


An Educator's Guide to Weather Underground®

(www.wunderground.com)

A Step-by-Step User's Manual for K-12 Educators

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Descriptions of Weather Underground® features are based on the site's version as of June 1, 2015.

This educational resource (and a broader collection of education resources) is available for download (.pdf) from the VirginiaView website. http://virginiaview.cnre.vt.edu/education.html

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Cover photos are by RJ McNally.

Photo on the left was taken May 26, 2014 during a Virginia Tech storm chase in Texas. The picture is the bubbling updraft of a super cell thunderstorm. This is also where the mesocyclone is located or where tornadoes are formed. The wall cloud is at the very bottom. The spiraling screw of the updraft going up in to the storm is visible. This updraft is the fuel source and life force of a super cell.

Photo on the right was taken on May 20, 2014 during a Virginia Tech storm chase in Wyoming. This is an up-close look at the mesocyclone of a super cell, also a wall cloud. You can see the rain shafts in the distance behind it, which indicate which way the wind is blowing. You can also see the greenish color at the top of the wall cloud. The mesocyclone is spiraling a little and you can almost see a funnel-like formation at thee bottom edge of it.

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Introduction

This resource is a guide for K-12 Teachers using the Weather Underground® Website. It provides step-by-step instructions on using the site but also describes some of its features. The Weather Underground® site provides information on science-related topics, other than weather, so this site is extremely useful for many science topics.

This guide is applicable to two types of Weather Underground® Users:

1) for teachers/schools that have a weather station on their property and it is connected on-line to the Weather Underground® site. This guide will assist you on finding your station on the site and finding the weather information that your station is generating; and
2) everyone else! Anyone can use this website for gathering, perusing, and in general, using weather information. Even if you do not have to have a station connected to this site, you can see and use data from ANY station connected to Weather Underground. You also will have access to historical weather information. We will guide you through this.

This guide is not a set of lesson plans, but rather it provides a resource for teachers, at all grade levels. This guide provides information, mainly for science-related topics, but because the site offers graphing capabilities, and numerical data that can be downloaded and used as spreadsheet files, is forms a useful resource for math teachers, again at all grade levels.

Background Information: The Weather Underground website is owned and operated by The Weather Underground®, Inc. In 1995, Dr. Jeff Masters and Perry Sampson founded The Weather Underground. Dr. Masters works under this establishment as the Director of Meteorology. Together with Jeff Ferguson and Alan Stermberg, they created a way to bring weather into K-12 schools via the internet. From there, the website grew from posting photos and blog posts to creating over 33,000 personal weather stations connected to Weather Underground.

Organization: This guide is organized around three themes – Virginia Standards of Learning, a step-by-step guide with screen shots, and a list of additional resources.

- Applicable Virginia Standards of Learning (pages viii and ix)

These two pages present tables with topics. We have included Virginia Standards of Learning for science and math. Our listing of applicable SOLs is likely not exhaustive, and most teachers will find this guide useful and applicable for Standards that we have not identified.

For the Science Standards, the columns are the topic, the applicable Standard(s) of Learning, and the chapter number in this guide.

For the math standards, we are specifically directing the teacher to Chapter 2, sections 2.4 and 2.5. Weather Underground® has pre-made graphs that can be used in mathematical analysis

(section 2.4). But a more useful resource is presented in Section 2.5, which describes procedures for downloading data. Weather Underground provides a source for a very large amount of data that can be used for teaching other math concepts. These concepts and the specific SOLs are listed within the SOL table for Math.

- Step-by-step guide for using the Weather Underground® website (pages 1 – 73)

Chapter 1 shows you how to find a specific weather station on Weather Underground®. For example, you may want to find the link to the weather station installed at your school, or any weather station of interest.

Chapter 2 discusses information on that specific weather station's site and outlines what information is available. It also steps through the process of finding all weather stations for a specific area, or for all weather stations that are in proximity to a specific weather station. The chapter includes graphing and downloading weather information for a specific station.

Chapter 3 discusses weather maps including Radar, satellite, Wundermap®, current conditions, and forecast maps. This chapter includes details on the Maps Catalog available on the Weather Underground® site.

Chapter 4 discusses Severe Weather, including both the U.S. and Europe, information on Hurricanes, Convective systems, Wildfires, preparedness for severe weather, and Weather Alerts issued by The National Weather Service.

Chapter 5 reviews resources for the news and blogs related to current and past weather events. But this chapter also includes downloadable information on other science topics related to weather events, including floods, volcanoes, earthquakes, and drought.

Chapter 6 discusses and displays photos and videos on current and past weather events.

Chapter 7 provides information related to weather conditions such as Snow, Marine Weather, Aviation Weather, and Sailing Weather.

Chapter 8 discusses how to access historical data on WeatherUnderground®.

- Additional resource available for most topics (Appendix A)

Finally, we provide a list of additional resources, which include sources of the information (e.g. National Weather Service, The Weather Channel, etc.) and the website URL.

Virginia Standards of Learning for Science (January 2010)

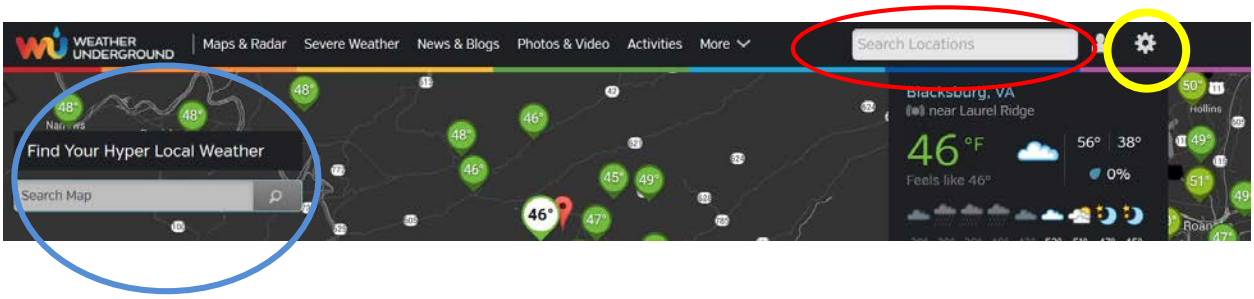
Topic	Chapter	SOL
Aviation Conditions		
Convection	4	Grade 6 - 6.3(b) Physical Science PS.7 (c) Earth Science ES.12(d)
Climate Change	5	Earth Science ES.11 (d) Life Science LS.10 (c)
Droughts	5	Grade 3 – 3.9 (a, d)
Earthquakes	5	Grade 5 – 5.7 (e) Earth Science ES.7 (a, b)
Fire	4	Earth Resources 3.10 (c)
Fronts	3	Grade 6 – 6.6(f)
Hurricane	4, 5	Grade 6 – 6.3 (e) Earth Science ES.12 (c)
Marine Conditions	7	Earth Science ES.3 (b); ES.10 (a, e)
Precipitation, floods, monsoons	2, 3, 4, 5, 7	Kindergarten – K5. (a, b, c) Grade 2 – 2.7 (b)
Severe Weather	4	Earth Science ES.12 (c)
Temperature	1, 2, 3	Grade 1-1.1 (e) 1.7(a, c) Grade 2 – 2.1(c) Grade 3 – 3.1 (c) Grade 4 – 4.1 (c) Grade 5 – 5.1(b) 5.4(b) Grade 6 – 6.6 (b) Physical Science PS.1(b) PS.7(a) Earth Science ES.1(a) Chemistry CH.5(a)
Thunderstorms	4	Grade 6-6.3 (e)
Tornadoes	5	Earth Science ES.12 (c)
Volcanoes		
Weather Conditions	2, 3, 4, 6	Kindergarten - K.1 (b, g, h, j) Grade 1 – 1.1 (b, g, h); 2.1 (g, j, k) Grade 3 – 3.1 (b) Grade 4 - 4.6 Grade 6 - 6.6 (e)
Weather Data	1, 2, 3, 4, 5	Grade 2 - 2.6 (b, c) Grade 3 – 3.1(h) Grade 4 – 4.1(i) Earth Science ES.12(a)
Weather Maps	3, 4, 6, 7	Grade 6 - 6.6 (f)
Weather Measurements	1, 2, 3, 4	Grade 4 - 4.6 (b, c)
Weather Observations	2, 3, 4, 5	Kindergarten K.9 (a) Grade 1 - 1.7 Grade 2 - 2.7 (a, b) Grade 5 – 5.1 (h)
Weather Patterns	3, 4, 5, 6, 7, 8	Kindergarten K 10 (b) Grade 1 – 1.7 (a, b, c) Grade 2 – 2.7 (a) Earth Science ES.12 (b)
Weather Phenomena	3, 4, 5, 6, 7, 8	Grade 2 - 2.6 (a) Grade 4 - 4.6 (a, c) Grade 6 - 6.3 (e) Earth Science ES.12(d)

Virginia Standards of Learning for Math (February 2009)
Using Sections 2.4 and 2.5 of this Guide

Topic	SOL
Tables	Kindergarten K.14 Grade 1 – 1.14 Grade 2 – 2.8 Grade 7 – 7.12 Grade 8 - 8.14
Basic Statistics – mean, median, mode, data variation	Grade 5 – 5.16 (a, c, d) Grade 6 – 6.15 (a, b)
Mean absolute deviation, standard deviation	Algebra A.9
Variance, interquartile range, range, outliers	Probability and Statistics PS.2
Graphs	Kindergarten K.14 Grade 1 1.14 Grade 2 – 2.8 Grade 3 – 3.17 (b, c) Grade 4 – 4.14 Grade 5 – 5.15 Grade 6 – 6.14 (c) Grade 7 – 7.11 (b); 7.12 Grade - 8.13 (a, b); 8.14
Patterns	Grade 5 – 5.17
Dependent and Independent variables	Probability and Statistics PS.15
Normality	Algebra, Functions, and Data Analysis AFDA 7 (a, b, c) Probability and Statistics PS.16
Analysis using large samples	Probability and Statistics PS.17

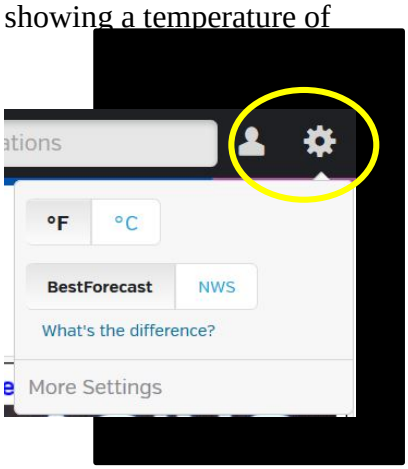
Chapter 1: Finding Your Weather Station

The Weather Underground® website is very easy to use. First, enter this web address into your browser or search bar: http://www.wunderground.com, then press the enter key on your keyboard, and the following page will display:



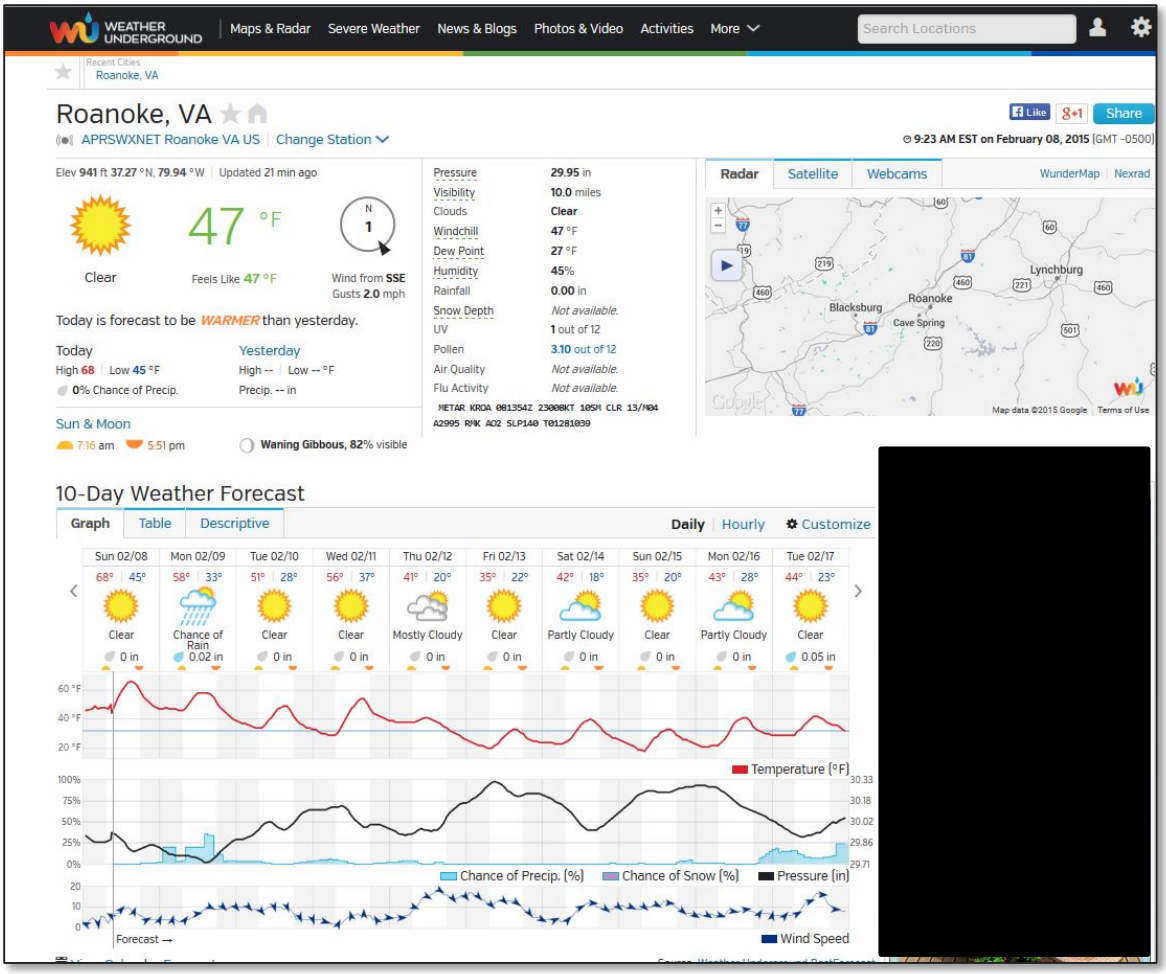
Weather Underground® selects the closest weather station to you, based on the IP address acquired by your internet provider, and displays that station's information. The temperature reading displayed within the circle on the map is that location's current temperature. In this case, it displays data for Blacksburg, Virginia, at Brush Mountain, showing a temperature of 48.3^{0}F.

You can change the temperature setting from Fahrenheit to Celsius. Go to settings in the upper right hand corner (yellow circle above and right). Click on the icon and you see a drop down window, where you can change the setting from ^{0}F to ^{0}C.



To find your specific station or a specific location, click on the search bar in the upper right hand corner of the page (within the red oval below) or in the bar titled *Where is Your Weather?* (blue oval).

For purposes of this exercise type *Roanoke, VA* in the search bar, then hit the enter key on your keyboard. You will then see the screen at the top of the next page. Within this screen, you will see current weather conditions for Roanoke, Virginia, including cloud cover, temperature, and wind displayed for you in big print; in this case: 47° F, clear conditions – you see a full sun, and wind speed is 2 miles per hour with the wind from a southeasterly direction. You see more detailed information in the middle of the screen and a map of Roanoke at the right-hand side of the screen. Below that is a *10-day Weather Forecast* that displays predicted weather for the next 10 days, including and it includes graphs for greater detail on how temperature and pressure are predicted to rise and fall over that time period.

