

The 2011/12 Yuma Lettuce Ice Forecast Program: Internet Access of Program Forecasts & Weather Data¹

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Introduction

The Yuma Lettuce Ice Forecast Program provides high resolution temperature forecasts for the agricultural areas of Yuma County. The program also operates a network of real time weather stations to assist with forecast improvement and validation. This document describes the procedures required to access program forecasts and weather data during the 2011/12 produce season.

Yuma Lettuce Ice Forecast Website

Forecasts and weather data are available from the Yuma Lettuce Ice Forecast Website located at the following URL:

<http://ag.arizona.edu/azmet/LIF.htm>

Upon entering the URL provided above, you will be taken to the program's main webpage (Fig. 1) that provides access to program forecasts and current weather data through two clickable buttons. Click the button labeled **Forecast Products** to access weather forecasts. Click the button labeled **Current Weather Data** to view current and recent weather data collected by program weather stations.

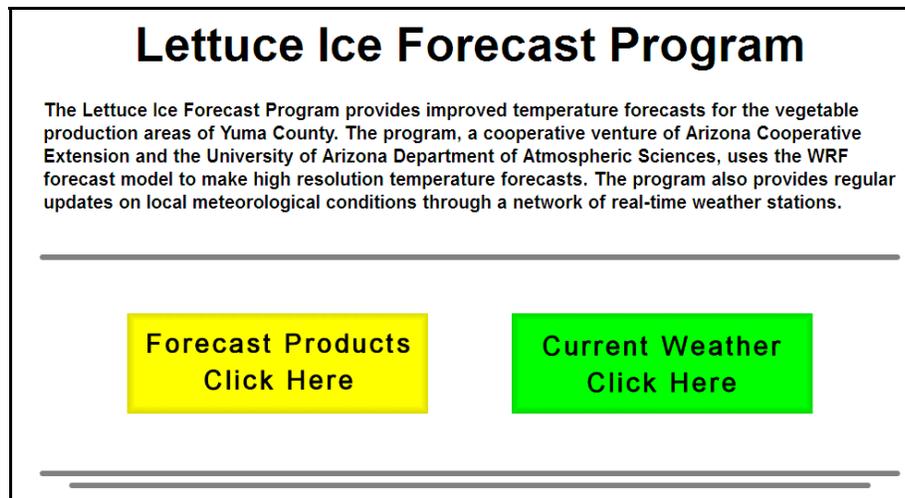


Figure. 1. Lettuce Ice Forecast Program webpage located at <http://ag.arizona.edu/azmet/LIF.htm>
Program forecasts and information can be accessed by clicking on the two buttons.

¹The Arizona Department of Agriculture, Agricultural Consultation and Training has funded all or a portion of this Project, using Speciality Crop Block Grant funds provided by the USDA, Agricultural Marketing Service. The views or findings presented are the Grantee's and do not necessarily represent those of the State or the Arizona Department of Agriculture.

Forecast Products

A number of forecast products are generated each day by the program. These products can be accessed by clicking on the button labeled **Forecast Products** located on the main webpage (Fig. 1). Upon clicking this button you will be transferred to the Forecast Products subpage (Fig. 2) where you will find a series of clickable buttons that allow you to access the various forecasts generated each day. A brief description and visual examples of each forecast product are provided on the next few pages of this document..

