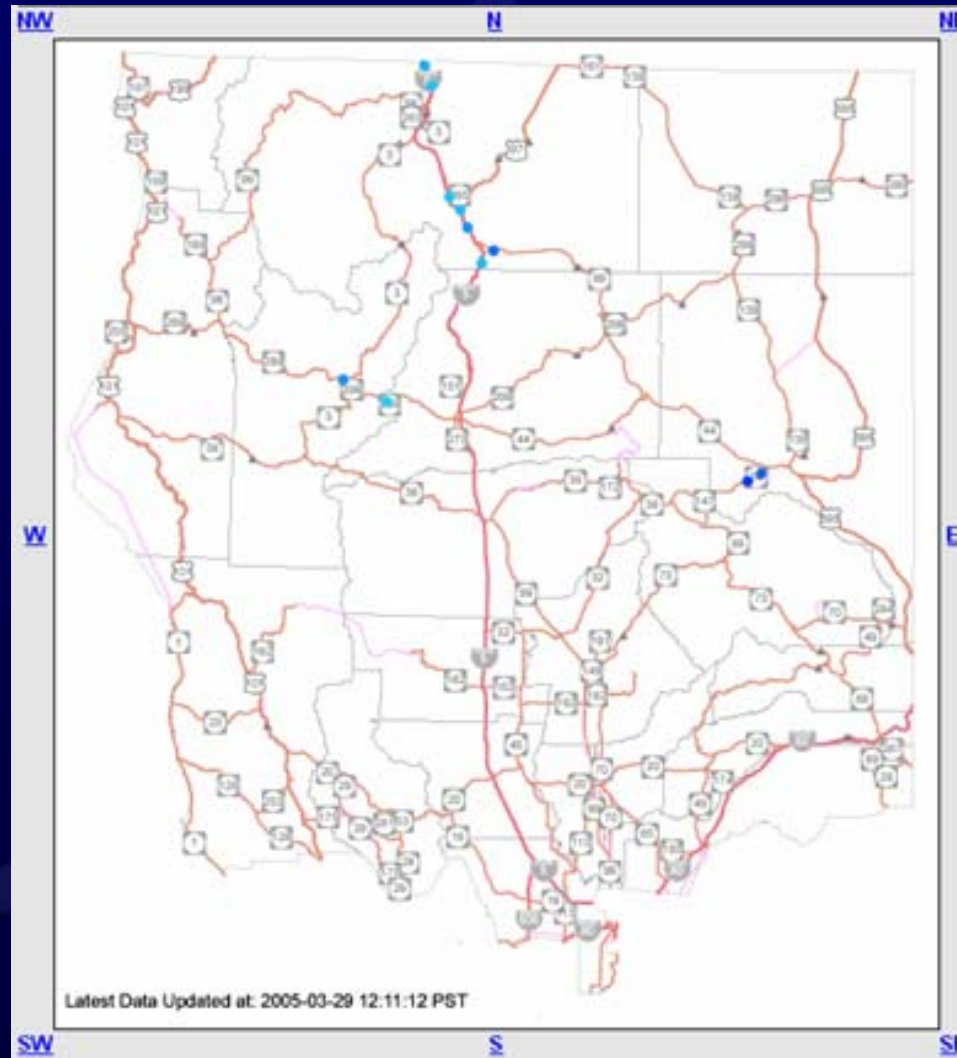
Primary Map: Recent Wind Readings



Can Filter by Data Source:

- California Data Exchange Center (CDEC)
- MesoWest
- Madis
- Caltrans

Caltrans' RWIS Stations



Details from Dunsmuir I-5 Station

Weather Information Query Results - Microsoft Internet ...

Updated at 12:00:23 PM PST Tuesday, March 29 2005

Network: [Caltrans District 2 Road Weather Information System](#)

Station Name: [Dunsmuir, I-5 Siskiyou](#)