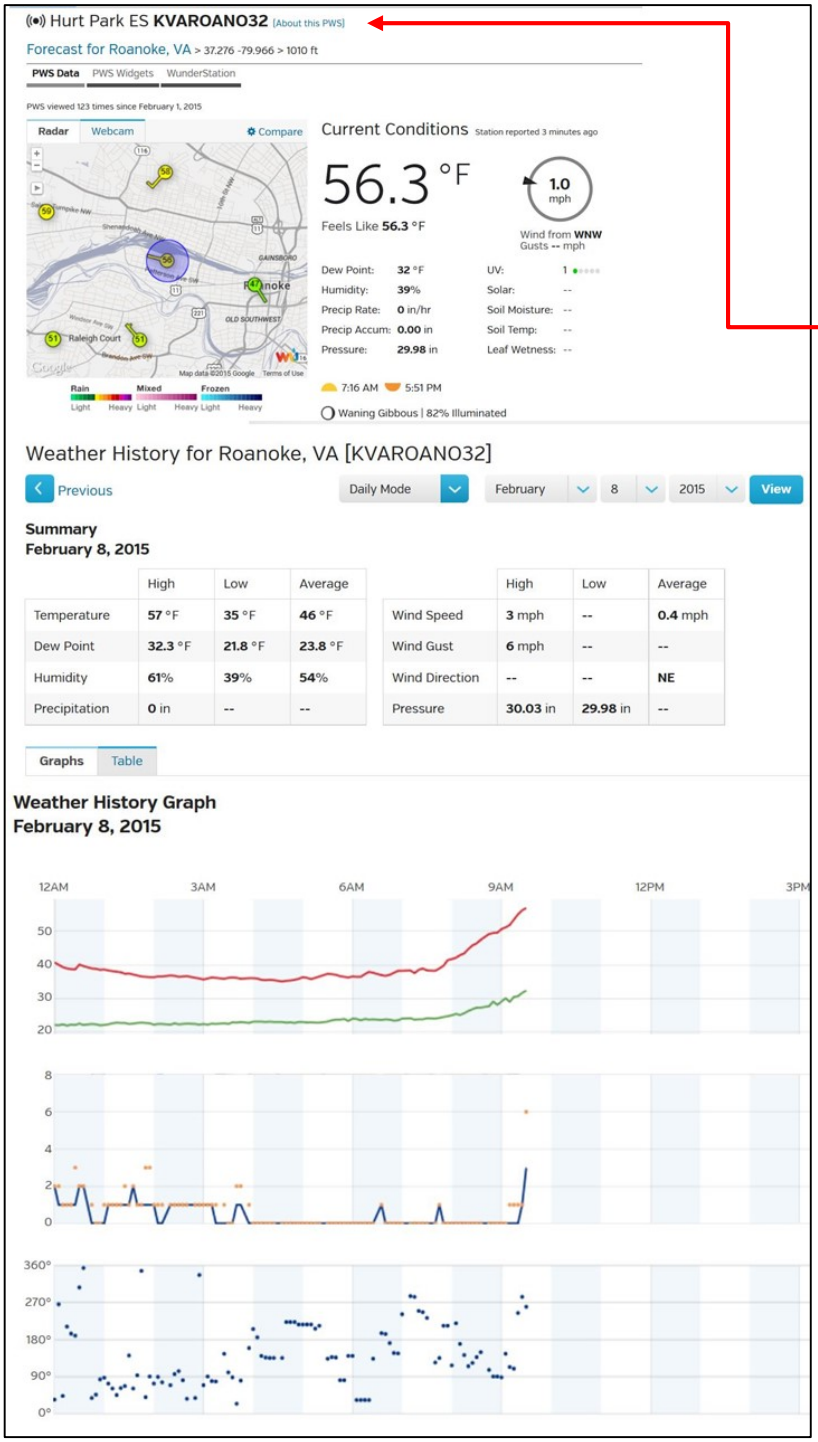


Scroll down the page until you find the table titled *Nearby Weather Stations* (table below), which lists all of Roanoke's weather stations and their data.

Nearby Weather Stations

Station Location	Temp.	Windchill	Heat Index	Dew Point	Humidity	Wind	Precip.	Elev	Updated	Type
Roanoke VA US, Roanoke, VA	51 °F	-- °F	51 °F	29 °F	43%	SW at 0.0 mph	0.00 in / hr	941 ft	7:12 PM EST	Rapid Fire
Hurt Park ES, Roanoke, VA	46.8 °F	46 °F	47 °F	28.1 °F	48%	WSW at 0.0 mph	0.00 in / hr	1010 ft	7:20 PM EST	Rapid Fire
Fallon Park ES, Roanoke, VA	46.6 °F	46 °F	47 °F	29.4 °F	51%	E at 0.0 mph	0.00 in / hr	932 ft	7:20 PM EST	Rapid Fire
Roanoke VA US, Roanoke, VA	53 °F	-- °F	53 °F	31 °F	42%	SSE at 1.0 mph	0.00 in / hr	1498 ft	7:12 PM EST	Rapid Fire
Raleigh Court - 1043ft. [Near Wasena ES], Roanoke, VA	44.1 °F	44 °F	44 °F	30.3 °F	58%	SW at 0.0 mph	0.00 in / hr	1043 ft	7:22 PM EST	Rapid Fire

Here you see weather stations in the Roanoke area. For, each station, current conditions are displayed-- current temperature, humidity, wind, precipitation amounts, and the last time it was updated.



You can click on any of the stations to link to that stations' webpage. Let's explore the weather data associated with one specific station.

Click on one of the stations. For this exercise, we have chosen Hurt Park Elementary School, but most any station you select will display the same basic details.

Once you have selected a station, you see the information displayed at the left.

You get detailed information about the station, including a map of the station's location.

The next chapter describes use of these pages and interpretation of the data for your station.

Chapter 2: Interpreting Weather Data

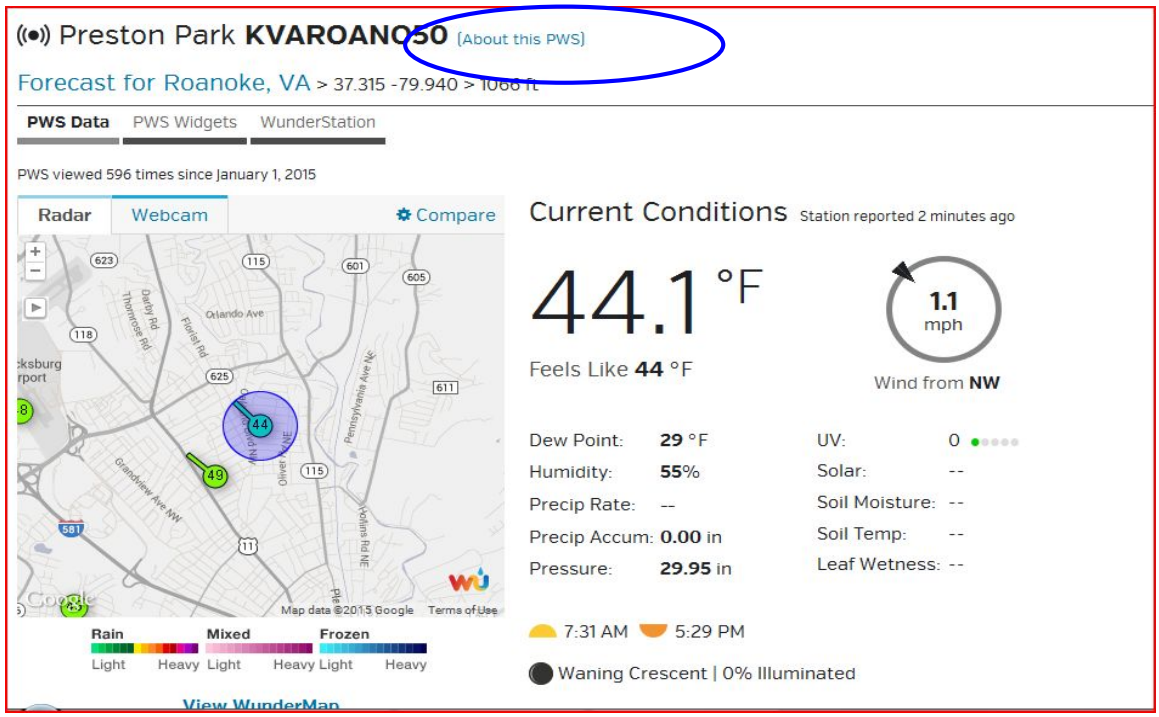
In chapter 1, we explored how to find your area's weather station from the search bar on the home screen and to find the closely related option in the table. For this chapter, we explain the pages related to a specific weather station found on Weather Underground®, and interpret the data for easy use and guidance for your area.

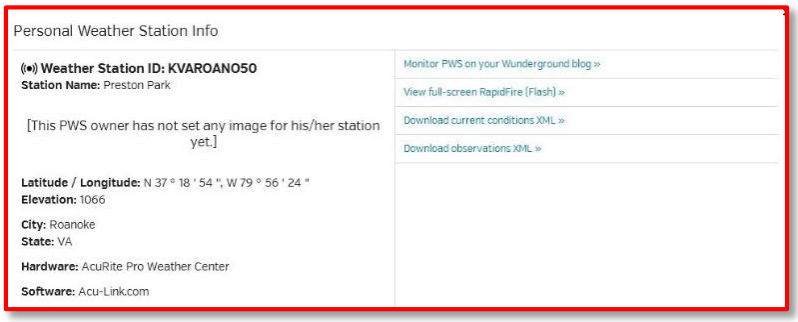
For this section, we will be using Preston Park as the example.

2.1 Information for a Specific Weather Station

Once you have selected your weather station, in this case Preston Park, the current weather conditions pop up on your screen.

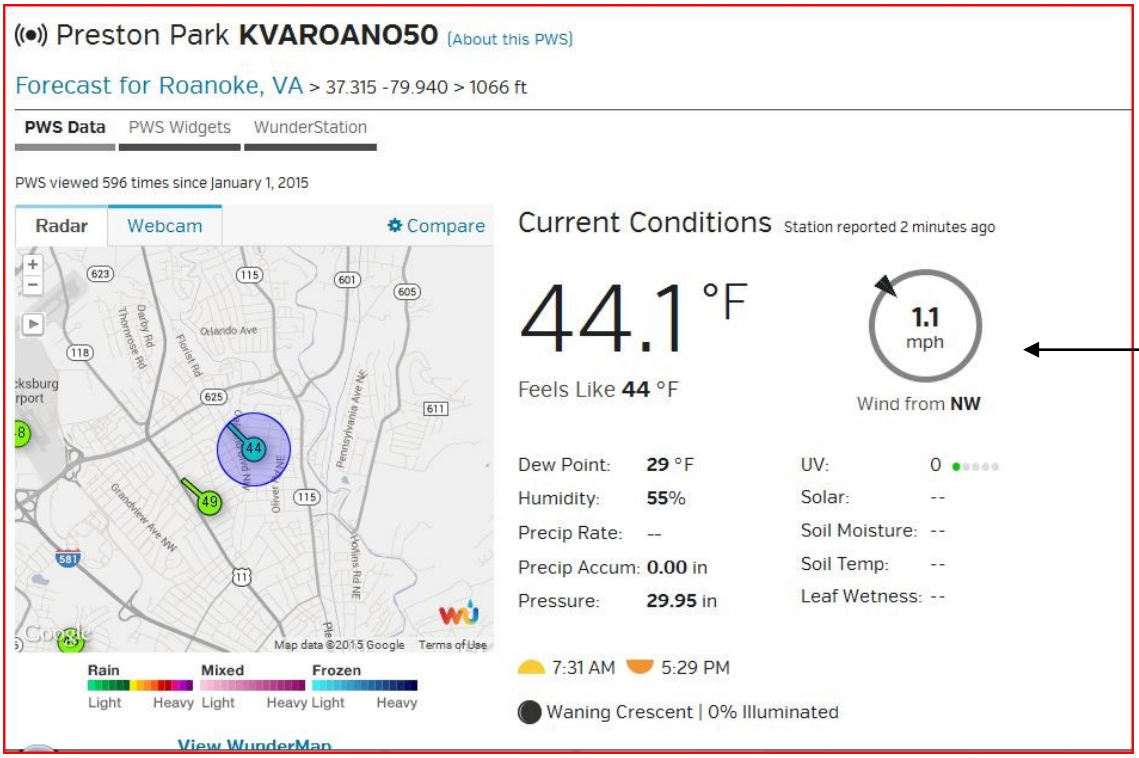
The "KVAROANO50" designation next to Preston Park at the top of the screen is that weather station's personal code. The *KVA* stands for Virginia; *ROANO* is Roanoke, and the *50* means that it is the 50th weather station in Roanoke set by Weather Underground®. Clicking on "*About this PWS"* (blue oval), you see an information box describing the weather station. (*PWS* stands for Personal Weather Station),



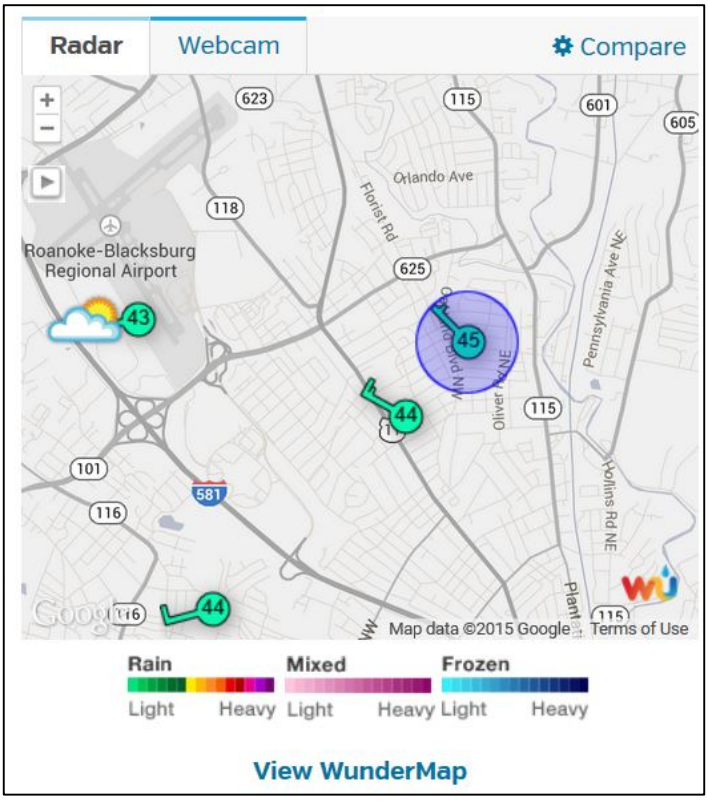


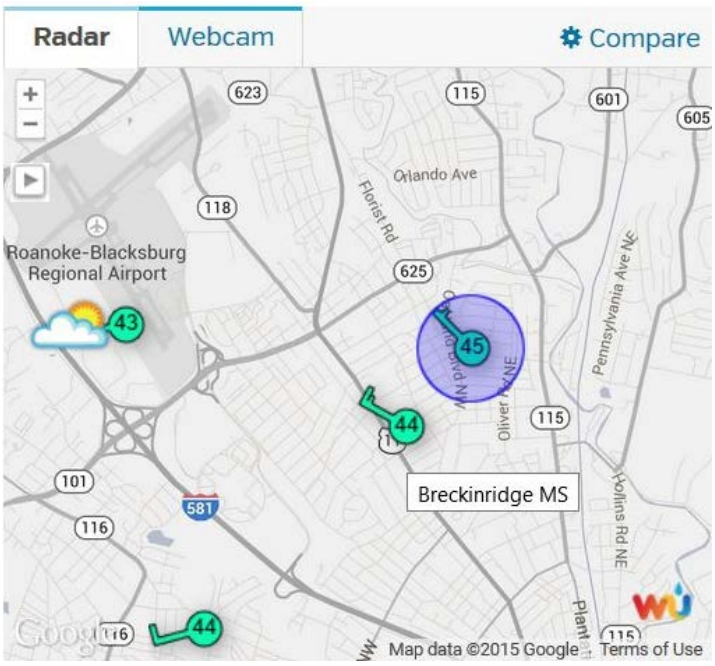
This link displays the *Personal Weather Station Info* - its absolute location as latitude and longitude, its elevation, and what brand of weather station (hardware) and the software the station has to record their weather station's data and report to the internet.

Now return to the main screen for your chosen weather station. The right side of the screen displays current conditions of the location. You also see data for current temperature, wind speed and direction, dew point, precipitation accumulation, and pressure. The latitude, longitude, and elevation also show right beneath the station ID. Below the current temperature is the *Feels Like*[1] temperature. This temperature is based upon wind chill or wind chill factor. The National Weather Service explains that the wind chill is the heat loss on exposed skin from increasing wind speeds, used to generate the *Feels Like* temperature in Weather Underground®.