Lettuce Ice Forecast Program

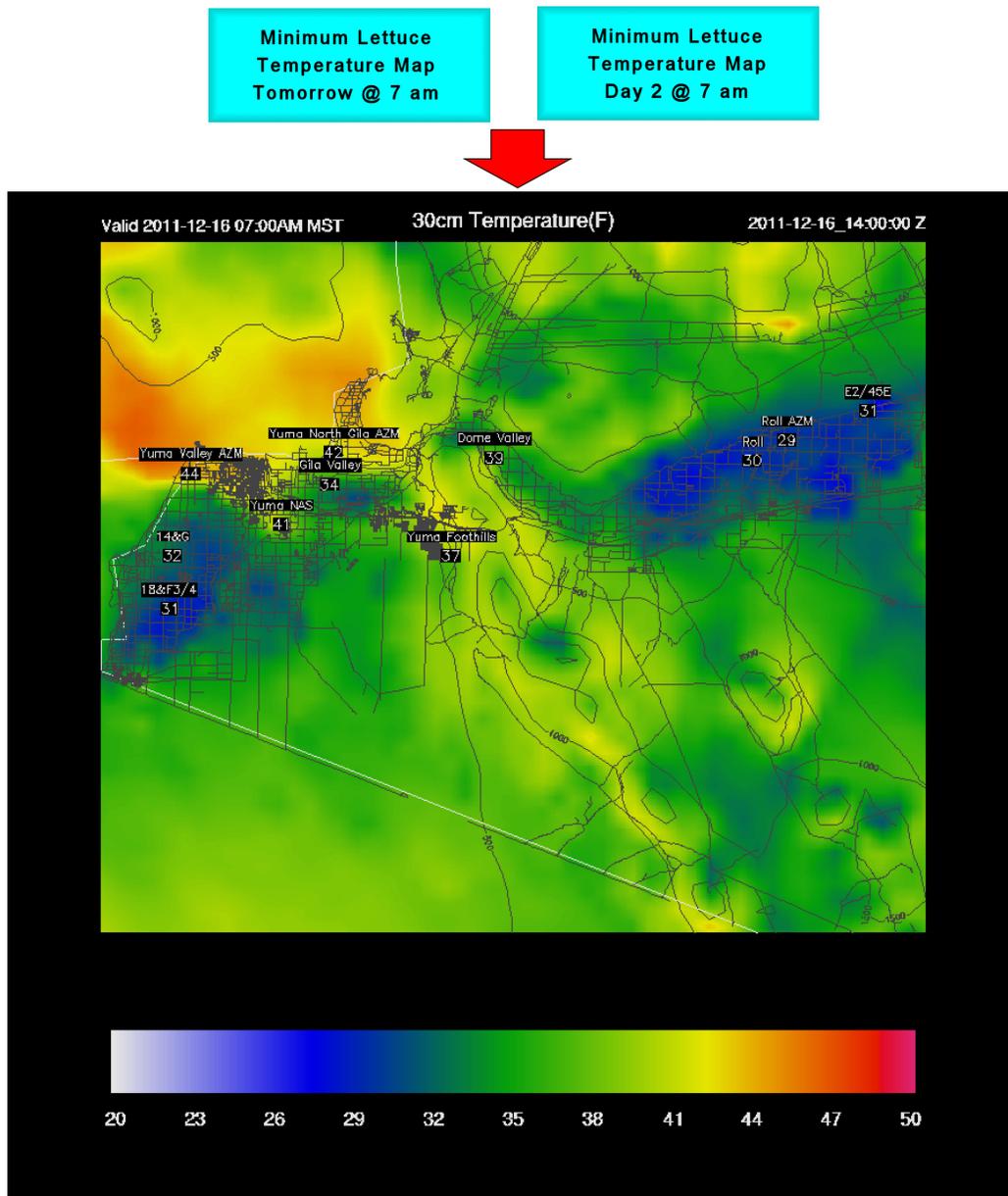
Forecast Products

Minimum Lettuce Temperature Map Tomorrow @ 7 am	Minimum Lettuce Temperature Map Day 2 @ 7 am	Hourly Text Forecast Shelter / Lettuce Temp. Updated @ 5 am
Hourly Forecast Maps Shelter Temperature GFS 5 am	Hourly Forecast Maps Shelter Temperature NAM 5 am	Hourly Forecast Maps Shelter Temperature GFS 11 pm
Hourly Forecast Maps Lettuce Temperature GFS 5 am	Hourly Forecast Maps Lettuce Temperature NAM 5 am	Hourly Forecast Maps Lettuce Temperature GFS 11 pm
<div style="background-color: gray; padding: 5px; display: inline-block;">Background on Forecast Products</div>		

Figure 2. The Forecast Products subpage for the Lettuce Ice Forecast Program. Clickable buttons provide access to forecast products developed by the program.

Minimum Temperature Maps

Clicking on either of the blue buttons labeled **Minimum Lettuce Temperature Map** provides access to a map of forecasted minimum temperatures for the next two days for the Lower Gila and Yuma Valleys. These maps are generated each morning using a 5am model run and are typically available by 8am. Clicking on the button labeled **Tomorrow** provides the forecasted minimum temperatures for tomorrow morning at 7am. Clicking on the button labeled **Day 2** provides the forecasted minimum temperatures for 7am on the day after tomorrow. It is important to note that these forecast products assume the minimum temperature will occur about 7am which is typical for the winter months in Yuma County. These forecasts could be in error on nights with unusual wind patterns or cloud cover (minimum temperature might occur earlier). Users are encouraged to review the full series of hourly forecast maps on such nights (described later in this document).



Text Forecast

Clicking on the button labeled **Hourly Text Forecast Shelter/Lettuce Temp** provides access to a text based forecast shown below. The top section of this product provides the forecast for today's maximum temperature, tonight's minimum temperature (occurs following morning), and tomorrow's maximum and minimum temperature (occurs on second morning) for selected locations in Yuma County. A quantitative precipitation forecast is provided to the right of the temperatures for these same locations. Precipitation forecasts are provided for 6-hour increments and will appear as inches rather than the normal percent probability provided by the National Weather Service. Hourly forecasts of shelter temperature, surface temperature and dew point for selected locations are provided in the next section of the document. Shelter temperature is defined as temperatures at 2.2m or 6.6' above the surface (standard forecast height). Surface temperatures represent temperatures at ground level where the produce is growing and will normally be several degrees colder than shelter temperature at night. The model generating this forecast runs at 5am and 11pm each day and forecasts temperatures for the 48-hour period beginning at 8am today for the 5am model run and 8am tomorrow for 11pm model run.