County: SISKIYOU

Elevation: 2500 Feet

Longitude: -122.27000

Latitude: 41.21000

Air Temp.Avg/Max/Min: 45.9 / - / - °F

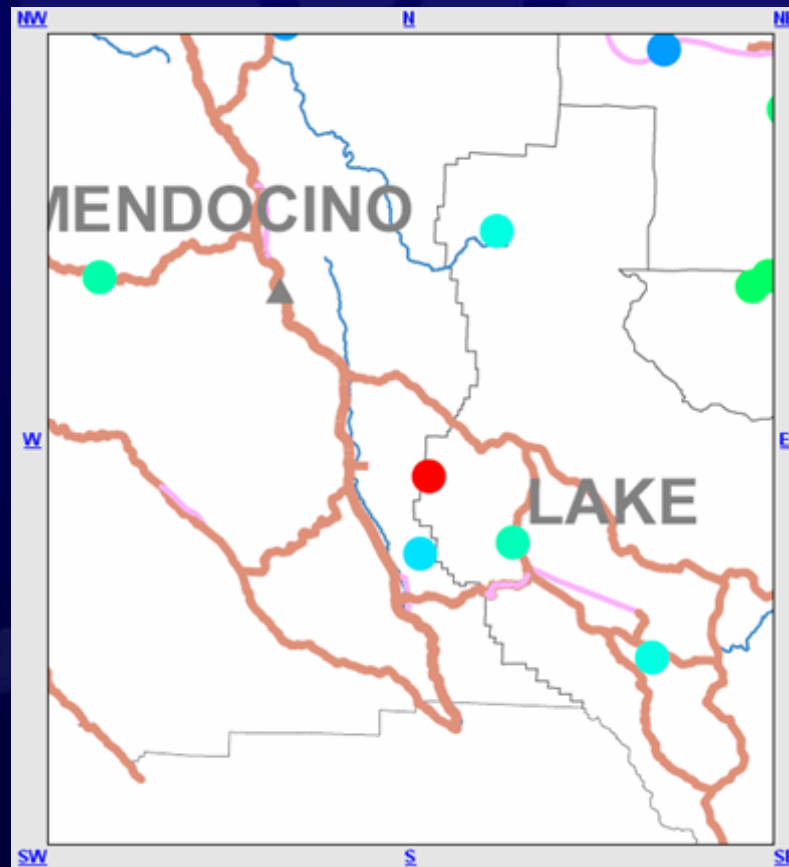
Relative Humidity: 51 %

Dew Point: 28.6 °F

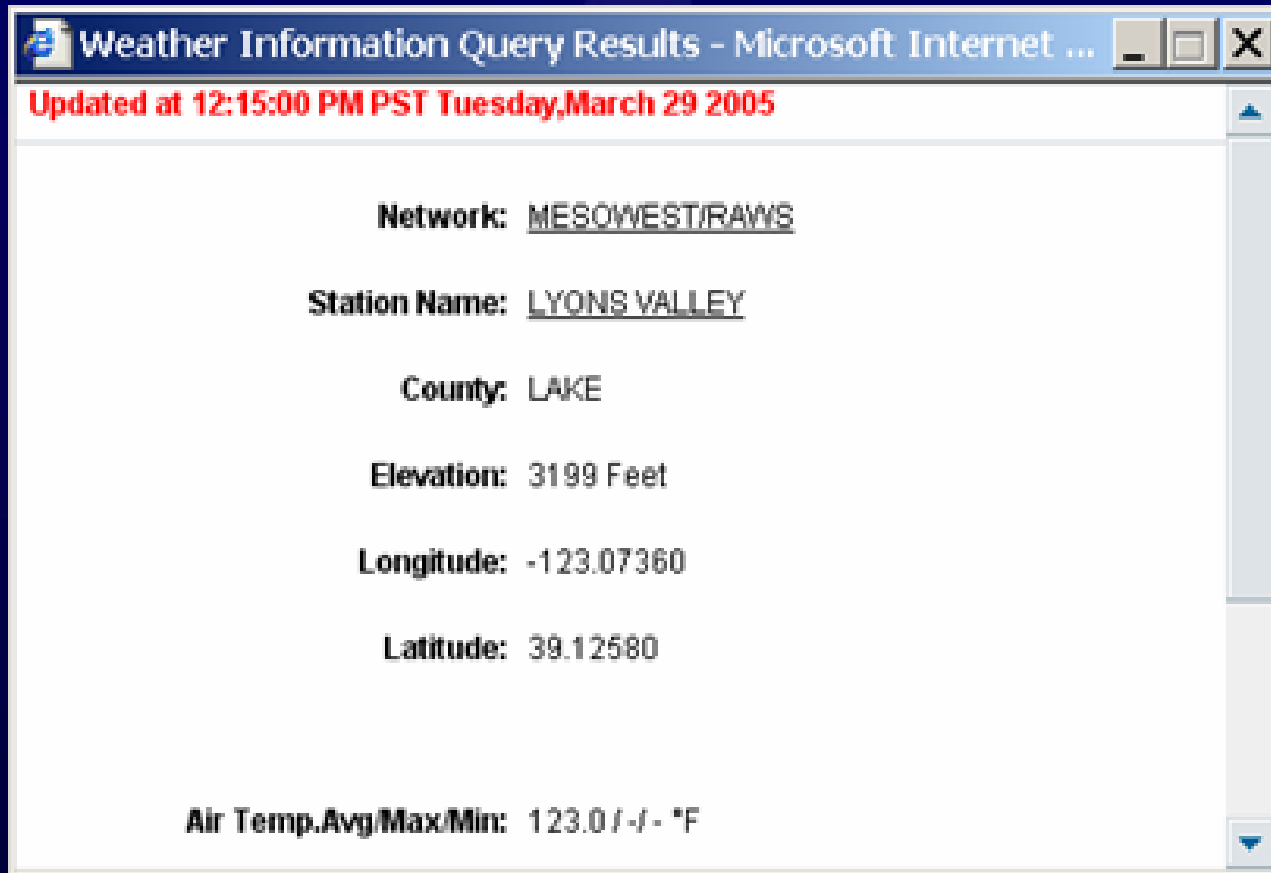
Avg/Gust Wind Speed: 5.0/ 6.8 mph

Data Can be Viewed in Context

- Example: The Lyons Valley station in Lake County was producing some “interesting” readings.



Further Detail: Lyons Valley Station



The screenshot shows a web browser window titled "Weather Information Query Results - Microsoft Internet ...". The page content is as follows:

Updated at 12:15:00 PM PST Tuesday, March 29 2005

Network: MESOWEST/RAWS

Station Name: LYONS VALLEY

County: LAKE

Elevation: 3199 Feet

Longitude: -123.07360

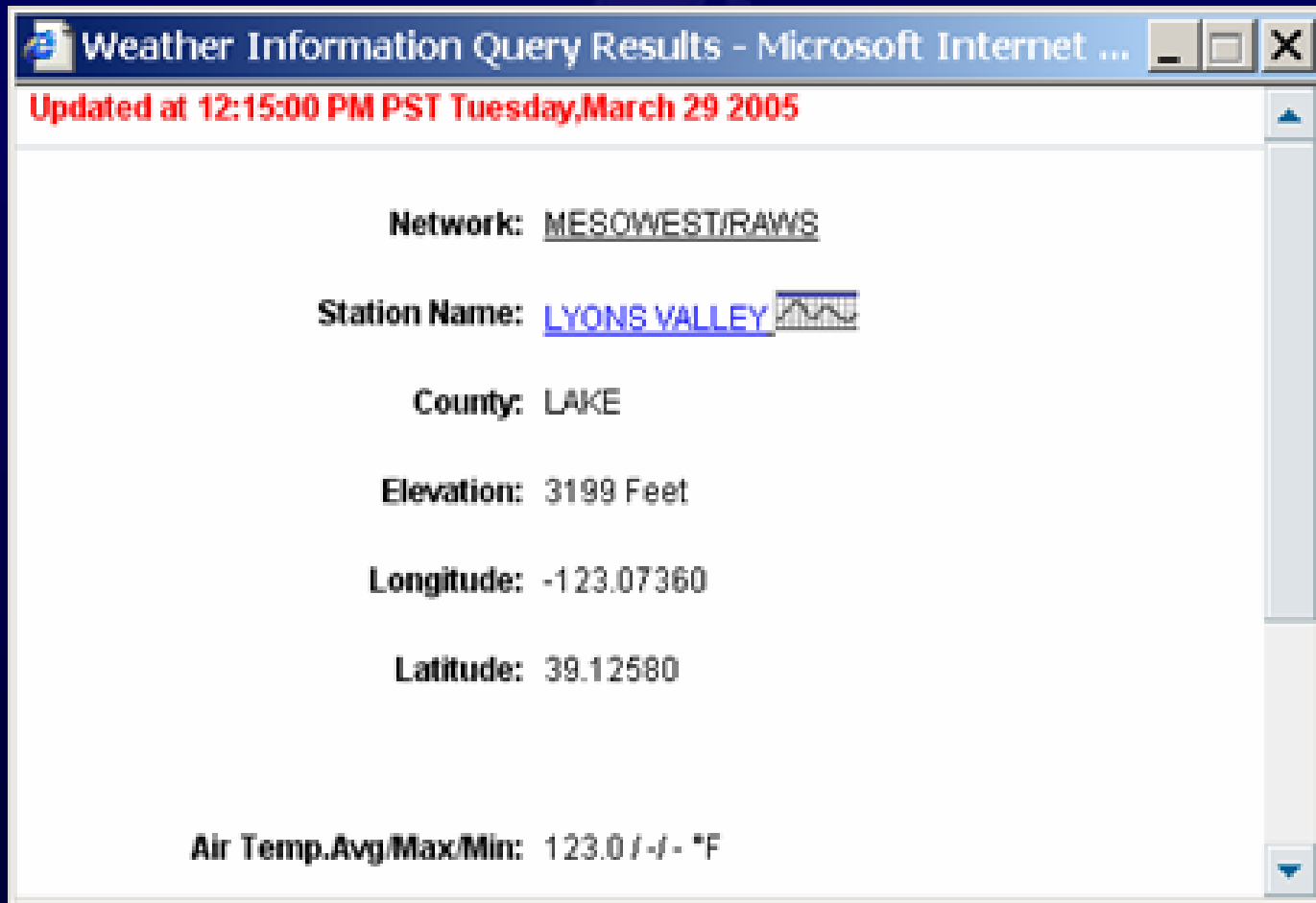
Latitude: 39.12580

Air Temp.Avg/Max/Min: 123.0 / - / - °F

Authorized Users

- Public has general access.
- Authorized users have access to further information and functionality.


Investigate Lyons Valley Further



Weather Information Query Results - Microsoft Internet ...

Updated at 12:15:00 PM PST Tuesday, March 29 2005

Network: [MESOWEST/RAWS](#)

Station Name: [LYONS VALLEY](#) 

County: LAKE

Elevation: 3199 Feet

Longitude: -123.07360

Latitude: 39.12580

Air Temp. Avg/Max/Min: 123.0 / - / - °F

Select date range for historical data:

Historical Data Export - Microsoft Internet Explorer


Station Name: LYONS VALLEY


County: LAKE

Elevation: 3199 Feet

Longitude: -123.07360

Latitude: 39.12580

From(YYYY/MM/DD): 

To(YYYY/MM/DD): 

Data Viewed in MS-Excel

Microsoft Excel - MESOWEST-2005-03-29[1].c...

File Edit View Insert Format Tools Data Window
Help Adobe PDF

10 B

B1841 3/23/2005 3:15:00 PM

	A	B	C	D
1834	COWC1	3/23/2005 8:15	38	10
1835	COWC1	3/23/2005 9:15	37	10
1836	COWC1	3/23/2005 10:15	38	10
1837	COWC1	3/23/2005 11:15	37	10
1838	COWC1	3/23/2005 12:15	38	10