[1] http://w1.weather.gov/glossary/index.php?letter=w





2.2 WunderMap for a Specific Station

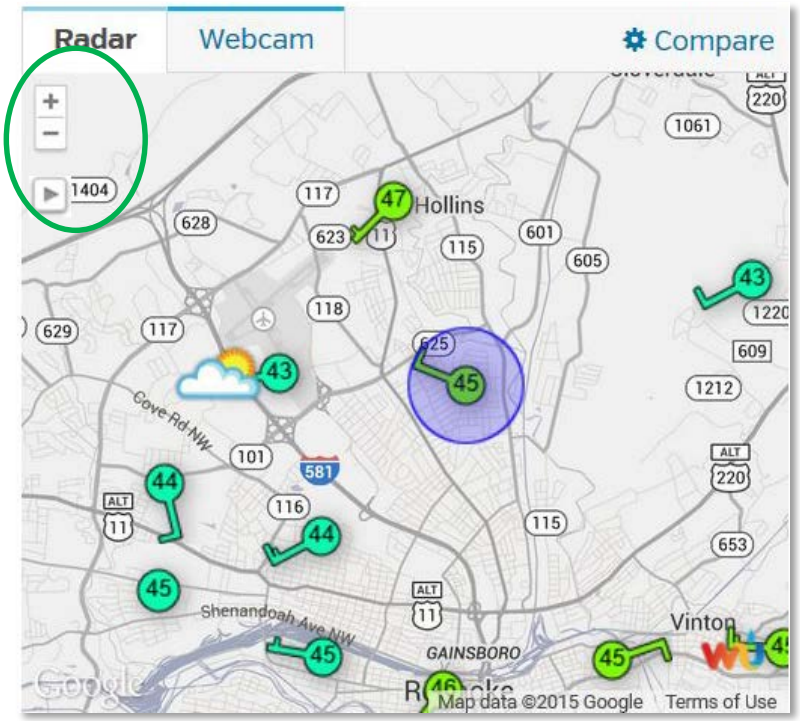
The map on this page displays the station location on the map and, in cyan, inside the larger blue circle in the center of the screen, the latest temperature reading reported to the Weather Underground® site by the station.

The surrounding weather stations are displayed in green. If you hold your mouse cursor over a bubble for another weather station, it identifies the station (see below).

If you place your cursor over the cyan bubble for another station, it provides that station's name. In this case, you can see the station reporting right below Preston Park is identified as Breckinridge Middle School, the station on the left is for the Roanoke-Blacksburg Regional Airport (also the location of the official National Weather Service Station). The station at the bottom of the map is for Roanoke Academy ES (Roanoke Academy for Math and Sciences – RAMS).
This map can display variations in temperature across the city of Roanoke.

As you can see, within this region, the temperature varies about 2 degrees Fahrenheit. Readers familiar with Roanoke, will know that these stations are relatively close together. An interesting phenomena exists in urban areas, which creates micro-climates[2] because of variations in the immediate landscape[3] around any specific weather station.

[2] The National Weather Service defines a micro-climate as the climate of a small area that may be different than that of a larger surrounding area. http://forecast.weather.gov/glossary.php?letter=m
[3] Landscapes differences can be attributed to presence or absence of trees or other vegetation, buildings, streets, and elevation.



You can zoom in and out on this map by clicking on the buttons in the upper left corner of the map (green circle).

Click on the minus sign and it zooms out. Readers can see even more weather stations within Roanoke. Roanoke has many personal weather stations reporting to Weather Underground As displayed a this scale, the map shows a larger area, and even greater temperature differences of up to 4 degrees Fahrenheit, just in one area of the region.

2.3 Weather History for a Specific Weather Station

By scrolling down on this page, you can see the *Weather History for Roanoke, VA [KVAROANO50]*, the same station your chosen station. If you notice, the page is set on *Daily Mode* and the current date is shown. Here you can see the recorded high and low temperatures, dew points, humidity, and precipitation of the day. You also see the wind speeds and pressure as well.

Weather History for Roanoke, VA [KVAROANO50]

Previous | Daily Mode | January | 19 | 2015 | View

Summary
May 19, 2014

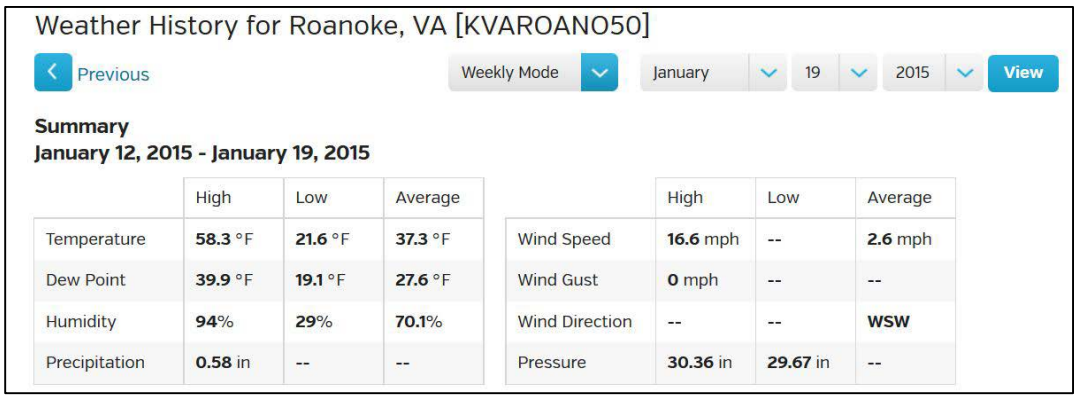
	High	Low	Average
Temperature	**77.9** °F	**43.3** °F	**60.6** °F
Dew Point	**48.4** °F	**38.7** °F	**43.5** °F
Humidity	**92**%	**32**%	**58**%
Precipitation	**0** in	--	--

	High	Low	Average
Wind Speed	**7.4** mph	--	**1.5** mph
Wind Gust	**0** mph	--	--
Wind Direction	--	--	**ESE**
Pressure	**30.24** in	**30.1** in	--

Graphs | Table

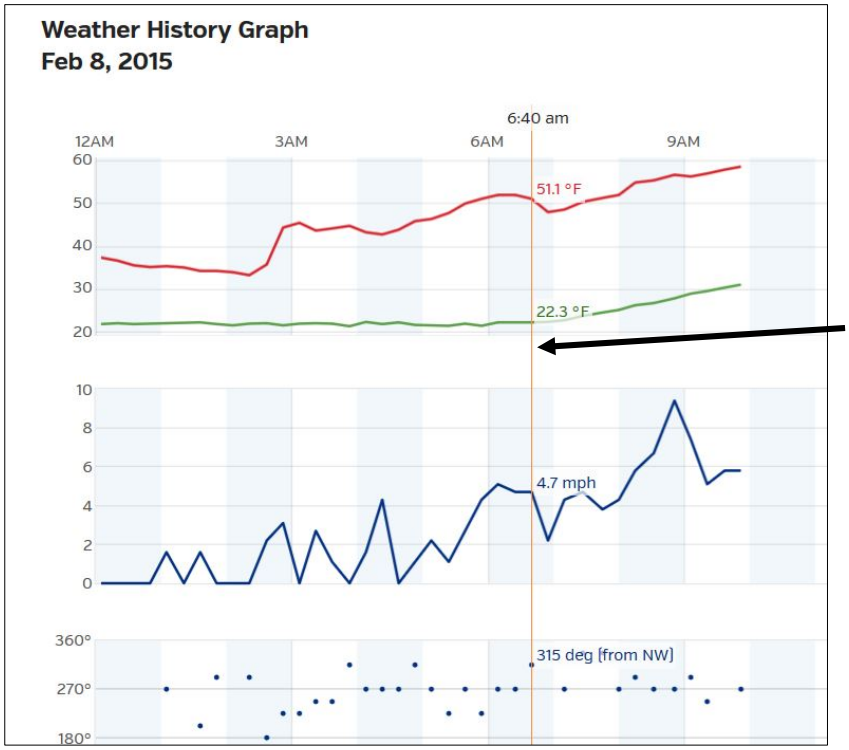
In this table you can customize the weather history data by viewing it daily, weekly, monthly, or yearly by clicking on the down arrow as indicated in the red circle below.

In the blue circle, users can also set the dates to view past weather data by adjusting the year, month, and day as desired (for easiest use, click the down arrows next to each field). Once these parameters have been adjusted, click the *View* button. The screen shot below illustrates the change from *Daily Mode* to *Weekly Mode*. The screen now gives a summary of the conditions for the week January 12, 2015 – January 19, 2015. If you want to see a previous week, change the date or just click on the *Previous* button.



	High	Low	Average
Temperature	**58.3** °F	**21.6** °F	**37.3** °F
Dew Point	**39.9** °F	**19.1** °F	**27.6** °F
Humidity	**94**%	**29**%	**70.1**%
Precipitation	**0.58** in	--	--

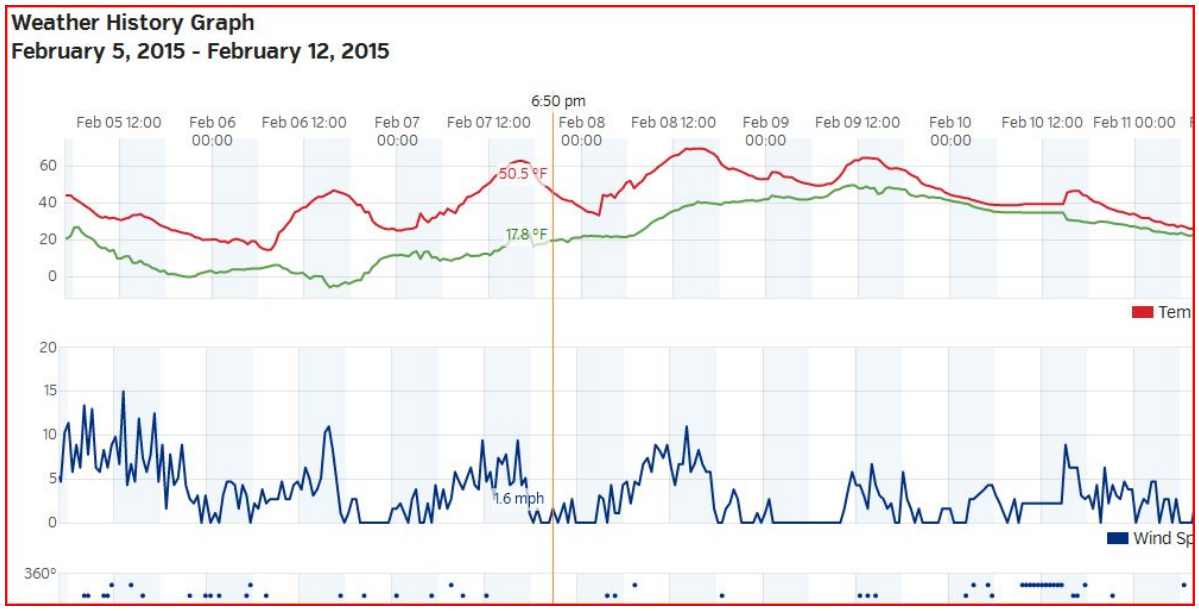
	High	Low	Average
Wind Speed	**16.6** mph	--	**2.6** mph
Wind Gust	**0** mph	--	--
Wind Direction	--	--	**WSW**
Pressure	**30.36** in	**29.67** in	--



2.4 Weather History Graphs

The weather history graph (shown at the right) gives a view of current conditions and the previous 12 hours for the date shown. If the mouse is positioned over the graph lines, it displays a vertical line that extends over all graphs to shows the temperature, precipitation, and pressure readings for that specific time. If you move your mouse back and forth, the readings change with the change in position of the line-- move the mouse to view this effect in action.

These graphs can be adjusted as well by changing from *Daily Mode* to *Weekly Mode*, or changing the date. The graph below shows weekly data from February 5, 2015 – February 12, 2015. Positioning the mouse on this graph will display information for specific dates and times. These graphs are displayed in 12 hour intervals for each day, based upon 24 hour intervals, so Feb 05 12:00 is noon, and Feb 06 00:00 is 12 AM-- midnight.



At the top of the graphs, see two tabs – *Graphs and Table*.

By clicking on *Table*, the data see above as a graph is visible Table format (see below).

Weather History Table
February 4, 2015 - February 11, 2015

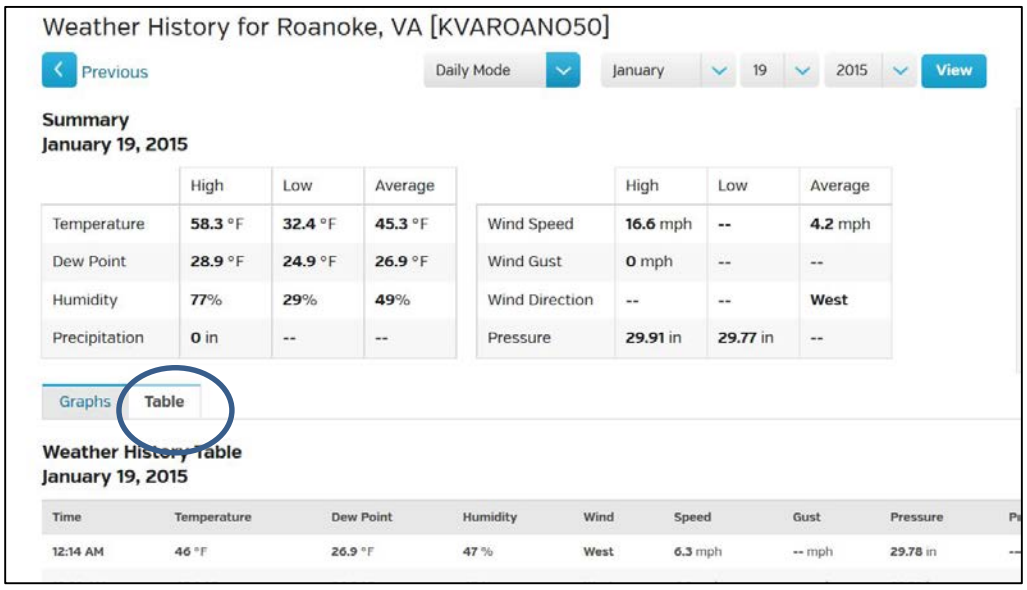
Download

Feb 4	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
12:13 AM	23.9 °F	17.5 °F	76 %	SSE	0 mph	-- mph	30.13 in	-- in	0 in
12:44 AM	24.1 °F	17.6 °F	76 %	SSW	0 mph	-- mph	30.13 in	-- in	0 in
1:14 AM	23.4 °F	16.9 °F	76 %	SSW	0 mph	-- mph	30.13 in	-- in	0 in
1:44 AM	22.6 °F	17.4 °F	80 %	SSW	0 mph	-- mph	30.13 in	-- in	0 in
2:15 AM	22.6 °F	17.4 °F	80 %	SSW	1.1 mph	-- mph	30.12 in	-- in	0 in
2:45 AM	23 °F	18.1 °F	81 %	SSW	0 mph	-- mph	30.12 in	-- in	0 in
3:15 AM	23.5 °F	18.3 °F	80 %	SSE	0 mph	-- mph	30.1 in	-- in	0 in
3:46 AM	24.1 °F	18.8 °F	80 %	West	0 mph	-- mph	30.11 in	-- in	0 in
4:16 AM	23.5 °F	18.3 °F	80 %	West	0 mph	-- mph	30.09 in	-- in	0 in
4:46 AM	23.7 °F	18.8 °F	81 %	West	0 mph	-- mph	30.09 in	-- in	0 in
5:17 AM	22.5 °F	17.8 °F	82 %	West	0 mph	-- mph	30.09 in	-- in	0 in
5:47 AM	22.1 °F	17.5 °F	82 %	West	2.7 mph	-- mph	30.08 in	-- in	0 in
6:17 AM	21.9 °F	17.3 °F	82 %	West	0 mph	-- mph	30.09 in	-- in	0 in
6:47 AM	21.9 °F	17.6 °F	83 %	West	0 mph	-- mph	30.1 in	-- in	0 in

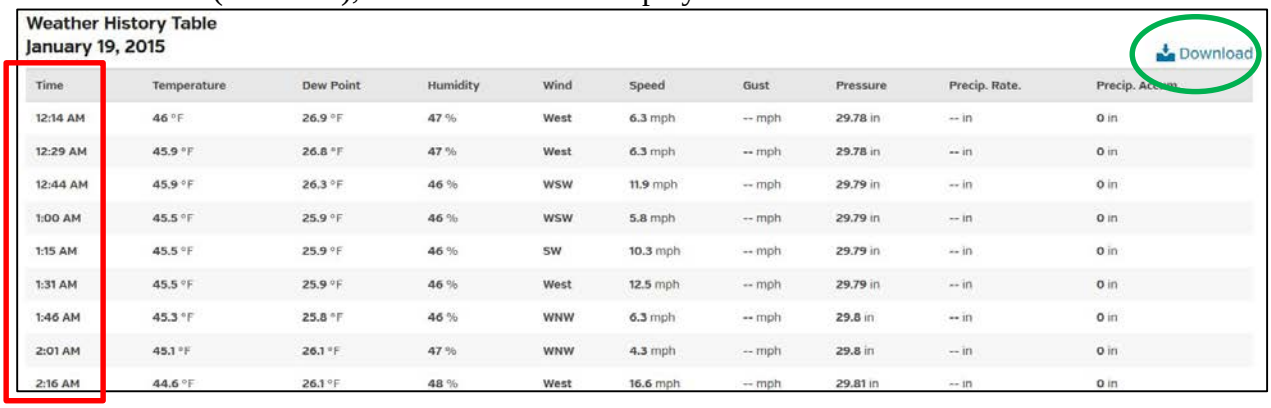
Here it displays the weather data periodically throughout the day, to week, or monthly, according to your selection. Here, it is shows that you can view the temperature humidity, wind, pressure and precipitation every half hour or so.