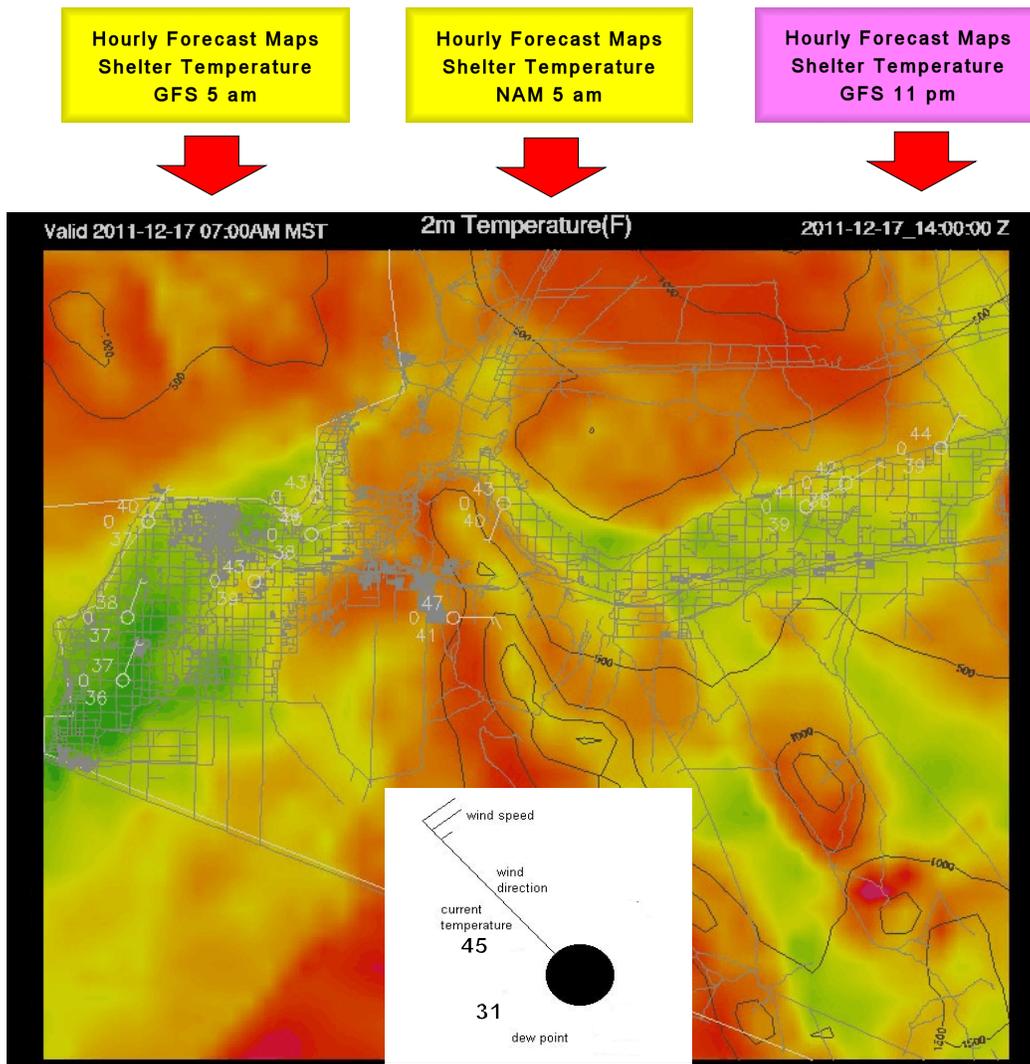
**Hourly Text Forecast
Shelter / Lettuce Temp.
Updated @ 5 am**



Local Forecast create from the UofA's regional WRF run, initialized at 2011-12-15 05:00AM																									
Location	Temperatures				Precipitation																				
	High Today	Low Tonight	High Tomorrow	Low Tom. Night	Today 6a-12p	12p-6p	Tonight 6p-12a	12a-6a	Tomorrow 6a-12p	12p-6p															
Dome Valley	61	41	67	42	0	0	0	0	0	0															
18/F 3/4	60	34	65	38	0	0	0	0	0	0															
US95 SE	61	41	68	40	0	0	0	0	0	0															
Roll	60	34	64	35	0	0	0	0	0	0															
Yuma Ag	61	44	67	39	0	0	0	0	0	0															
14/G	61	34	67	38	0	0	0	0	0	0															
Yuma Valley AZM	61	44	67	39	0	0	0	0	0	0															
Yuma N Gila AZM	61	42	69	41	0	0	0	0	0	0															
E2/4SE	61	32	65	38	0	0	0	0	0	0															
Yuma NAS	62	43	67	41	0	0	0	0	0	0															
Yuma Foothills	61	42	64	46	0	0	0	0	0	0															
Roll AZM	61	31	65	37	0	0	0	0	0	0															
Dome Valley 8am..9..10..11..12p..1...2...3...4...5...6...7...8...9..10..11..12a..1...2...3...4...5...6...7..8am																									
Day 1 2m Temp(F)	037	041	046	051	055	058	060	061	061	058	053	051	049	048	047	046	045	044	043	042	042	041	041	041	
Day 1 Sfc Temp	032	044	052	059	064	068	068	067	063	054	047	044	044	045	045	044	043	042	041	040	040	039	039	039	040
Day 1 Dew-point	035	038	039	040	039	038	039	039	038	040	039	037	037	037	037	036	036	036	035	035	034	034	034	034	033
Day 2 2m Temp(F) 041 046 054 059 065 066 066 067 065 061 056 055 056 053 049 049 049 047 045 045 046 045 043 042 042																									
Day 2 Sfc Temp	040	048	057	064	070	072	073	071	067	057	049	048	053	050	045	044	041	041	040	040	044	044	041	039	042
Day 2 Dew-point	033	033	033	034	033	034	037	037	038	040	038	037	037	036	039	037	036	036	037	037	038	038	039	039	042
18/F 3/4 8am..9..10..11..12p..1...2...3...4...5...6...7...8...9..10..11..12a..1...2...3...4...5...6...7..8am																									
Day 1 2m Temp(F)	029	039	047	051	055	058	059	060	060	058	049	046	043	044	044	042	041	040	036	035	034	034	036	035	035
Day 1 Sfc Temp	031	043	052	058	062	064	065	063	060	050	042	039	039	037	036	036	035	035	036	032	033	030	032	031	033
Day 1 Dew-point	029	036	039	040	039	040	039	040	040	040	039	038	038	038	038	037	038	037	036	035	034	034	036	035	035
Day 2 2m Temp(F) 035 046 054 058 061 063 064 065 065 060 057 050 046 047 049 048 045 042 042 040 042 043 040 038 038																									
Day 2 Sfc Temp	033	047	055	059	063	065	066	065	064	053	044	041	040	043	046	046	037	038	036	041	042	043	037	035	038
Day 2 Dew-point	035	035	034	035	035	035	036	038	043	040	037	039	039	038	039	039	039	039	040	039	039	040	039	038	038

