

Accessing real-time temperature data from the NOAA-UCCE towers

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To provide growers with improved frost forecasting for vineyards in the Russian River watershed, as well as determine if wind machines are a viable alternative to using sprinkler frost protection, funds provided by NOAA beginning in late 2013 allowed UC Cooperative Extension viticulture advisors to install 17 towers to monitor temperature inversion conditions. Twelve towers are located in Sonoma County and five in Mendocino County. These towers enable wireless transmission of temperature data at each location that can be viewed in real-time on NOAA and University of California websites.

Each NOAA-UCCE temperature inversion tower has temperature sensors at 5 feet (1.5 meters, but sometimes indicated as 2 m) and 35 feet (about 11 m) heights. During an inversion, the temperature at 35 ft. will be warmer than the temperature at 5 ft. Additional sensors on several towers record wind speed, relative humidity (%), black globe temperature (a measurement of radiant temperature), and precipitation (on eight of the 17 towers). Eventually all towers will be outfitted with the same sensors.

The inversion conditions for each station are available on a University of California website in a user-friendly format. They are also available on a NOAA website in units more commonly used by researchers. This document describes how to locate and utilize the temperature data on both the UC and NOAA websites. Once you are familiar with both websites, you may want to add links to one or both on your smartphone's home screen.

How to add links to the UC and NOAA frost websites to your smartphone home screen:

UC ANR: http://ucanr.edu/sites/russianriverhabitat/Inversion_Data/

NOAA: <http://www.esrl.noaa.gov/psd/data/obs/datadisplay/index.php?ProjectID=9>

For **iPhones** - Open Safari and navigate to one of the frost temperature inversion data websites linked above. Once you have landed at the NOAA or UC ANR website on your phone, select the "Bookmark" icon on the bottom of the browser and click "Add to home screen". You can name it something quick and easy to remember. For more information on how to add an icon to your home screen visit <https://www.kook.com.au/how-to-add-icons-to-your-iphones-home-screen/>

For **Androids** - Open your internet browser and navigate to one of the frost temperature inversion data websites linked above. When the website loads, click the 3 vertical dots menu. Next you can click on the + sign and select "Add to Home Screen". Not all Androids or browsers are the same, so please select the following link for more information <http://www.wikihow.com/Set-a-Bookmark-Shortcut-in-Your-Home-Screen-on-Android>


University of California Agriculture and Natural Resources (UC ANR) Website (mobile friendly):

Click on the following link to view the station locations of the NOAA-UCCE towers located in Sonoma County and southern Mendocino County: http://ucanr.edu/sites/russianriverhabitat/Inversion_Data/

You will see the following map image and user interface when you first access the UC ANR website:

University of California, Division of Agriculture and Natural Resources

Frost Protection Weather Data



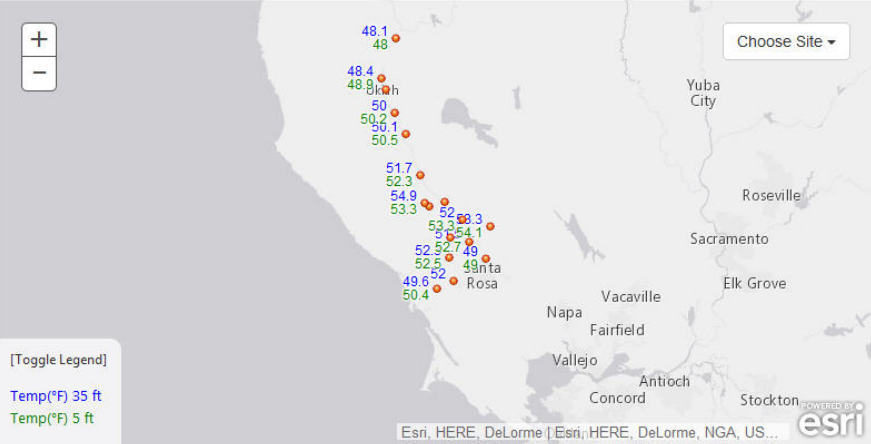
Inversion Data

Inversion Data

In order for a wind machine to increase the temperature of a target vineyard, the air high above the crop must be warmer than the air at the crop level (an inversion); the warmer the upper air is relative to the lower air, the greater the temperature increase realized by the wind machine.