2.5 Downloading Weather History for a Specific Weather Station

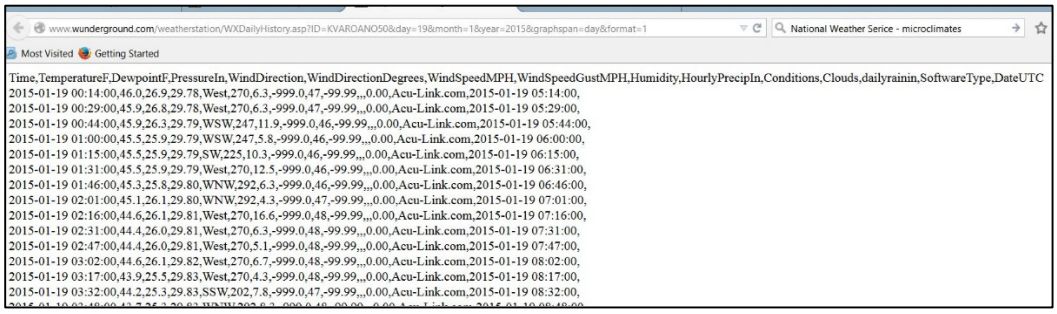
To download the weather history data from the table, switch back to *Daily Mode (for example)*, then change the screen parameters so it looks like this:



Click on *Table* (blue oval); the table data will display as follows:



The table is listing all the readings for January 19, 2015, about every 15 minutes (red rectangle). At the top of the table, on the right, you see a *Download* icon (green oval). Click on this icon. It will open into a new webpage as follows:



Users can save this webpage, or download it into a pdf, but that really just saves the data as a document. Those who wish to use these data for instructional purposes, (e.g., for meteorological, math, or statistical instruction), should follow these instructions on how to prepare these data in a spreadsheet format.

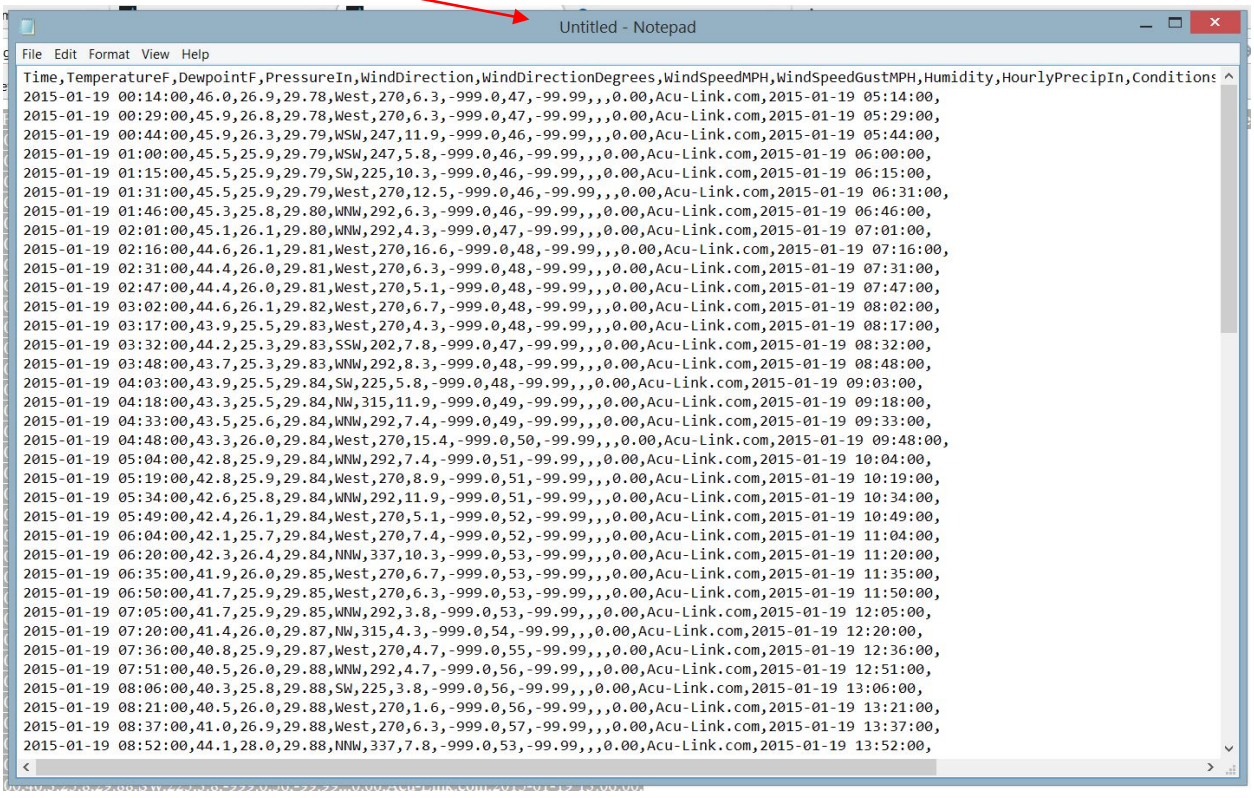
(If you are not interested in this section on preparing spreadsheets, skip ahead to the end of the chapter.)

1. Copy and paste into Notepad:

Go to the very top of the screen, when the capital T (for time is located). Hold your left mouse button down, and keep it held down, then drag your mouse to highlight all the data across the page and down the page. Once all the data is highlighted, hit *ctrl* and *c* (at the same time) on your keyboard. You have copied the data.

2. Open Notepad

Once Notepad is open, hit *ctrl* and *v* (at the same time) on your keyboard. The data is now pasted into Notepad.

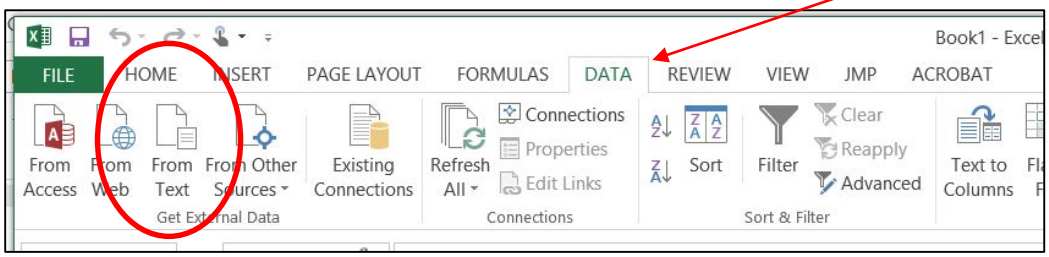


Look at the data in Notepad, you have readings from the station for January 19, 2015 from 00:14 a.m. (14 minutes after midnight) to 23:48 (11:48 p.m.).

Save your Notepad document (*File > save as*; navigate to the place on your computer where you save your documents). It will save as a .txt file.

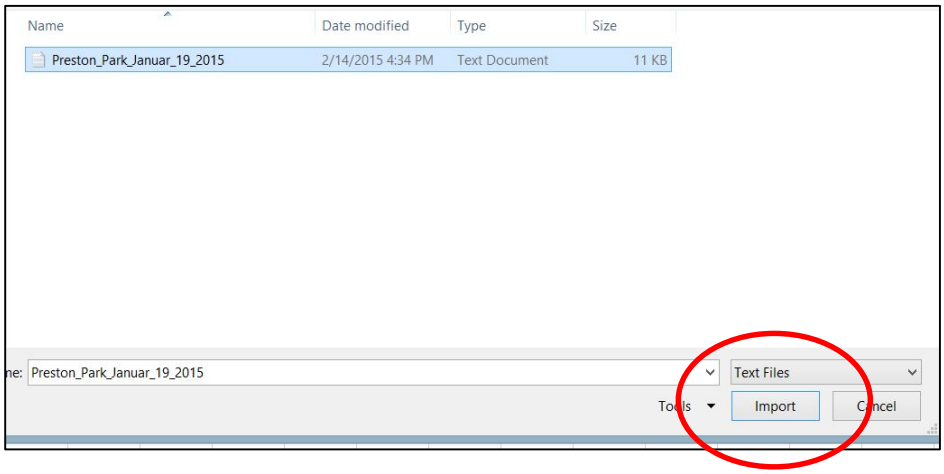
3. Opening the data in Microsoft Excel.

Open a blank Excel document. In the top tool bar, you want to click on the *Data* tab and then click on *From Text* (red circle).

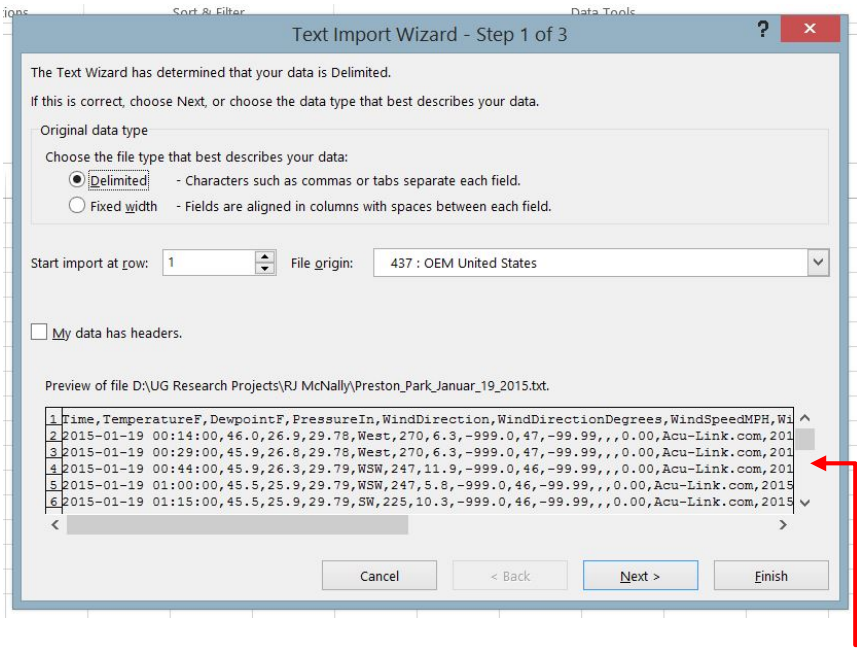


This will open a window called *Import Text File*:

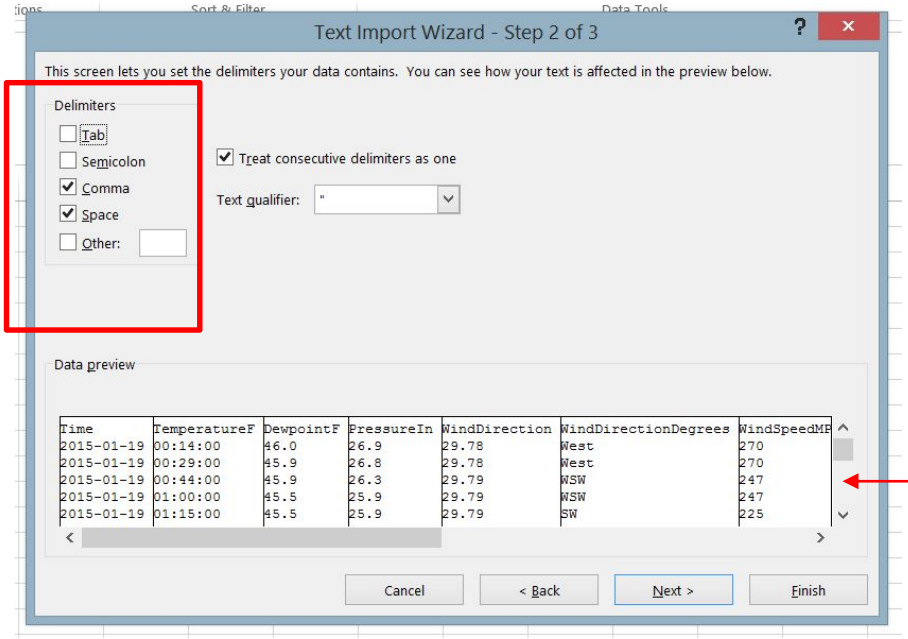
Navigate to the location on your computer where you saved the Notepad file. Click on the file to highlight it and then click *Import* (red oval):



You get the *Text Import Wizard*:

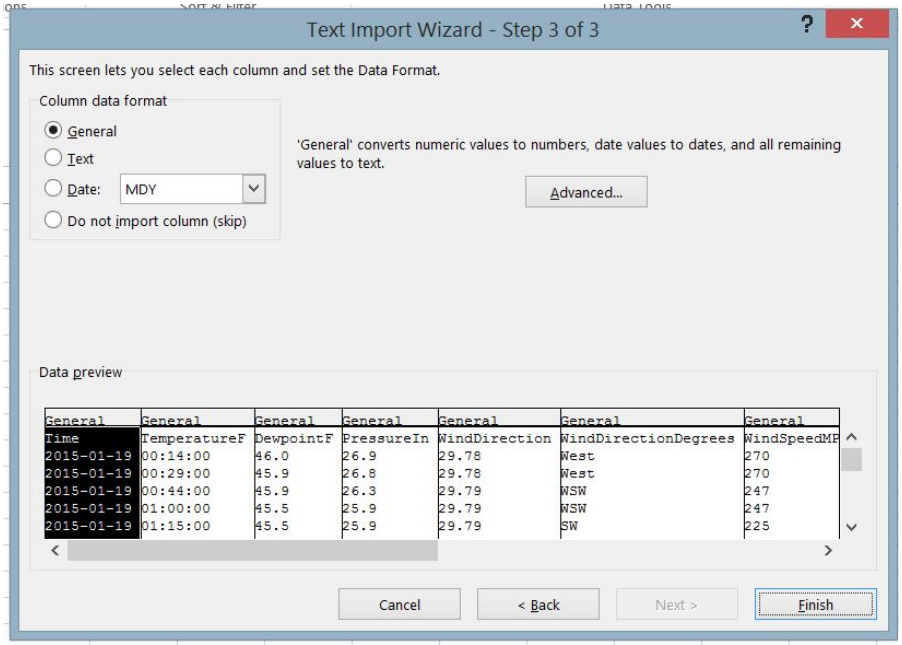


Make sure *Delimited* is selected. You can see your data in the *Preview* window. Hit *Next*.



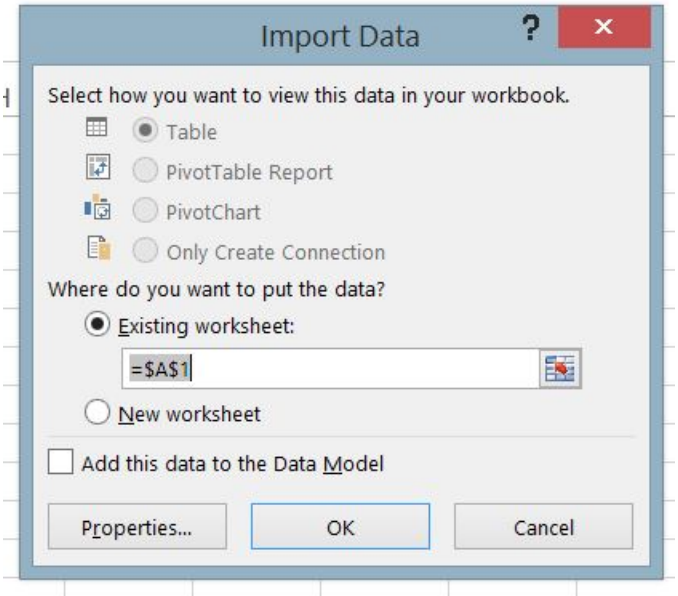
The Weather Underground® data is delimited in two ways, by comma and by space, so make sure in Step 2 of 3, you have checked both *Comma* and *Space* (red rectangle), under *Delimiters*. Also be sure that *Treat consecutive delimiters as one* is also checked. If you look in the *Data Preview* window, you see how the data is tabulated into columns with those specific delimiters identified.

Click *Next*.