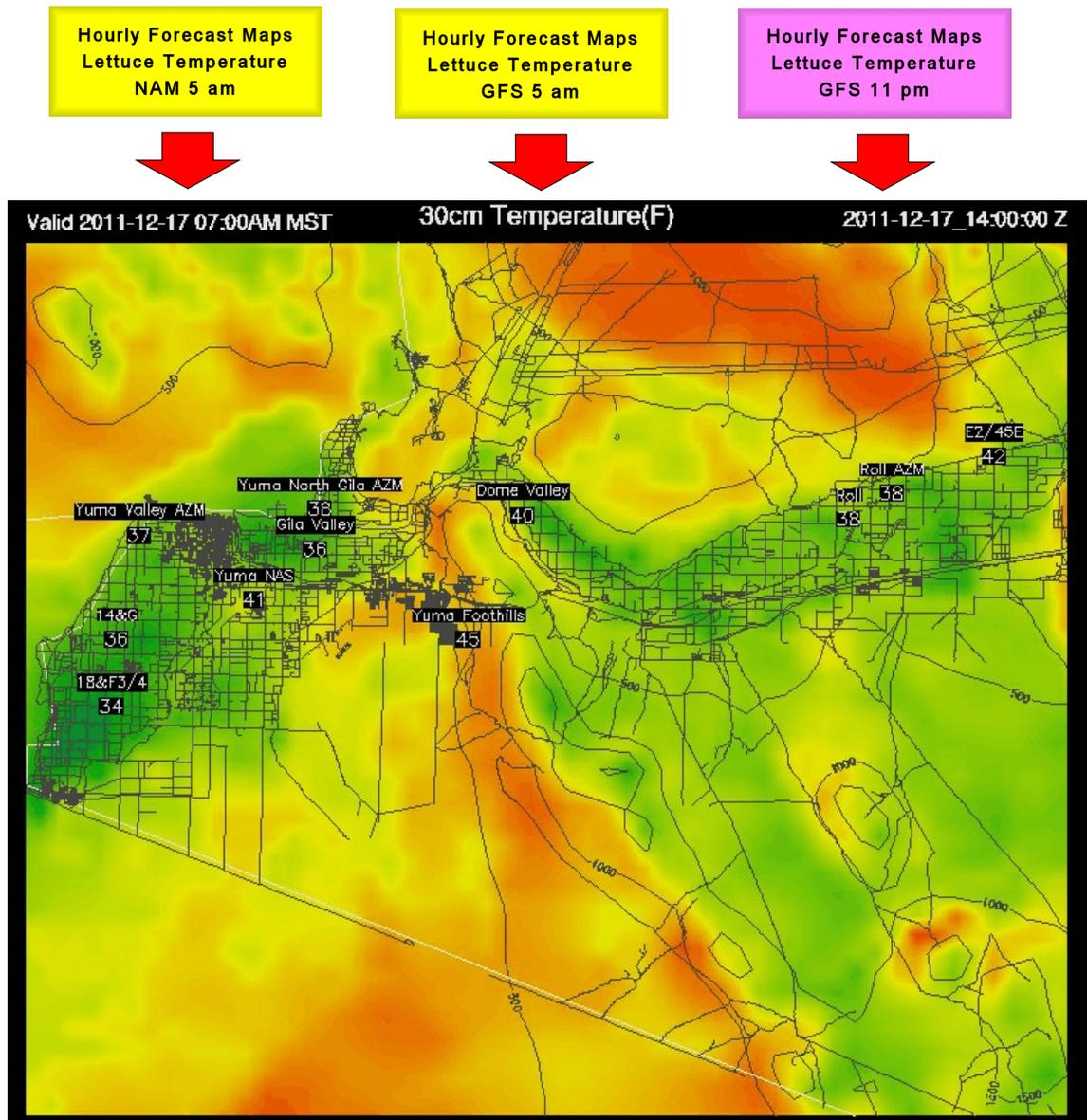
Graphic Shelter Temperature Forecasts

Graphic or map-based forecasts of shelter temperature (2m or 6.6' above surface) are accessed by clicking on one of the three buttons labeled **Hourly Forecast Maps Shelter Temperature**. Three hourly forecasts are generated each day – two at 5am and one at 11pm. The forecasts come in the form of a “movie” that provides 48 consecutive hourly maps of shelter temperature. The controls at the top of the screen allow you to control the speed of the movie, or stop the movie and sequence through movie one map at a time. The two 5am forecasts differ slightly because they use different model initialization routines (GFS and NAM). Current meteorological data must be input into the forecast model prior to running the model. This process is referred to as initialization. We are still evaluating which initialization routine is best for this program. Growers are encouraged to examine both runs and decide which model best fits their particular situation/location. Data for specific locations are presented using synoptic meteorological symbols. See inset below to interpret these symbols. Note that these forecasts also provide wind direction and wind speed. Wind speed forecasts are interpreted as follows: no barbs < 3 mph, half barb = 5mph; full barb = 10 mph; each additional barb is 10 mph. Wind speeds are predicted for 30' above ground. Winds at shelter height (6.6') will be about 25% lower.