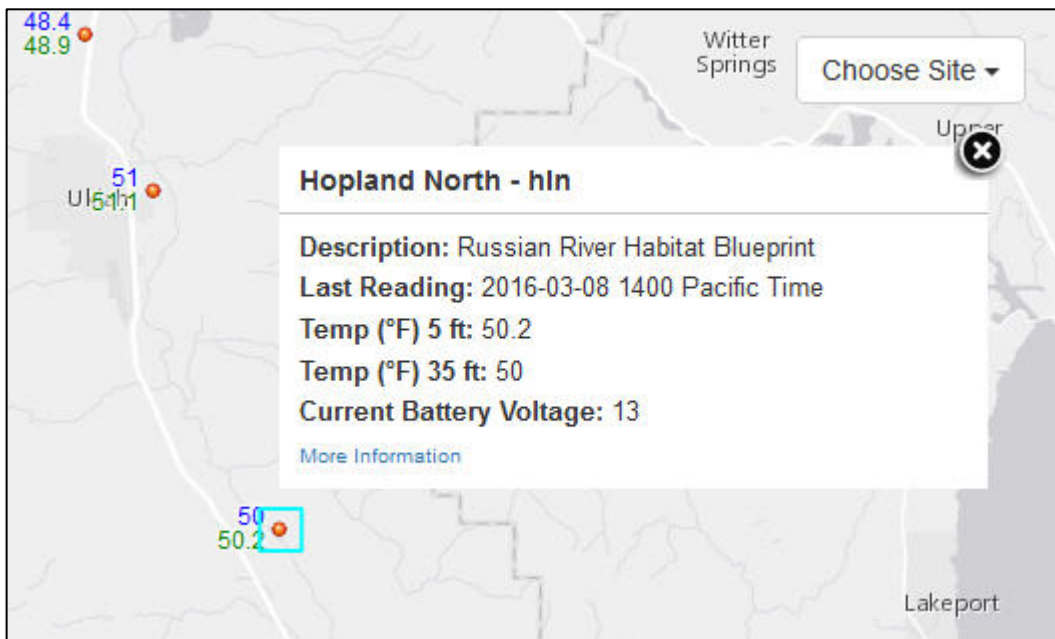
[Toggle Legend]

- Temp(°F) 35 ft
- Temp(°F) 5 ft



Esri, HERE, DeLorme | Esri, HERE, DeLorme, NGA, US...

A tower station is represented by a red dot adjacent to most recent temperature readings (°F) at 35 ft. and 5 ft. heights. Click on a red dot to open a pop up box that includes additional information. To see a list of all station names, use the **“Choose Site”** dropdown menu. Select a station to open the pop up box. You should see the following image (below) when you either click on a station dot located on the map or select a station from the drop down menu. . **Click on the text “More Information”** located at the bottom of the pop up box to see the weather charts for the previous week.