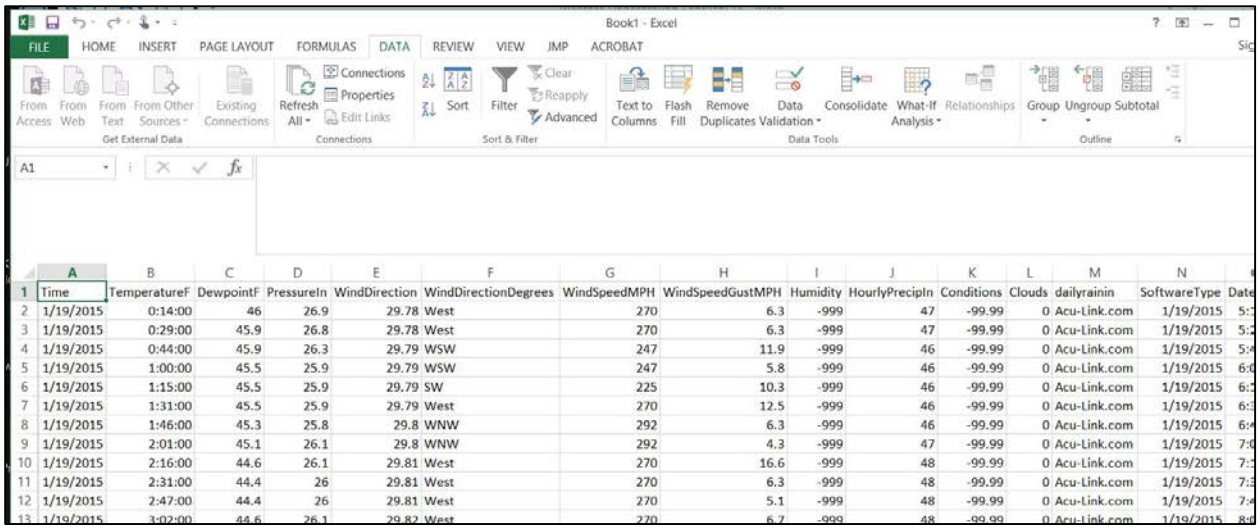
For the final step of the import (*Step 3 of 3*) make sure the Column data format is *General*. This format will recognize the data in each column as specific types, i.e. the dates as date data and time as time, the numbers as numeric data to which mathematic formulas can be applied.

Click *Finish*. You will get one more window: *Import Data*. For this procedure, you want a *Table* and you are importing it into the *existing worksheet* from which you started this procedure.



Click *OK*.

The data is now displayed as an Excel worksheet. The import has included all the headings for the correct column.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Time	TemperatureF	DewpointF	PressureIn	WindDirection	WindDirectionDegrees	WindSpeedMPH	WindSpeedGustMPH	Humidity	HourlyPrecipIn	Conditions	Clouds	dailyrainin	SoftwareType	Date
2	1/19/2015	0:14:00	46	26.9	29.78	West	270	6.3	-999	47	-99.99	0	Acu-Link.com	1/19/2015	5:
3	1/19/2015	0:29:00	45.9	26.8	29.78	West	270	6.3	-999	47	-99.99	0	Acu-Link.com	1/19/2015	5:
4	1/19/2015	0:44:00	45.9	26.3	29.79	WSW	247	11.9	-999	46	-99.99	0	Acu-Link.com	1/19/2015	5:
5	1/19/2015	1:00:00	45.5	25.9	29.79	WSW	247	5.8	-999	46	-99.99	0	Acu-Link.com	1/19/2015	6:
6	1/19/2015	1:15:00	45.5	25.9	29.79	SW	225	10.3	-999	46	-99.99	0	Acu-Link.com	1/19/2015	6:
7	1/19/2015	1:31:00	45.5	25.9	29.79	West	270	12.5	-999	46	-99.99	0	Acu-Link.com	1/19/2015	6:
8	1/19/2015	1:46:00	45.3	25.8	29.8	WNW	292	6.3	-999	46	-99.99	0	Acu-Link.com	1/19/2015	6:
9	1/19/2015	2:01:00	45.1	26.1	29.8	WNW	292	4.3	-999	47	-99.99	0	Acu-Link.com	1/19/2015	7:
10	1/19/2015	2:16:00	44.6	26.1	29.81	West	270	16.6	-999	48	-99.99	0	Acu-Link.com	1/19/2015	7:
11	1/19/2015	2:31:00	44.4	26	29.81	West	270	6.3	-999	48	-99.99	0	Acu-Link.com	1/19/2015	7:
12	1/19/2015	2:47:00	44.4	26	29.81	West	270	5.1	-999	48	-99.99	0	Acu-Link.com	1/19/2015	7:
13	1/19/2015	3:02:00	44.6	26.1	29.82	West	270	6.7	-999	48	-99.99	0	Acu-Link.com	1/19/2015	8:

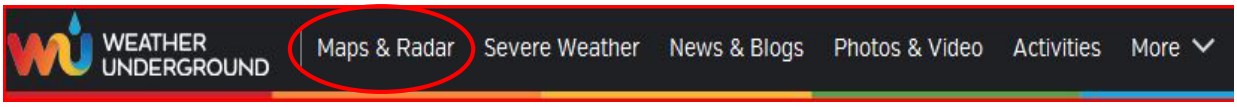
Save your Excel document. The data is now usable for your class, in the same way instructors use any data in an Excel Spreadsheet format, and import it into other programs (as allowed by specific software).

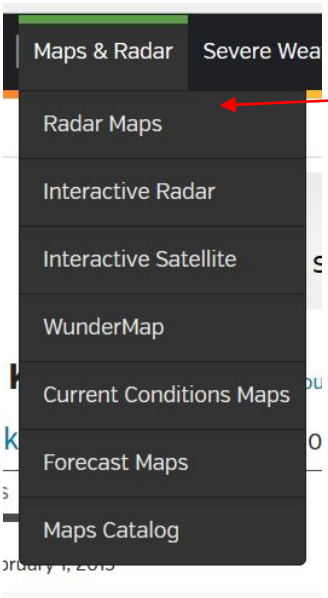
At this point, you have learned the basics of using Weather Underground to examine weather data a specific region, and choosing a weather station. In the next chapter, we will explore users for the tabs visible at the top of the Weather Underground® website home page.

Chapter 3: Maps and Radar: Radar Maps

This chapter will go over the *Maps & Radar* tab found on the upper tool bar of the website.

3.1 Radar Maps



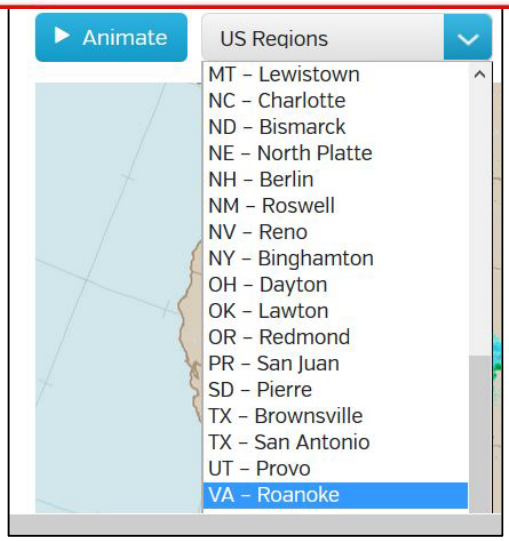


After clicking on the Maps and Radar tab, a menu drops down. Click on the top most menu item called "*Radar Maps*."

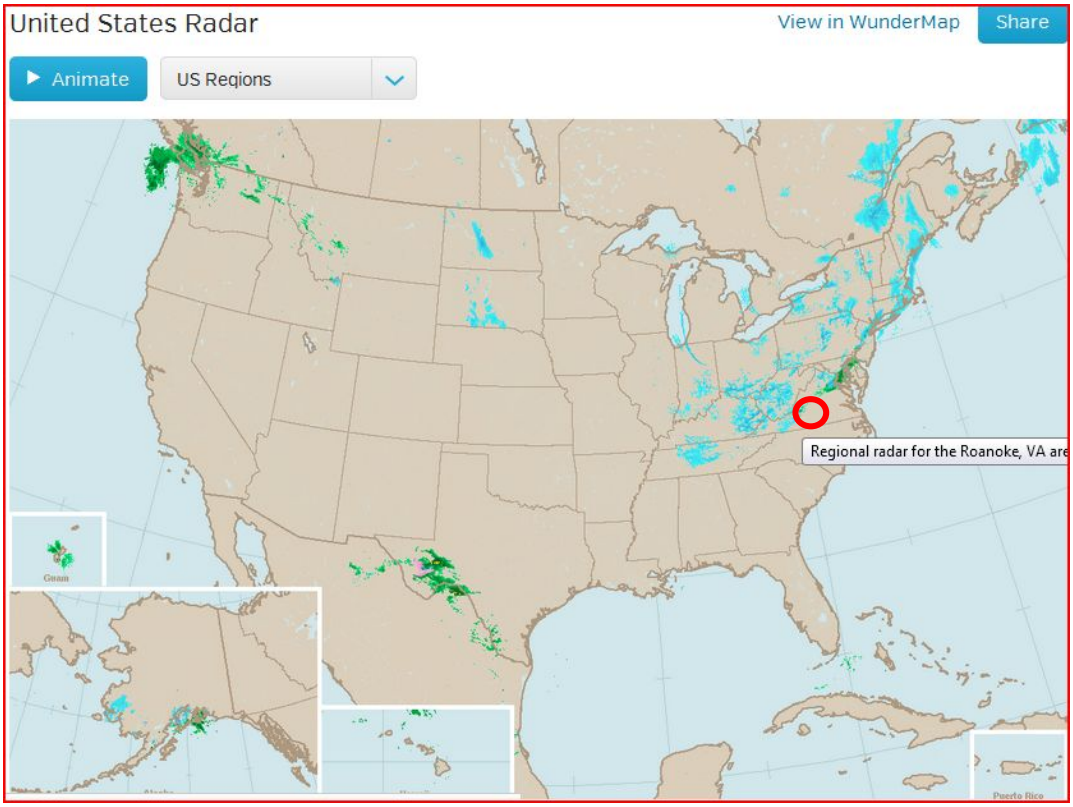
Here you can look at radar maps of the United States, Canada, and Australia. You can animate the map, which shows the progression of weather over the course of 1 hour, by clicking on the *Animate* button. You can also select the region of your choice.

Clicking on Canada, Australia, or clicking on a weather station will bring you onto a new map with which you can interact.

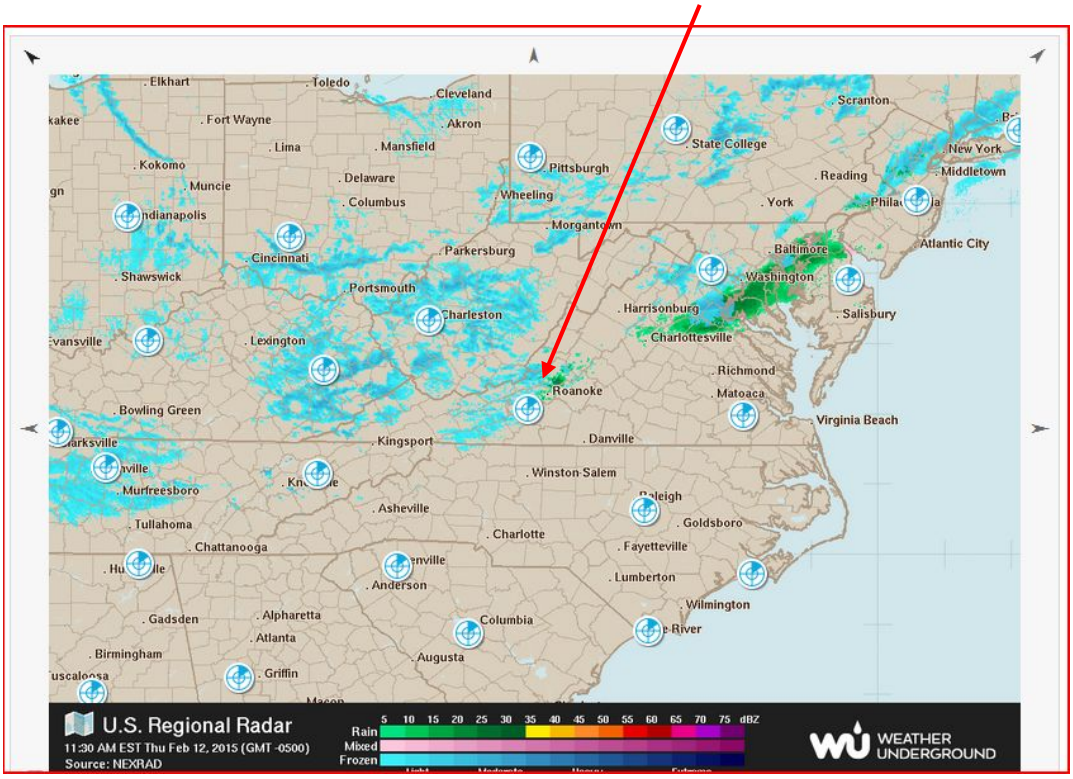
Here, we narrowed the search to VA – Roanoke, by clicking on the down arrow next to *US Regions*.



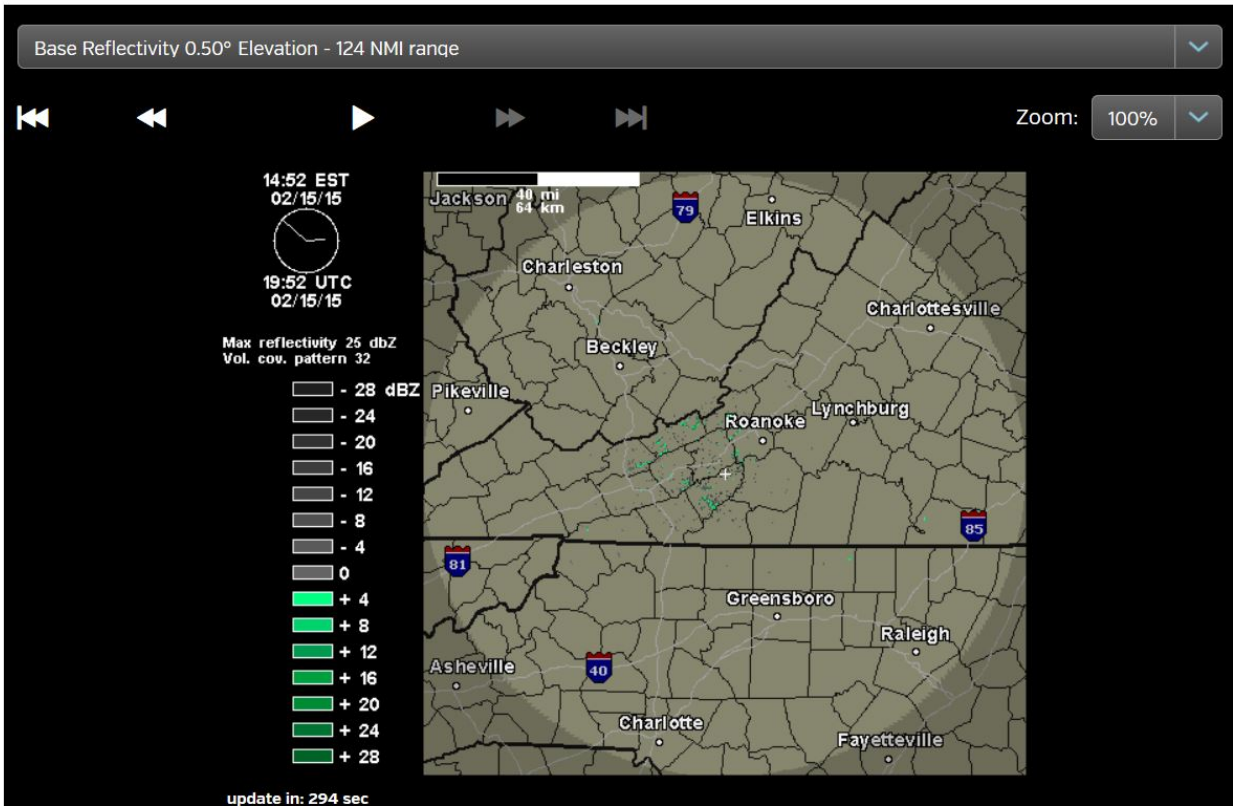
Click on the general area of Roanoke, Virginia indicated by the red circle.