Graphic Surface Temperature Forecasts

Graphic or map-based forecasts of surface or lettuce temperature are accessed by clicking one of the three buttons labeled **Hourly Forecast Maps Lettuce Temperature**. Three hourly forecasts are generated each day – two at 5am and one at 11pm. The forecasts come in the form of a “movie” which provides 48 consecutive hourly maps of surface temperature. You can stop the movie or sequence through the maps one hour at a time using the controls at the top of the screen, The two 5am forecasts differ slightly because they use different model initialization routines (GFS and NAM). Growers are encouraged to examine both runs and decide which model best fits their particular situation/location.



Current Weather Data

Growers can examine current weather conditions at six locations in Yuma County by clicking on the button labeled **Current Weather Data** located on the main webpage (Fig. 1). Upon clicking this button you will be transferred to the Current Weather Data subpage (Fig. 3) where you will find a series of location specific buttons that provide access to each station's data. The data sets and presentation are similar at most locations. The examples presented below are from the Lettuce Station located near 14th & G and are representative of data sets at all locations.

Lettuce Ice Forecast Program

Current Weather Data

South Yuma Valley
18th & F3/4

Central Yuma Valley
14th & G

North Yuma Valley
Yuma Ag Center

South Gila Valley
US-95 & 5E

Dome Valley
6th & 18E

Roll
6th & 37E

Composite
of All Sites

Understanding
Current Data
Displays

Raw Data Collected at Lettuce Sites

South Yuma Valley	Central Yuma Valley	North Yuma Valley	South Gila Valley	Dome Valley	Roll
ls03-1.dat ls03-2.dat ls03-3.dat	ls04-1.dat ls04-2.dat ls04-3.dat	ls05-1.dat ls05-2.dat ls05-3.dat	ls02-1.dat ls02-2.dat ls02-3.dat	ls01-1.dat ls01-2.dat	ls06-1.dat ls06-2.dat ls06-3.dat

[Raw Data Format Information](#)

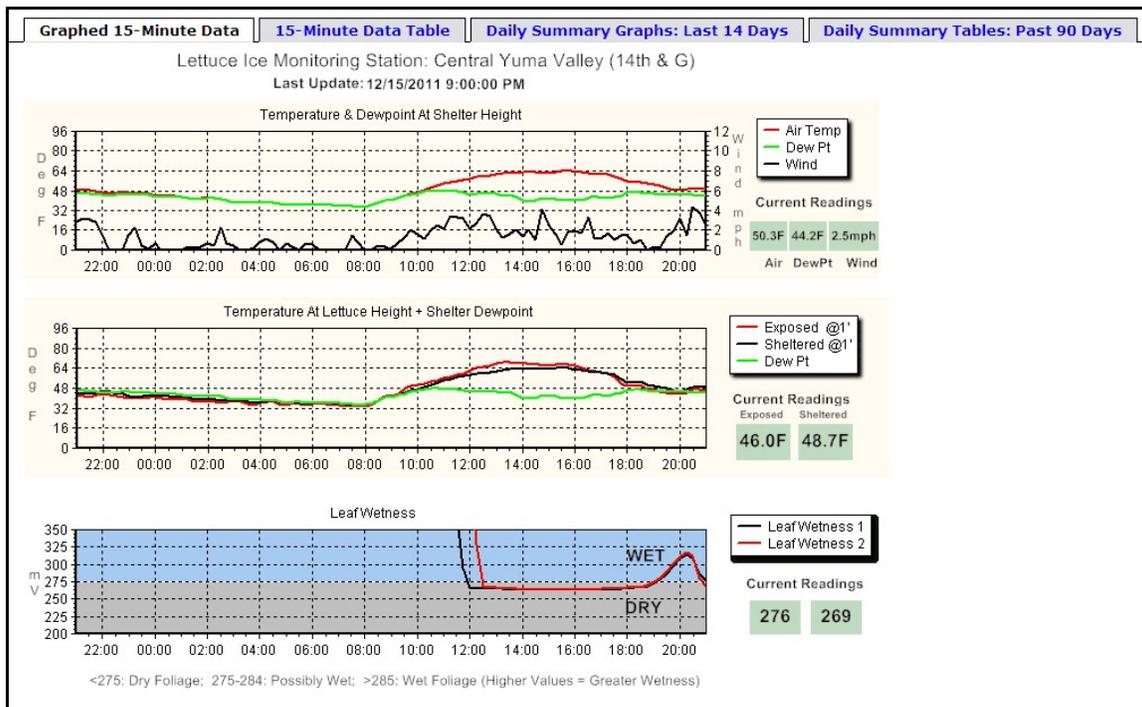
Figure 3. Current and recent weather data are available through the Current Weather Data subpage. Archived station data in raw comma delimited ASCII text file format are provided at the bottom of this subpage.