1839	COWC1	3/23/2005 13:15	38	10
1840	COWC1	3/23/2005 14:15	39	10
1841	COWC1	3/23/2005 15:15	129	10
1842	COWC1	3/23/2005 16:15	130	10
1843	COWC1	3/23/2005 17:15		10
1844	COWC1	3/23/2005 18:15	120	10
1845	COWC1	3/23/2005 19:15	114	10
1846	COWC1	3/23/2005 20:15	120	10
1847	COWC1	3/23/2005 21:15	116	10
1848	COWC1	3/23/2005 22:15	117	10
1849	COWC1	3/23/2005 23:15	118	10

Read Sum=7/30/2005 15:15 NUM

Caltrans' Surface & Pavement Temps

Weather Information Query Results - Microsoft Internet ...

Latitude: 41.21000

Air Temp.Avg Max/Min: 50.7 / - / - °F

Relative Humidity: 41 %

Dew Point: 27.6 °F

Avg/Gust Wind Speed: 6.8/ 11.2 mph

Avg/Gust Wind Direction: 0 / 5

Preci. Accum in 24hrs: 0.000in

Pavement Data							
Sensor id	Status	Surface Temp.	Pavement Temp.	Freeze Point	Chemical Factor	Chemical %	Ice %
0	32	- °F	49.0 °F	-	95	-	-
1	33	70.4 °F	- °F	-	-	-	-
2	33	70.2 °F	- °F	-	-	-	-

Alerts/Thresholds

Microsoft Internet Explorer window: Edit your profile - Microsoft Internet Explorer

Address: <http://www.weathershare.org/profile.php?mode=editprofile>

This information will be publicly viewable

Location:

Occupation:

Preferences

Default View:

Map Layers:

- County Names: Yes
- County Boundaries: Yes
- Highways: Yes
- Road Shields: Yes
- Summit: Yes
- Lakes: Yes
- Rivers: Yes
- City Names: Yes