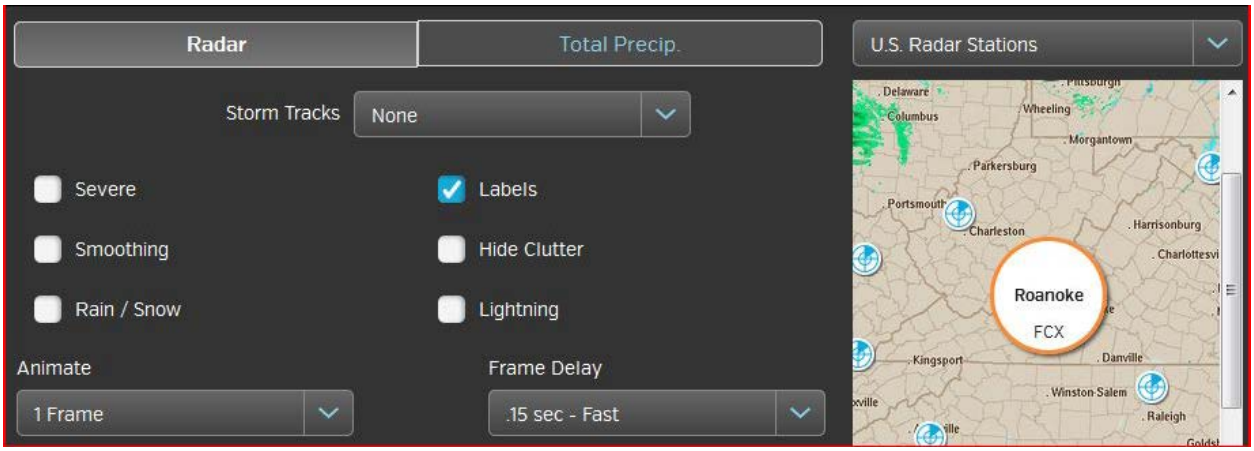
You will get the map below. Click on the Roanoke radar icon.



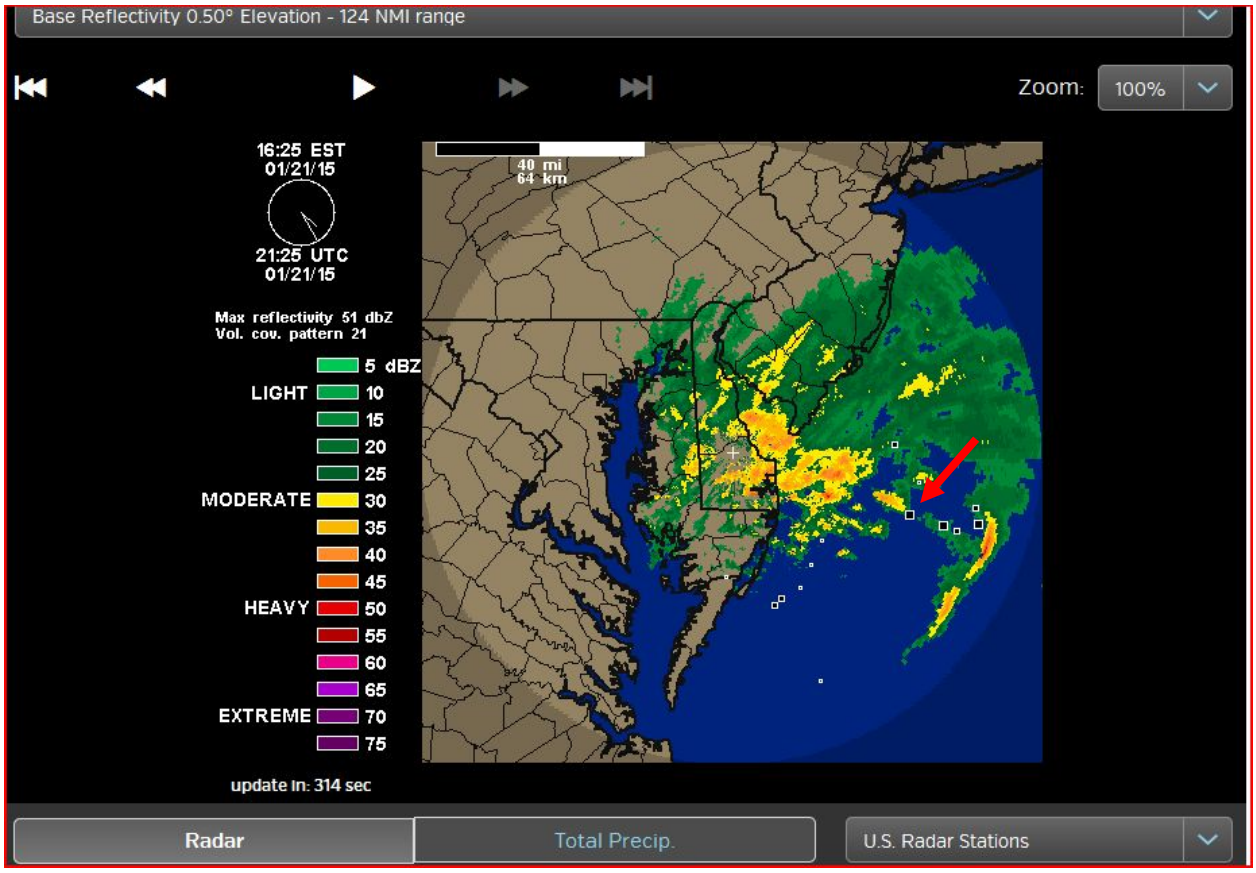
You will see an image of the area covered by the radar, with Roanoke near the center.



Below the radar image, you can select criteria to analyze the map and present a better idea on what is going on in your area.



For this date, there no interesting weather to view for Roanoke, so we look now at the Dover, Delaware area, as seen in the next screen shot.



Here we see a radar image of a weather system as it passes through Dover, Delaware. Here, we selected *Lightning* and *Hide Clutter* from the menu just below the image, and de-selected the *Labels* box. These choices eliminated the excess cloud information and added black squares to indicate lightning occurrences (see the red arrow).

Positioned below the radar image of this particular weather system is the *Doppler Radar Detected Storms* table. This table provides information on storms indicated in the radar, including height tops, hail, speed of the system and direction. This is good to indicate how severe the storm is and where it is going.

Doppler Radar Detected Storms

ID	Max	Top	VIL	Severe Hail	Hail	Max Hail Size	Speed	Direction (from)
E3	50 dBZ	2,000 ft.	2 kg/m²	0% chance	0% chance	0.00 in.	New Cell	
D3	49 dBZ	7,000 ft.	4 kg/m²	0% chance	0% chance	0.00 in.	New Cell	
Y2	46 dBZ	7,000 ft.	3 kg/m²	0% chance	0% chance	0.00 in.	51 knots	WSW (237)
T2	46 dBZ	4,000 ft.	1 kg/m²	0% chance	0% chance	0.00 in.	41 knots	WSW (237)
W2	43 dBZ	4,000 ft.	2 kg/m²	0% chance	0% chance	0.00 in.	56 knots	WSW (250)
F3	43 dBZ	2,000 ft.	1 kg/m²	0% chance	0% chance	0.00 in.	New Cell	

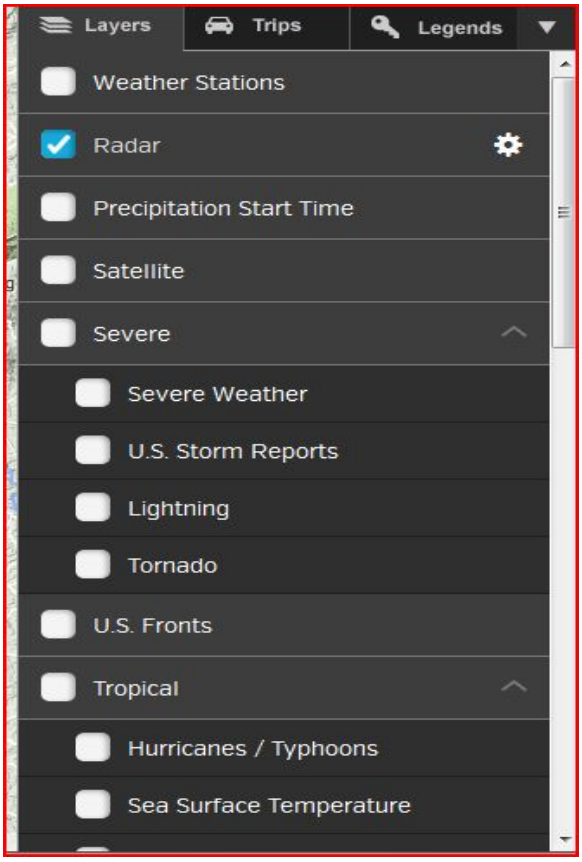
▽ Tornado Vortex Signature ◇ Mesocyclone □ Hail

To return to the main screen, click on the Weather Underground® logo on the top left hand side of the page.

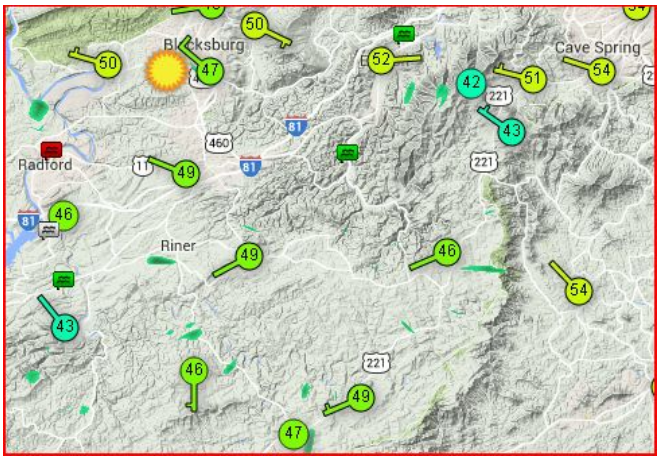
3.2 Interactive Radar

Under the Maps and Radar tab, the second item is *Interactive Radar*. Clicking on the *Interactive Radar* tab brings you to a full page weather map. On the right hand side of the page is a menu that lets you interact with the map. (There might be an advertisement on the bottom right hand side, just click on "close this ad" to get rid of it to see the full interactive menu for the map).

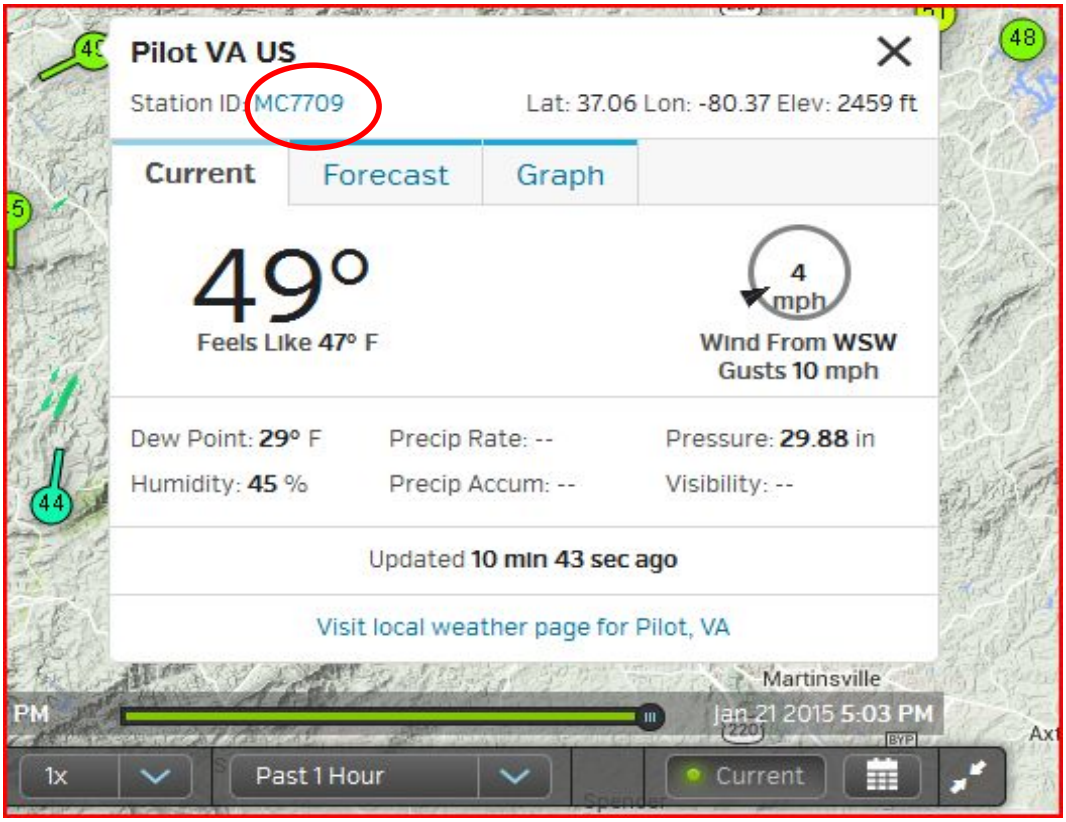
Here you can interact with the map in different ways by clicking on the check boxes.



For example, in the next screen shot, *Weather Stations* and *Rivers* have been checked. You see the weather stations in circles and rivers information in the rectangles.



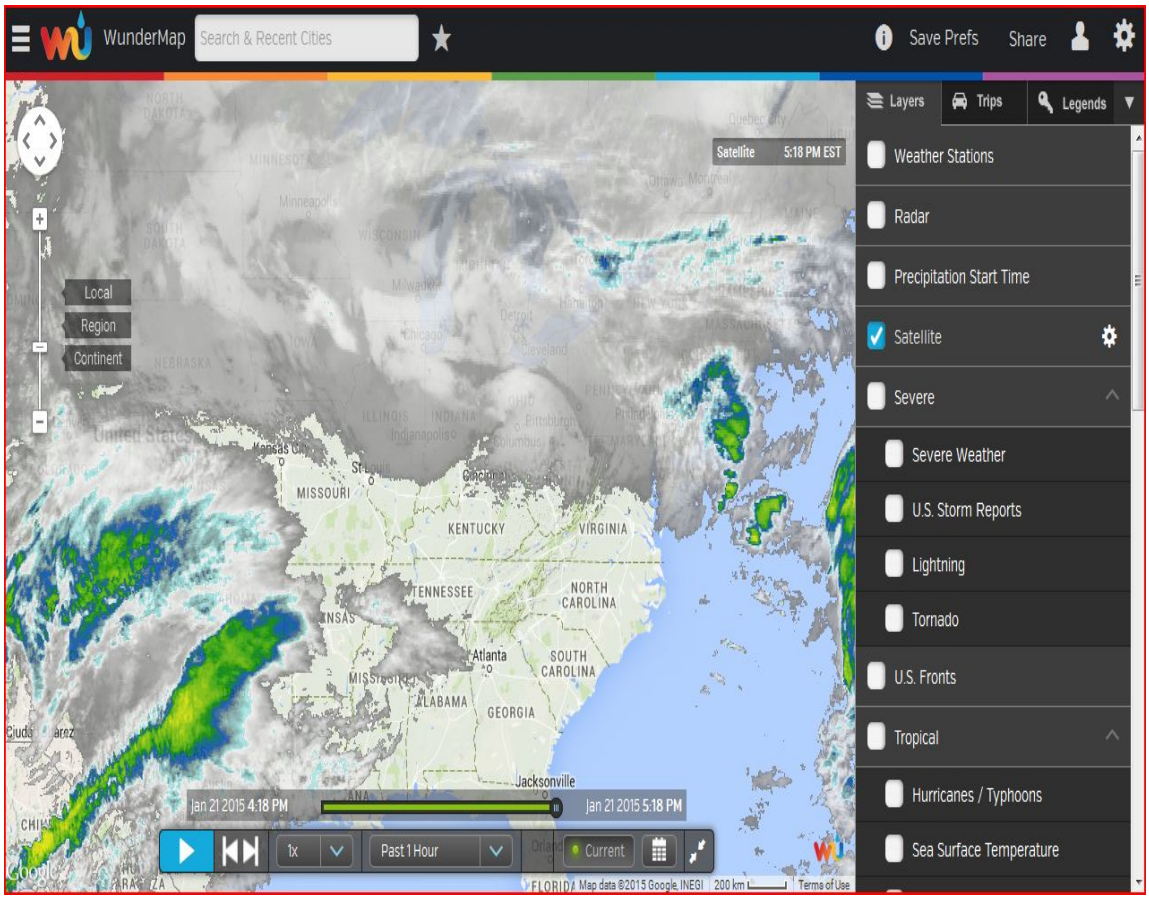
You can click on the weather stations and rivers to view a small box of information on that particular location like the one shown below.



Like the previous maps, you can animate the radar image. You can also click on the *Station ID* (red circle) and it will take you to that station's weather page.