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Graphed 15-Minute Data

Current and recent weather conditions can be examined by clicking on the location of interest. Data are displayed using a standard format which consists of graphed 15-minute data, 15-minute data tables, graphed daily data for the most recent 14 days and daily summary tables for the past 90 days. The 15-minute data will appear after you click on any location button. The 15-minute data are presented using three graphs. The top graph summarizes shelter temperature, dew point and wind speed for the past 24 hours. The middle graph summarizes temperature collected at lettuce level (30cm or 1' above ground level). At most locations there are two temperature sensors at this level – one is exposed (not sheltered) while the second sensor is sheltered. The sheltered value better represents air temperature while the exposed value better represent crop conditions as this sensor is exposed to the cold night sky. The dew point measured at shelter height is also plotted on this graph to better assess dew formation. Dew will generally form when the lettuce level temperatures reach dew point. The third graph summarizes the output from leaf wetness sensors. Typically, there are two wetness sensors at each location. Sensor readings in excess of 275mV indicate dew or rainfall (wet foliage). Data presented under the label **Current Readings** provide the most recent 15-minute values collected by the station. At times, data can be delayed due to poor telecommunications. The time of the most recent data transfer is presented adjacent the heading **Last Update**.

Central Yuma Valley
14th & G



15-Minute Data Tables

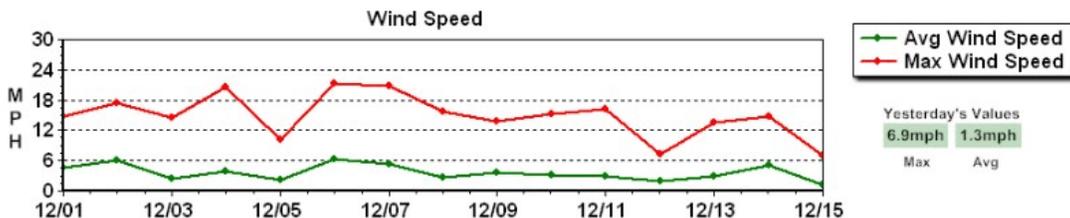
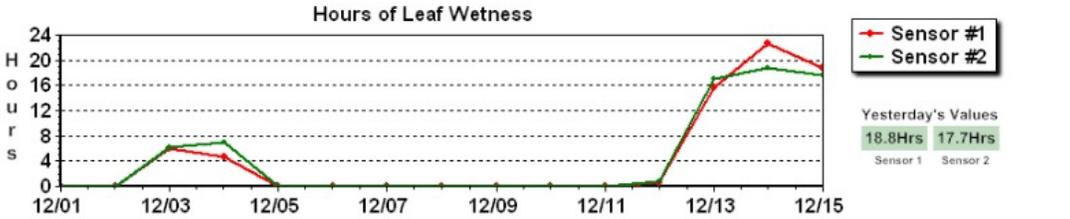
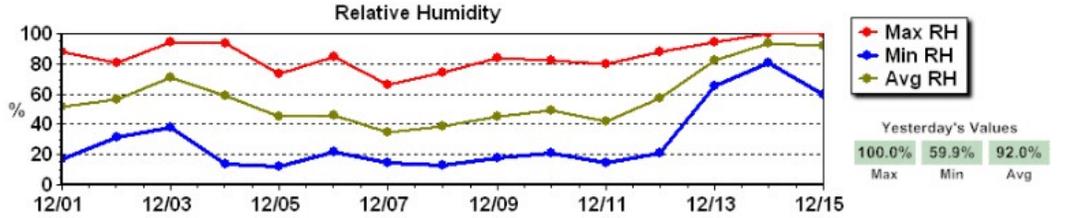
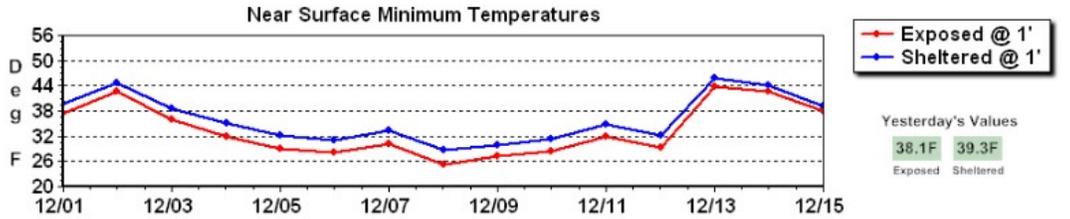
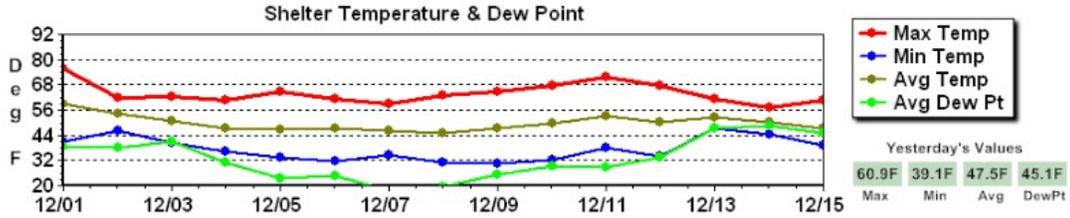
The data presented in the 15-Minute Graphs can be view in tabular form by clicking on the tab labeled **15-Minute Data Table** located at the top of the display. Column headings in the table are explained at the bottom of the table. The table provides only the most recent 24 hours of data. Older data may be accessed from the raw text files (described later)