Alert Threshold Yes

Air Temperature: °F

Wind Speed: mph

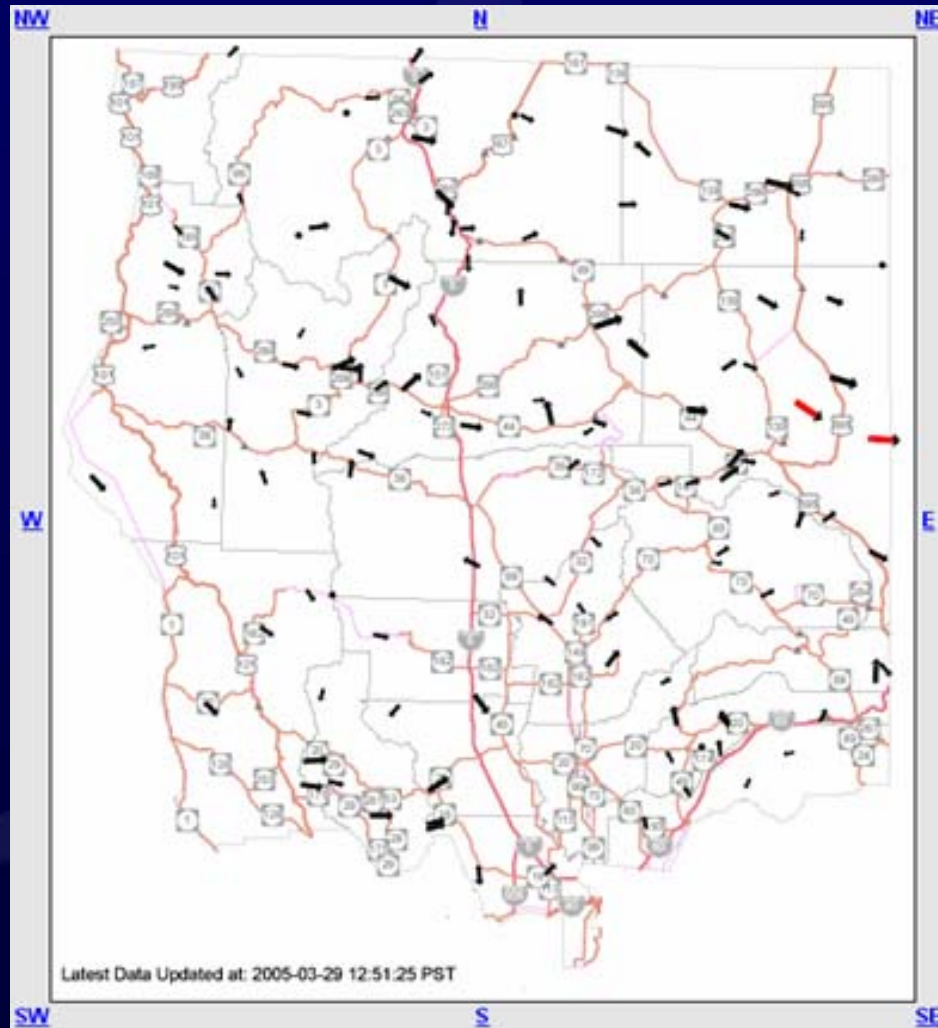
Air Temperature - Dew Point: °F

[Back to home](#)

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Done Internet

Wind Alerts = Blinking Arrows



Quality Control

- Multivariate linear regression is being implemented for Level 3 quality control
- Results are experimental
- No uniform standard for this
- It has already proven useful.
- Requires further investigation.

Six Faulty Stations Identified:

- Temperature anomaly at Lyons Valley station.
- Two portable stations have been moved.
- Elevation was identified incorrectly by a provider.
- Two stations identified as questionable by providers.

Preliminary to Phase 2

We have:

- A working, proof-of-concept system.
- Detailed concept of operations, requirements.

Next Steps – Phase 2

- Prepare System for Statewide Coverage and Deployment
- Enhance Alert Capability
- Improve Reporting Capability
- Add Weather Forecasts and Alerts
- Continue to Work and Usability and Utility Issues

Acknowledgements

- WTI
 - Xianming Shi
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 - Mandy Chu
 - Sean Campbell
- Caltrans D2
 - Ian Turnbull
 - Many Others
- Other Stakeholders
 - Norcal EMS
 - CDF
 - Shascom
 - Others