3.3 Interactive Satellite

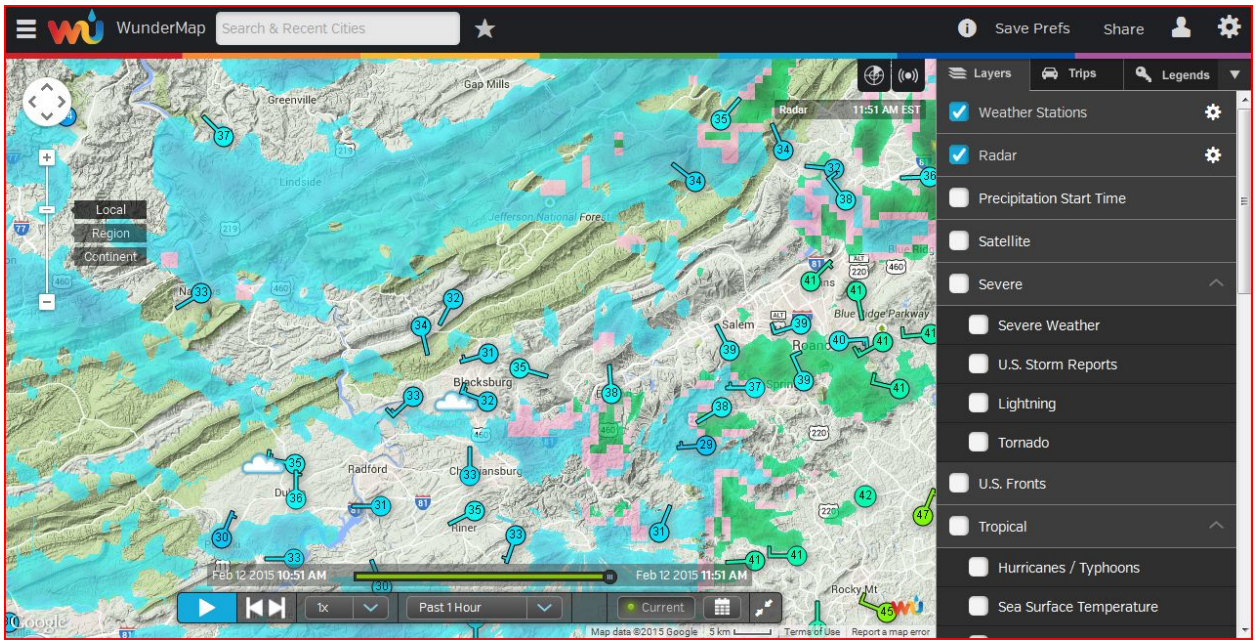
Now, go back to the main screen by clicking on the *Weather Underground*® logo. Then clicking under the *Maps & Radar* tab again and next click on *Interactive Satellite*. This brings you to a view of the United States. This displays what the satellite is recording. You can also access this in *Interactive Maps* by selecting *Satellite* on the right hand menu and zoom out on the map.



You can interact with this map in much the same way as in the *Interactive Maps* tab. You can obtain information on weather systems at a larger scale.

The next tab under the Maps and Radar tab is just like the Interactive map but with the *Weather Stations* check box highlighted. Experiment with these maps and return to the main screen.

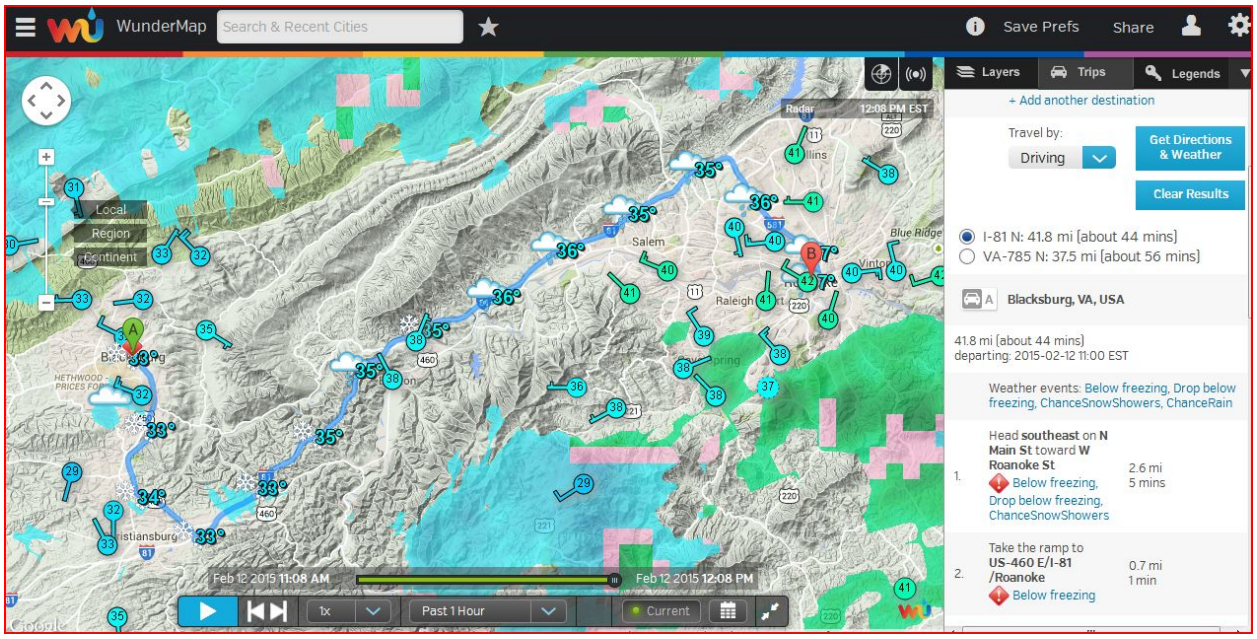
3.4 Wundermap



Above is the *Wundermap* from the *Maps & Radar* tab. This is a bigger map of the one on the main screen of *Weather Underground*®. If you hover your mouse over a temperature bubble, it will identify the weather station. Clicking on it will take you to that station's current conditions.

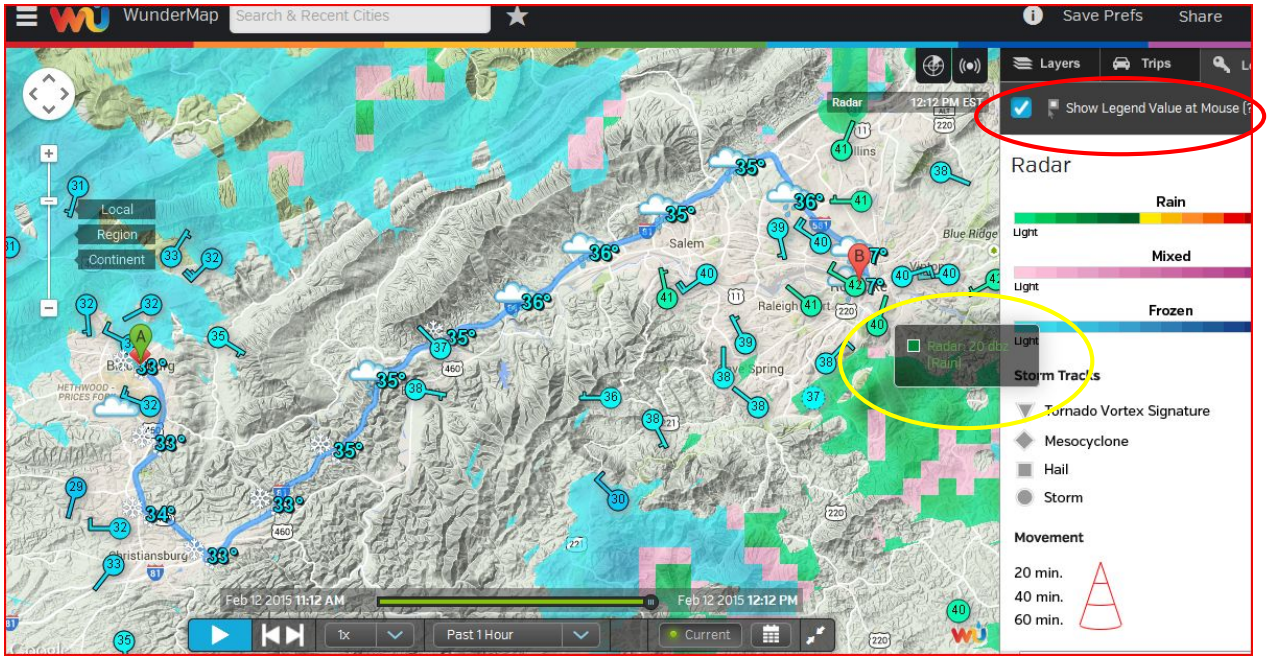
The *Layers* menu on the right-hand side of the map allows users to select or de-select different criteria like fronts and view severe weather threats.

The *Trips* tab provides directions from point A to point B; it will also provide temperatures at intervals on your way, as well as weather conditions and warnings at along your route.



We choose to navigate from Blacksburg to Roanoke, as shown above.

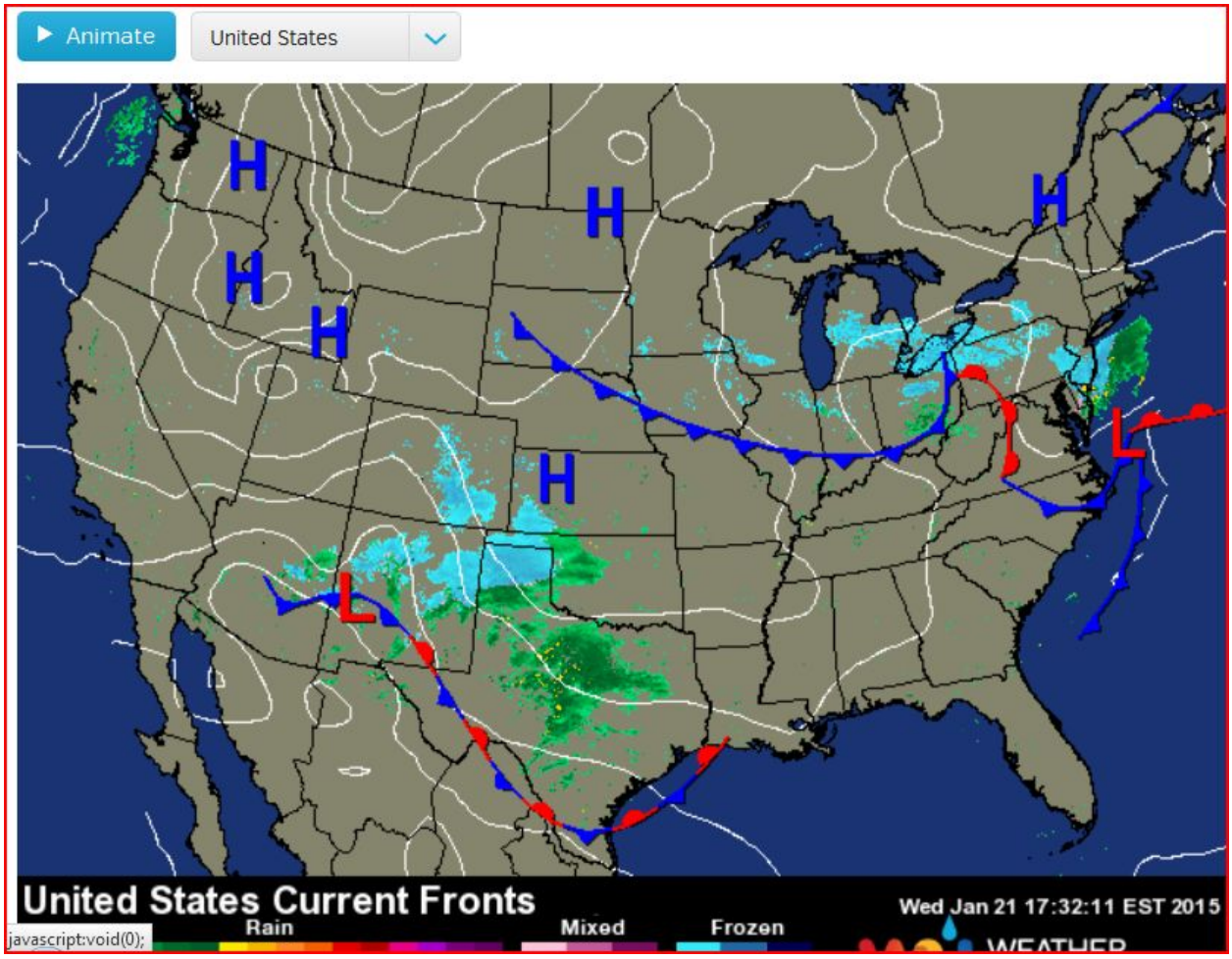
The *Legends* tab displays all the symbols and colors that can display on the map and what they represent.



Clicking on the *Show Legend Value at Mouse* (red oval) will allow you can hover over the map at the colored pixilation to see what is happening in that area. For example, the pixel (yellow circle) in the map above indicates that it is raining at 20 dbz[4].

3.5 Current Conditions Maps

Under the *Maps & Radar* tab, click on the *Current Conditions Maps* selection. This brings you to a generalized map of the current weather systems, weather fronts, and locations of High and Low pressure systems.

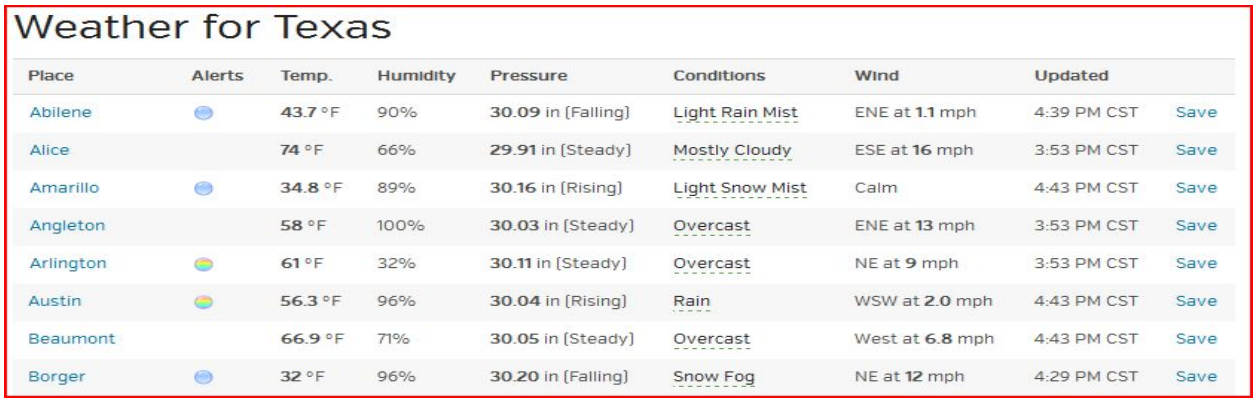


Users can animate this map as well as see maps from all over the world. Clicking anywhere on the map provides a list of current conditions in the cities in that state. For instance, we clicking

[4] Dbz is the measure of the strength of the energy return from objects in a weather event. The higher the reading of dbz, the more likely hail is present in a thunderstorm.

on *Texas* provides a list of cities and general weather conditions for each location including (in the last column), the time that the information was last updated. Clicking on any of the cities and directed to the weather page for that location.

In the second column shows an icon for *Alerts*. If the National Weather Service has issued a weather alert for that location, an icon will appear in this column. If you scroll down the page to just under the list of cities, you will find the *Alerts Legend*, explaining the icon's meaning.