Graphed 15-Minute Data 15-Minute Data Table Daily Summary Graphs: Last 14 Days Daily Summary Tables: Past 90 Days										
15 Minute Data: Central Yuma Valley (14th & G)										
Last Update: 12/15/2011 9:00:00 PM										
Timestamp	AirT_F_Avg	Ext_F_Avg	SHT_F_Avg	Td_F_Avg	LfWet1_mV_Avg	LfWET2_mV_Avg	Wet1_Min_Tot	Wet2_Min_Tot	WS_mph_Avg	H_Avg
12/14 09:00 PM	48.11	42.21	43.95	46.15	446.37	453.48	15.00	15.00	2.91	92.82
12/14 09:15 PM	48.50	41.94	43.90	46.04	462.37	469.34	15.00	15.00	3.18	91.12
12/14 09:30 PM	48.37	41.02	43.04	45.73	475.70	483.72	15.00	15.00	3.14	90.49
12/14 09:45 PM	47.42	42.76	44.76	45.03	486.12	495.86	15.00	15.00	2.80	91.29
12/14 10:00 PM	46.59	43.70	45.87	44.59	496.83	507.40	15.00	15.00	1.55	92.65
12/14 10:15 PM	45.72	42.33	44.92	44.27	511.35	521.14	15.00	15.00	0.00	94.59
12/14 10:30 PM	45.68	41.38	43.83	44.70	525.28	535.94	15.00	15.00	0.00	96.33
12/14 10:45 PM	47.40	41.04	43.36	46.15	537.42	548.50	15.00	15.00	0.00	95.36
12/14 11:00 PM	46.27	39.40	41.24	44.89	548.39	560.11	15.00	15.00	1.45	94.88
12/14 11:15 PM	45.60	39.62	41.03	44.74	557.81	569.72	15.00	15.00	2.28	96.75
12/14 11:30 PM	45.69	39.67	41.46	45.07	568.16	579.27	15.00	15.00	0.47	97.62
12/14 11:45 PM	45.28	41.17	42.85	44.60	577.69	588.25	15.00	15.00	0.15	97.41
12/15 12:00 AM	43.63	40.34	41.68	43.04	588.57	599.57	15.00	15.00	0.68	97.76
12/15 12:15 AM	43.84	39.59	41.76	43.42	597.76	609.16	15.00	15.00	0.00	98.39
12/15 12:30 AM	44.01	39.35	41.47	43.67	606.24	617.42	15.00	15.00	0.00	98.66
12/15 12:45 AM	43.54	39.10	40.97	43.26	615.12	626.14	15.00	15.00	0.00	98.87
12/15 01:00 AM	43.00	39.38	40.93	42.75	622.99	634.78	15.00	15.00	0.01	99.01
12/15 01:15 AM	42.19	38.94	40.64	41.98	612.38	646.69	15.00	15.00	0.36	99.14
12/15 01:30 AM	41.50	37.48	38.86	41.34	603.27	656.58	15.00	15.00	0.18	99.33
12/15 01:45 AM	41.65	37.50	39.26	41.53	606.38	667.10	15.00	15.00	0.37	99.49

Daily Summary Graphs: Last 14 Days

Plots of the extremes, averages and totals of all variables for the past 14 days can be viewed by clicking on the tab labeled **Daily Summary Graphs: Last 14 Days**. Five graphs are used to display this data. The first graph provides the maximum, minimum and average shelter temperature along with the average dew point temperature. The second graph summaries the minimum exposed and sheltered temperatures at lettuce level (30cm or 1' above surface) for the past 14 days. Surface temperature may be reported at selected locations. Surface temperatures are measured using an infrared thermometer and measure the actual foliage temperature of the produce. The third graph provides the maximum, minimum and average relative humidity while the fourth graph provides the number of hours per day of leaf wetness. There are two leaf wetness sensors at most locations and the two daily values may differ due to shading or sensor contamination. The final graph summarizes the maximum and average wind speed for the 14-day period. For all five graphs, the most recent values are provided under the label **Yesterday's Values**. It is important to understand the time value presented in these graphs. Daily extremes, averages and total are summarized for the 24-hour period ending at midnight which is the beginning of a new day. The time stamp for these midnight readings carries the new date even though the data occurred the previous day. For example, data collected for the 24 hours ending at midnight December 15th are actually for the previous date, December 14th.

Lettuce Ice Monitoring Station: Central Yuma Valley (14th & G)



Daily Summary Tables: Past 90 Days

The data presented in the Daily Summary Graphs can be view in tabular form by clicking on the tab labeled **Daily Summary Table: Past 90 Days** located at the top of the display. Column headings in the table are explained at the bottom of the table. The table provides only the most recent 90 Days of data (After Nov 12, 2011). Older data may be accessed from the raw text files (described later). Daily extremes, averages and total are summarized for the 24-hour period ending at midnight which is the beginning of a new day. The time stamp for these midnight readings carries the new date even though the data actually occurred on the previous day. For example, data collected for the 24 hours ending at midnight November 24th are actually for the previous date, November 23rd.