Witter Springs

Choose Site ▾

Upper

Hopland North - hln

Description: Russian River Habitat Blueprint

Last Reading: 2016-03-08 1400 Pacific Time

Temp (°F) 5 ft: 50.2

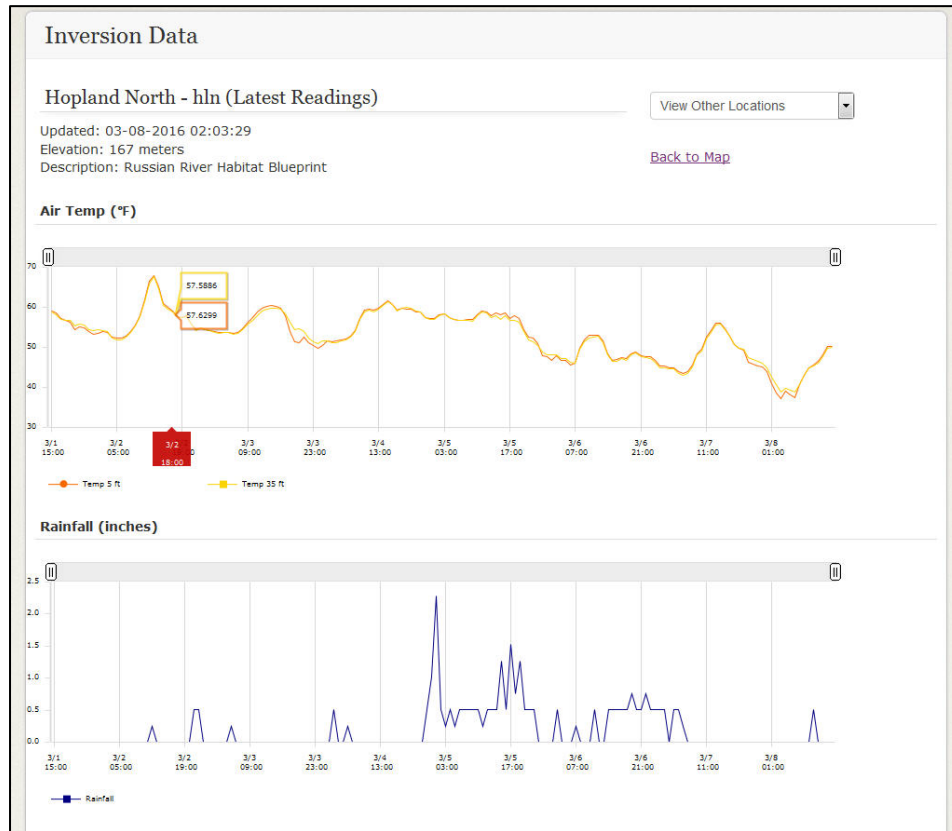
Temp (°F) 35 ft: 50

Current Battery Voltage: 13

[More Information](#)

Lakeport

After you click on “**More Information**” you should see an image similar to the one below:

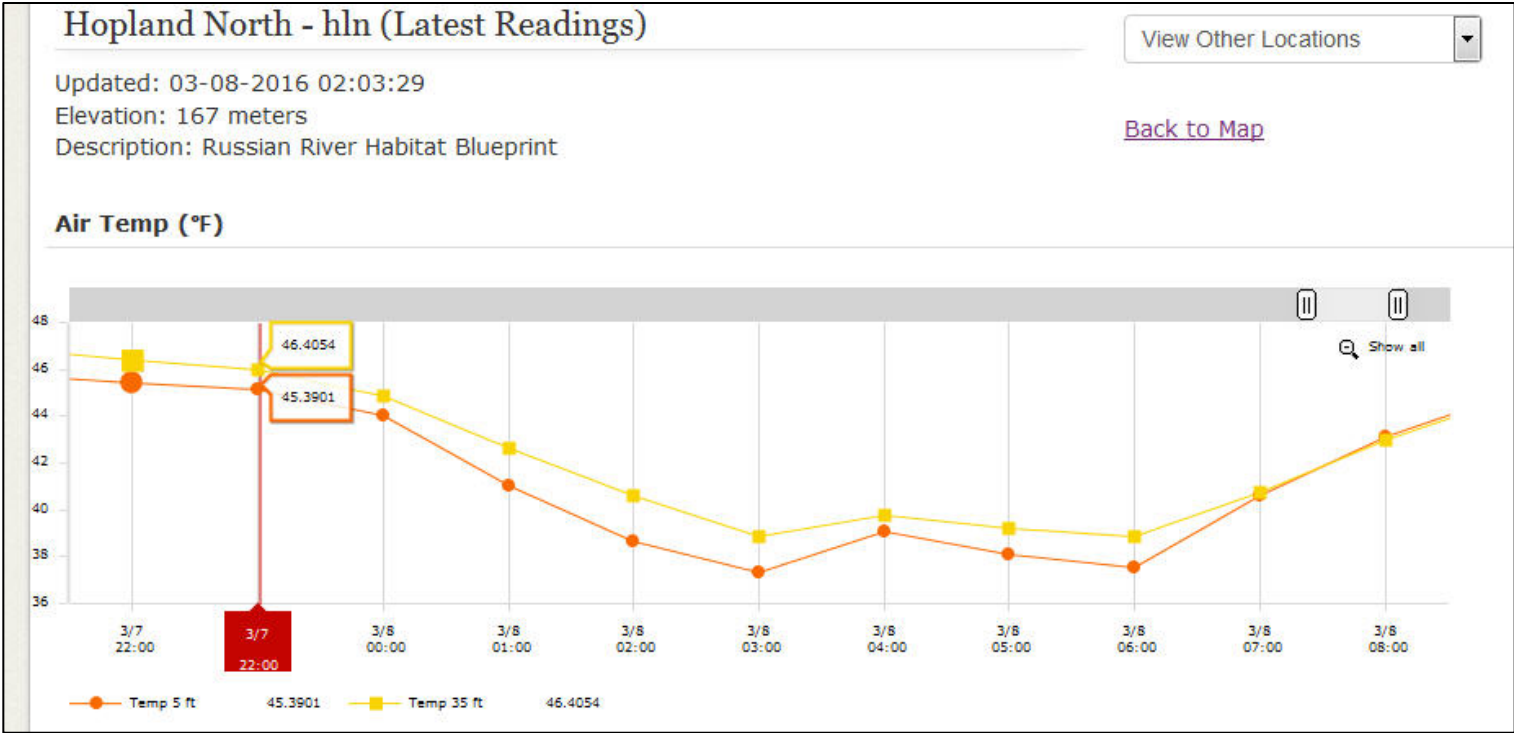


Understanding the UCANR Charts:

- A. Several data charts are provided for each station and all have similar designs and can be manipulated in the same manner as described for the **Air Temperature** and **Rainfall** charts shown above. Charts are given in 24-hour clock time (military time), thus 14:00 is 2:00pm. The current date and time are shown on the **right** side of the charts.
- B. The Air Temperature chart is presented in Fahrenheit (°F). The orange and yellow lines correspond to temperatures at 5 ft. (2 m) and 35 ft. (11 m) heights respectively. (Only temperature data are provided by height.)

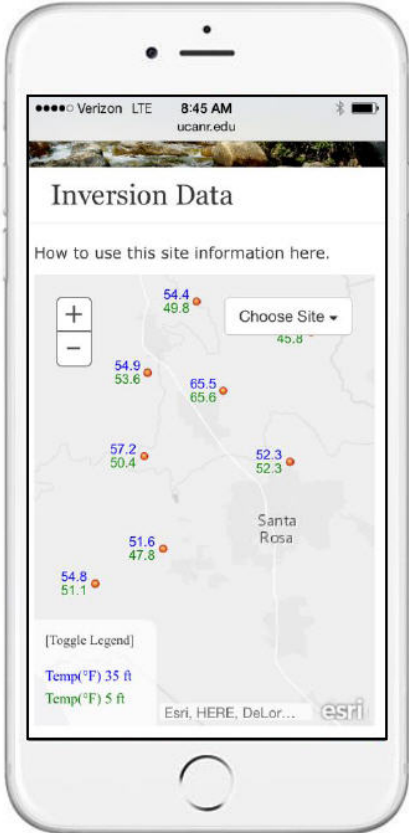
[If you want to convert to Celsius (°C), take the temperature in °F and subtract 32, next multiply by 0.55.]