Graphed 15-Minute Data 15-Minute Data Table Daily Summary Graphs: Last 14 Days Daily Summary Tables: Past 90 Days														
Timestamp	AirT_F_Max	AirT_F_Min	AirT_F_Avg	Ext_F_Max	Ext_F_Min	Ext_F_Avg	SHT_F_Max	SHT_F_Min	SHT_F_Avg	WS_mph_Max	WS_mph_Avg	Td_F_Max	Td_F_Min	Td_F_Avg
11/12/2011 12:00:00 AM	75.51	51.63	64.83	79.33	48.51	63.26	76.53	51.04	64.36	8.62	1.71	50.65	24.06	38.70
11/13/2011 12:00:00 AM	77.75	48.51	61.86	83.80	44.46	61.90	80.33	47.22	62.21	24.38	6.23	57.29	34.06	46.66
11/14/2011 12:00:00 AM	70.55	54.15	60.83	75.91	51.59	60.78	72.46	53.21	61.01	9.79	2.59	61.95	53.34	56.98
11/15/2011 12:00:00 AM	75.14	48.37	60.81	81.67	46.55	60.82	76.27	48.16	60.91	8.45	1.47	59.87	48.37	53.73
11/16/2011 12:00:00 AM	76.27	51.18	62.30	81.98	48.85	62.15	77.79	50.76	62.42	7.78	1.95	59.88	46.81	53.13
11/17/2011 12:00:00 AM	78.76	51.71	63.16	84.99	48.54	62.89	79.30	50.65	62.88	7.44	2.01	60.01	48.46	53.32
11/18/2011 12:00:00 AM	80.81	49.29	63.49	87.01	45.45	62.38	82.16	47.83	62.67	11.30	1.38	55.77	38.94	47.61
11/19/2011 12:00:00 AM	78.38	48.37	62.46	82.37	44.92	61.54	79.77	47.22	62.33	15.33	4.60	61.05	45.89	51.64
11/20/2011 12:00:00 AM	150.43	48.69	59.89	77.75	45.84	59.28	73.43	48.03	59.67	11.13	2.99	127.76	41.22	45.47
11/21/2011 12:00:00 AM	70.96	49.17	59.22	78.69	45.14	59.09	72.40	48.35	59.12	13.15	3.21	53.41	39.30	44.26
11/22/2011 12:00:00 AM	69.47	48.79	58.65	75.84	44.95	58.65	70.76	47.41	58.56	16.00	3.68	53.65	44.15	48.23
11/23/2011 12:00:00 AM	76.09	42.98	57.34	80.28	39.55	56.37	75.51	41.74	56.69	10.63	2.43	48.04	38.63	43.25
11/24/2011 12:00:00 AM	78.63	43.90	58.79	83.71	39.58	57.71	77.87	42.43	58.15	10.80	1.74	50.49	38.47	43.10
11/25/2011 12:00:00 AM	70.75	49.86	59.15	80.50	47.98	59.28	73.79	49.76	59.26	16.33	5.73	57.39	40.06	47.70
11/26/2011 12:00:00 AM	73.17	44.81	57.74	79.76	42.42	57.19	74.48	44.28	57.09	11.13	3.62	50.69	39.41	43.74
11/27/2011 12:00:00 AM	78.85	44.41	61.79	82.20	40.35	59.69	79.30	42.38	60.48	20.52	5.15	44.33	19.77	34.60
11/28/2011 12:00:00 AM	78.36	48.55	62.14	81.30	42.11	59.33	79.61	45.73	60.56	16.33	4.70	44.98	21.55	29.55
11/29/2011 12:00:00 AM	78.23	43.38	60.07	81.72	38.38	57.48	79.20	41.09	58.45	16.83	4.04	39.44	17.00	29.27
11/30/2011 12:00:00 AM	76.67	47.68	60.06	81.52	43.07	57.57	77.89	44.99	58.41	12.47	2.76	45.35	22.11	34.51
12/1/2011 12:00:00 AM	75.89	40.65	58.66	80.28	37.46	57.36	76.58	39.64	57.91	14.82	4.56	53.57	26.18	38.71
12/2/2011 12:00:00 AM	61.80	46.16	54.10	66.77	42.60	53.29	63.12	44.76	53.79	17.51	6.00	44.29	30.87	38.19

Raw Data Access

All data collected by the program can be downloaded in raw, comma delimited ASCII text file format for entry into spreadsheets or private databases. The files are listed at the bottom of the Current Weather Data subpage under the label **Raw Data Collected at Lettuce Sites**. To access a file simply move the cursor over the filename and click the mouse. Once the file loads and appears on the screen, you can download the file to your computer. The formatting of the raw files may be obtained by clicking on the label **Raw Data Format Information**. Formats differ slightly among locations due to differences in dataloggers and sensor arrays. Please note that we do not quality check this data before placement on the web and erroneous data may appear in these files on occasion, especially if program staff are conducting maintenance or changing sensors.

Raw Data Collected at Lettuce Sites

South Yuma Valley	Central Yuma Valley	North Yuma Valley	South Gila Valley	Dome Valley	(Roll) <small>Not Yet Available</small>
ls03-1.dat ls03-2.dat ls03-3.dat	ls04-1.dat ls04-2.dat ls04-3.dat	ls05-1.dat ls05-2.dat ls05-3.dat	ls02-1.dat ls02-2.dat ls02-3.dat	ls01-1.dat ls01-2.dat	ls06-1.dat ls06-2.dat ls06-3.dat

[Raw Data Format Information](#)



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101,2011,315,1345,0,75.03214,77.6655,75.80799,31.2937,258.902,259.6206,0,0,0.3289833,20.01333
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Composite of All Data

All recent and current data collected by network stations can be obtained by clicking on the button labeled **Composite of All Data**. A 3-panel graph similar to the one available for each station will appear upon clicking this button. Data from all locations are displayed on the composite graphs. The most recent values collected by network stations are located to the right of the graphs. Wind and humidity graphs may be examined by clicking on the appropriate tab. Data for each location can be examined in tabular form by clicking the remaining tabs.