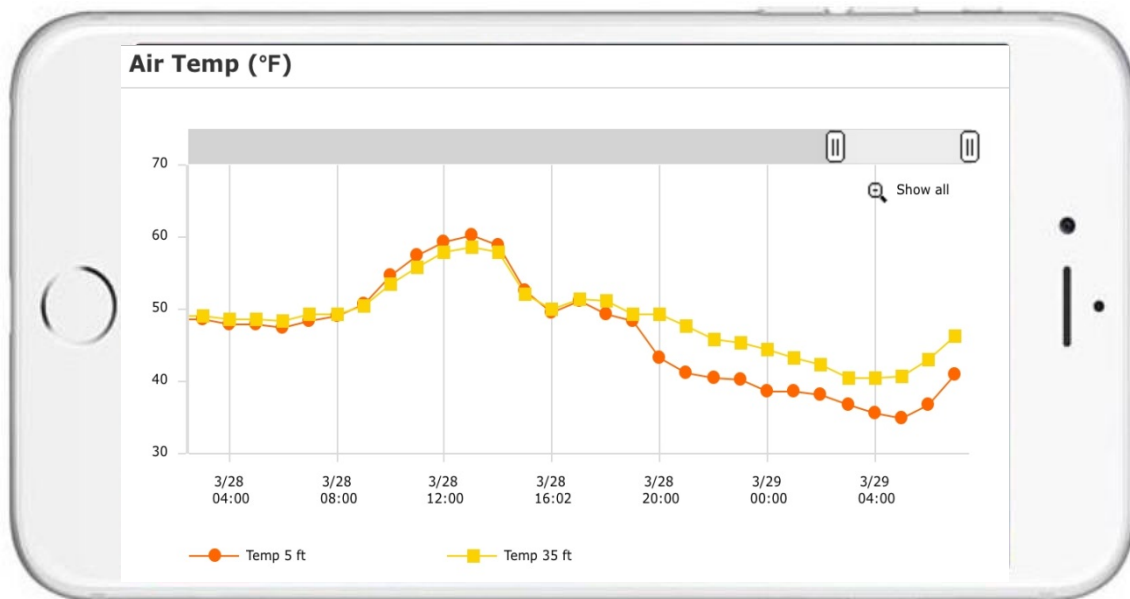
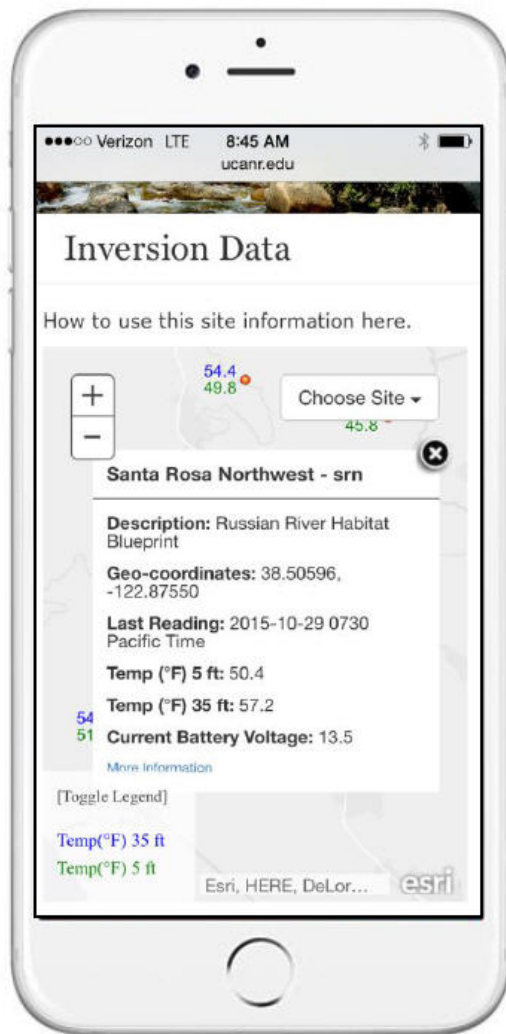
- C. Charts read from left to right. The most current time is shown on the **right** side of the charts, unlike that of the NOAA website.
- D. A **Variable Slider** is at the top of each chart.
This enables the user to “zero in” on specific events that occurred over the previous week. Data can be viewed at any location along the curve by placing your mouse cursor on a curve and hovering across the map. The UC ANR website provides precise data values for all charts in this manner and not in data tables as found on the NOAA website. In the Air Temperature chart, this enables easier access to temperatures at both sensor heights for the latest readings available on the website to any time in the past week (see image below). In the example provided, a slight inversion began sometime prior to 10pm March 7th and ended 7am March 8th.



Mobile Viewing:

The functionality of viewing/using the NOAA and the UC ANR websites is the same on your mobile phone or tablet device because you are pulling information straight from the websites and simply accessing it on your device. Here are some images of how the UC ANR website may appear on your device and chronological steps to locate a station of interest:

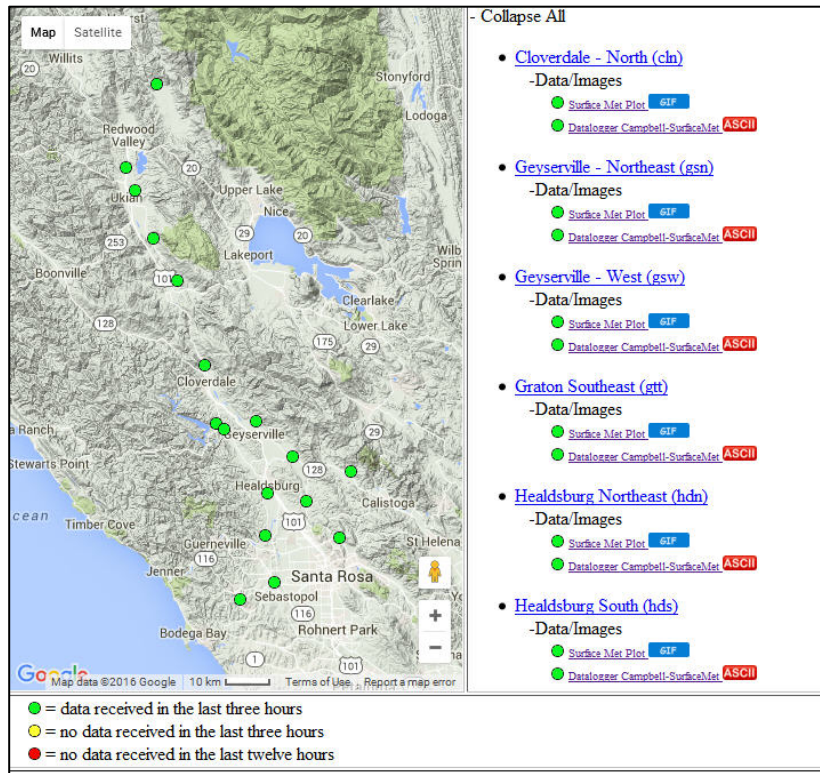




NOAA Website:

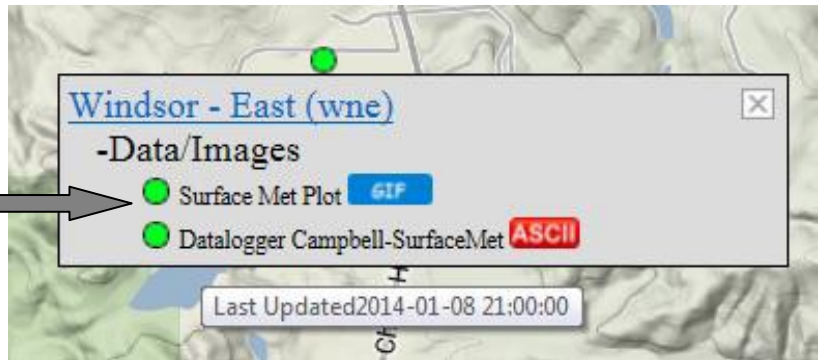
Click on the following link to view the station locations of the NOAA-UCCE towers located in Sonoma County and southern Mendocino County: <http://www.esrl.noaa.gov/psd/data/obs/datadisplay/index.php?ProjectID=9>

You will see the following map image and list of tower station names and codes when you first access the NOAA website:



A tower station is represented by a green dot. Place your cursor over a green dot on the map to see the station name. Click on the station dot and an information box will pop up. **Click on the text “Surface Met Plot” to see temperature charts.** Charts are generated from data tables that are discussed below in **“Data Table Example”**.

To see temperature charts, click on the text “Surface Met Plot”.



Understanding Charts:

- E. Charts are given in UTC time (Coordinated Universal Time).
Pacific Standard Time (PST) is 8 hours behind UTC.
Pacific Daylight Time (PDT) is 7 hours behind UTC.

PST occurs in winter. This year, PDT began the second Sunday in March. The spring frost hazard for grapes occurs during both PST and PDT.

Below are two online time converters from UTC to our time which adjust for standard versus daylight savings time:

<http://www.timebie.com/timezone/utcpst.php>

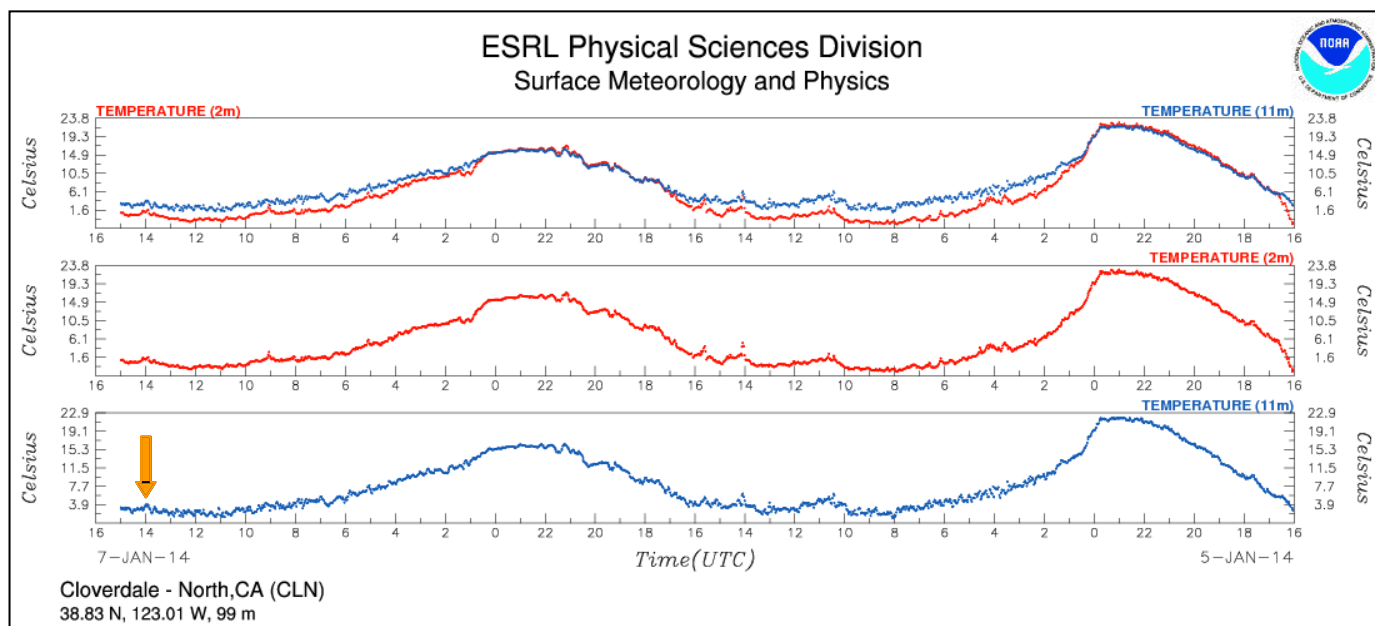
<http://www.worldtimebuddy.com/utc-to-pst-converter>

- F. Charts are presented in Celsius (°C).
To convert to Fahrenheit (°F), multiply °C by 1.8 then add 32.

- G. Charts read from **right to left**.
The most current temperature readings are located at the far left side of the chart.

Chart Example:

Charts have two temperature profiles (see below). The red line is the temperature profile at 2 meters (~5 ft.); the blue line is the temperature profile at 11 meters (~35 ft.). The top pair of lines displays the overlaid temperature profiles and can be used to see the relative inversion.



To learn your way around the temperature charts locate the orange arrow in the chart example near the most recent temperature data (on 7-Jan-14) recorded at 11 meters. It points to the following information:

➔ **January 7, 1400 hours UTC, 3.9 °C, 11 meter height:**

For PST:

Subtract 8 hours: (1400 – 8 hours) = 6:00 am

Convert °C to °F: (3.9 x 1.8) + 32 = 39 °F

At 6 am it was 39 °F at 11 meters above the vineyard floor. The top pair of lines in the chart indicates that at 6 am the temperature at the 2 meter height (red line) was lower; thus an inversion was present.

The charts present the temperature profiles of a site, yet the precise temperature values are quite difficult to see. To calculate the inversion strength at 6 am you need precise temperatures at the 2 meter and 11 meter heights, which can be obtained from the **data tables**.

Data Table Example:

Click on the station's green dot to open the information box. **Click on the text "Datalogger Campbell- SurfaceMet" to see the data table.**

In general, when an inversion is present, a wind machine will increase the vineyard temperature by about one-half of the difference in temperature at 2 meters and 11 meters above the soil surface. In the example, tabular data are used to calculate the estimated increase in temperature a wind machine would provide on this morning.

Datalogger ID	Year (end time of average)	Julian Day (end time of average)	HoursMinutes (end time of average)	Battery Voltage (volts)	Temperature (C) 2m	Temperature (C) 11m	Datalogger Temperature (C)
101	2014	7	1400	12.16	1.122	3.872	-0.697

➔ **January 7, 1400 hours**

11 meters: (3.872 °C)

2 meters: (1.122 °C)

Calculate the *inversion strength* which is the temperature difference between 11m and 2m:

3.872 °C – 1.122 °C = 2.75 °C

Convert to °F:

2.75 °C x 1.8 = 4.95 °F

Multiply by 0.5 to estimate the amount of warming that will occur with the operation of a conventional type wind machine under these conditions:

4.95 °F x 0.5 = 2.48 °F

In this example, given the temperature difference at 2 meters and 11 meters, a wind machine would be expected to increase the air temperature near the vines by about 2.5 °F.