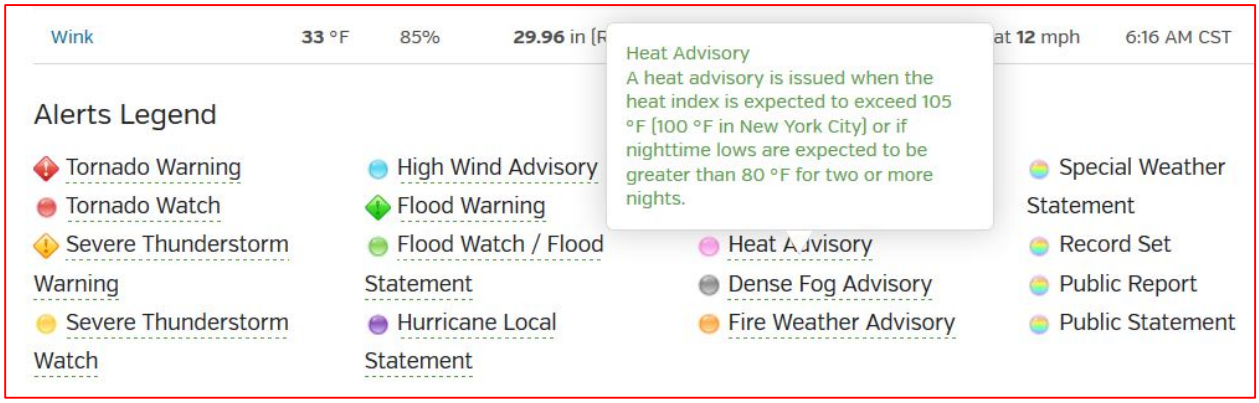
Weather for Texas

Place	Alerts	Temp.	Humidity	Pressure	Conditions	Wind	Updated	
Abilene		43.7 °F	90%	30.09 in (Falling)	Light Rain Mist	ENE at 1.1 mph	4:39 PM CST	Save
Alice		74 °F	66%	29.91 in (Steady)	Mostly Cloudy	ESE at 16 mph	3:53 PM CST	Save
Amarillo		34.8 °F	89%	30.16 in (Rising)	Light Snow Mist	Calm	4:43 PM CST	Save
Angleton		58 °F	100%	30.03 in (Steady)	Overcast	ENE at 13 mph	3:53 PM CST	Save
Arlington		61 °F	32%	30.11 in (Steady)	Overcast	NE at 9 mph	3:53 PM CST	Save
Austin		56.3 °F	96%	30.04 in (Rising)	Rain	WSW at 2.0 mph	4:43 PM CST	Save
Beaumont		66.9 °F	71%	30.05 in (Steady)	Overcast	West at 6.8 mph	4:43 PM CST	Save
Borger		32 °F	96%	30.20 in (Falling)	Snow Fog	NE at 12 mph	4:29 PM CST	Save

Alerts Legend

- Tornado Warning
- Tornado Watch
- Severe Thunderstorm Warning
- Severe Thunderstorm Watch
- High Wind Advisory
- Flood Warning
- Flood Watch / Flood Statement
- Hurricane Local Statement
- Winter Weather Statement
- Heat Advisory
- Dense Fog Advisory
- Fire Weather Advisory
- Special Weather Statement
- Record Set
- Public Report
- Public Statement

If the *Alerts* icon is underlined, you can place your mouse over the words and the definition for that specific alert is displayed. Below, we placed our mouse over *Heat Advisory*.



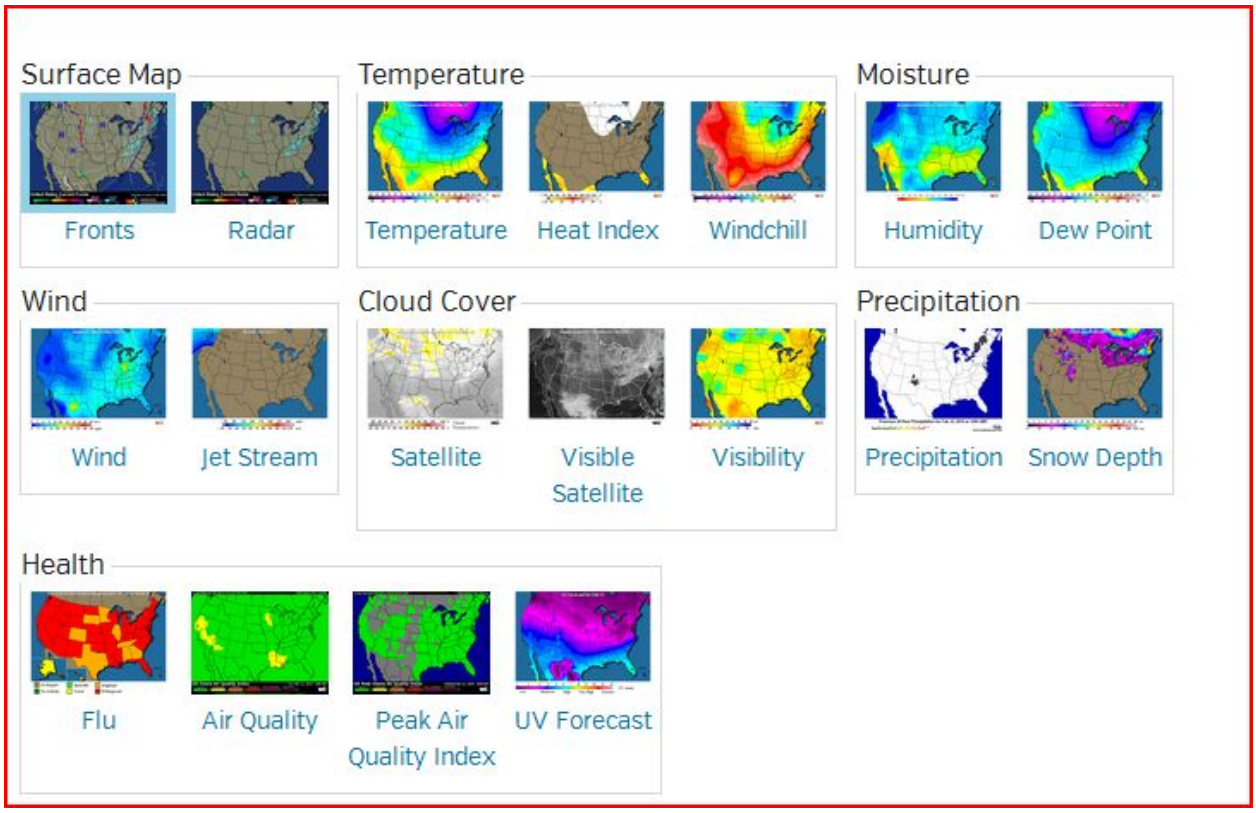
Wink 33 °F 85% 29.96 in (R ... at 12 mph 6:16 AM CST

Heat Advisory
A heat advisory is issued when the heat index is expected to exceed 105 °F (100 °F in New York City) or if nighttime lows are expected to be greater than 80 °F for two or more nights.

Alerts Legend

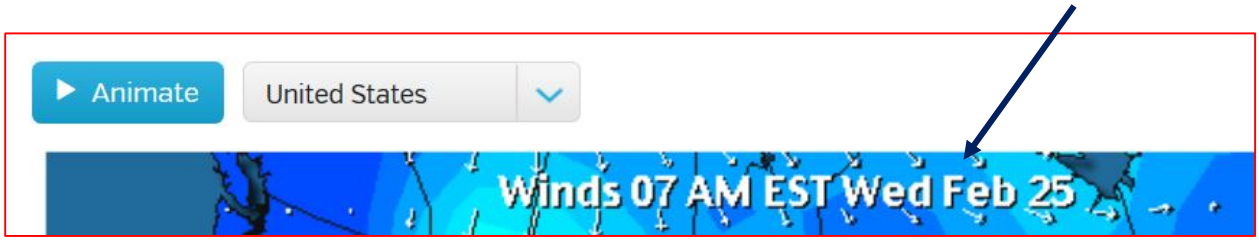
- Tornado Warning
- Tornado Watch
- Severe Thunderstorm Warning
- Severe Thunderstorm Watch
- High Wind Advisory
- Flood Warning
- Flood Watch / Flood Statement
- Hurricane Local Statement
- Heat Advisory
- Dense Fog Advisory
- Fire Weather Advisory
- Special Weather Statement
- Record Set
- Public Report
- Public Statement

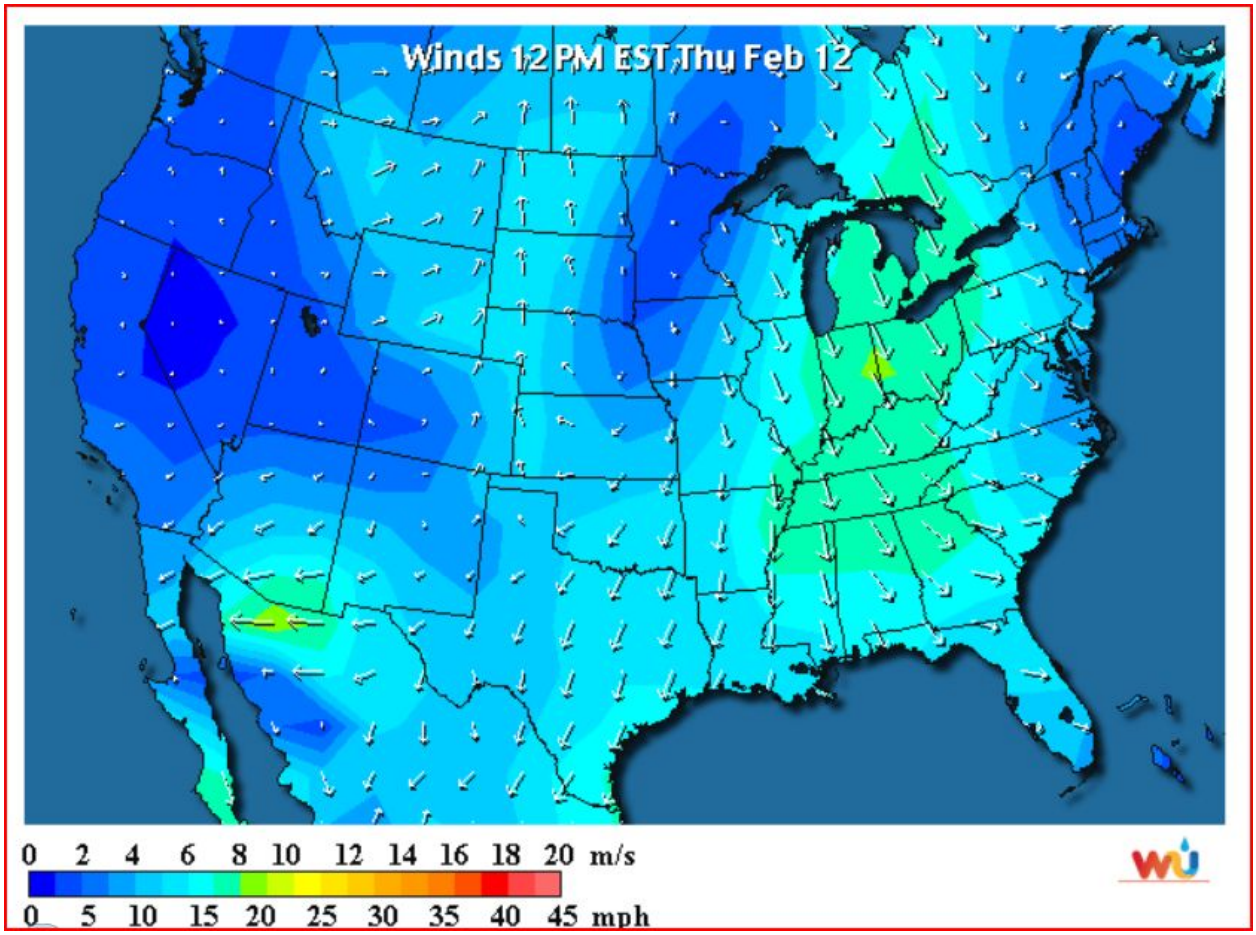
Now go back to the *Current Conditions and Forecast Maps* main page and scroll down. Below the current conditions weather map is a list of other maps to look at and analyze – *Surface Map*, *Temperature*, *Moisture*, *Wind*, *Cloud Cover*, *Precipitation* and *Health*.



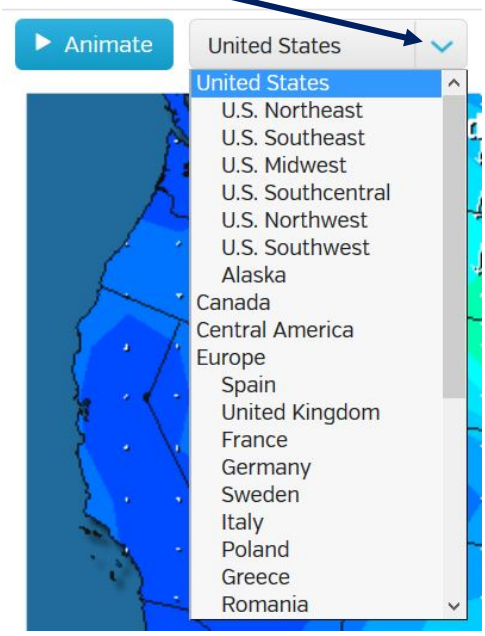
For example: the figure at the top of the next page shows an image of the wind map which displays wind speeds and directions. Wind speeds are represented by the colors (the legend is at the bottom of the map), for example, dark blue is over Minnesota represents a wind speed of almost zero. The arrows also indicate wind speed, the smaller the arrow, the less the speed. The arrows also indicate the direction from which the wind originates, for example, over the Arizona-Mexico border, the wind originates from the East.

This map can be animated by clicking on the *Animate* button at the top of the map. If you click on this button, the time period covered by the animation changing at the top of the map.



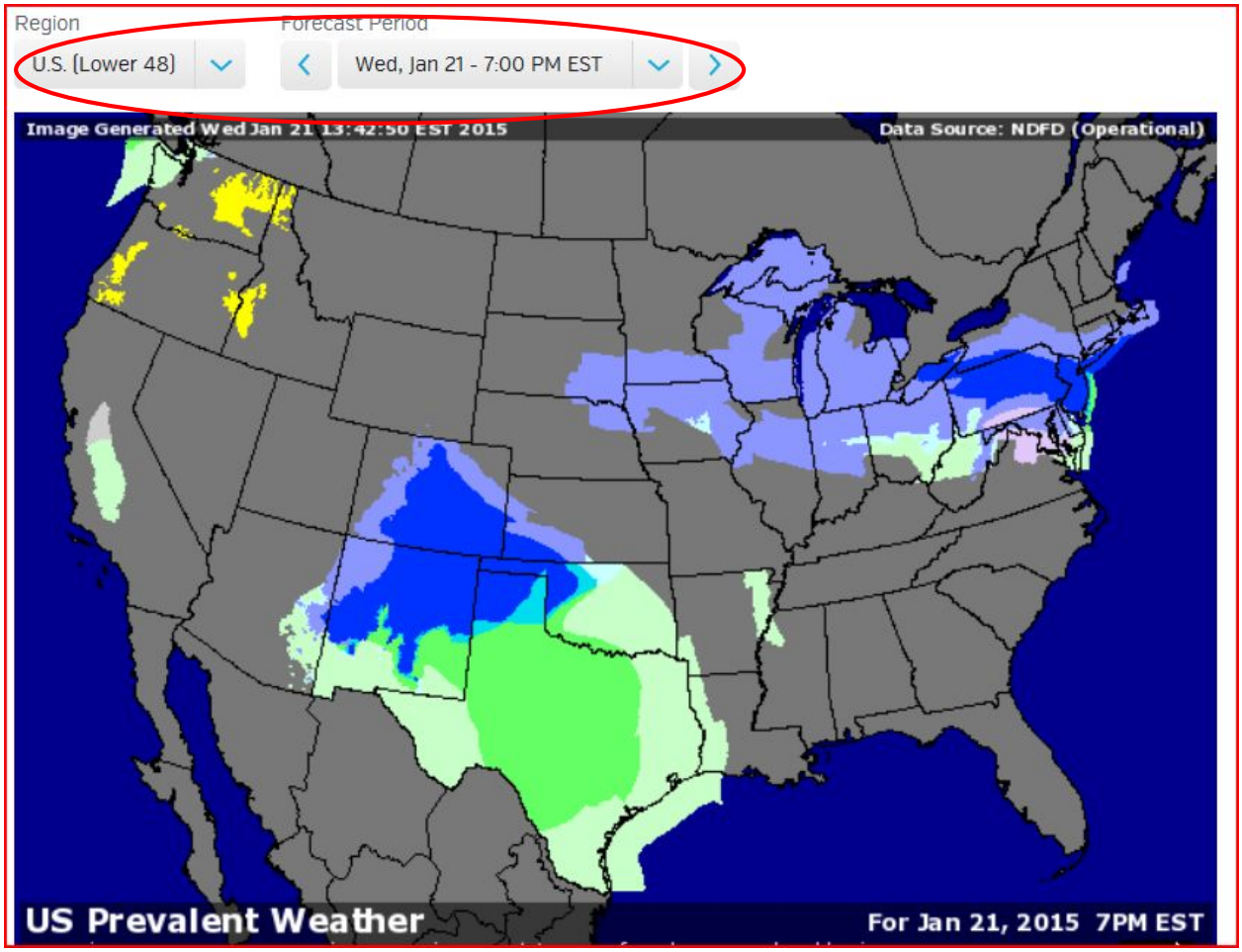


You can also look at the maps for different locations, by clicking on the region from the down arrow next to the *Animate* button.



3.6 Forecast Maps

The "*Forecast Maps* under the Maps and Radar tab brings up an interactive weather map of current conditions. This map, and the others beneath it, are available only used for the United States. You can interact with it by selecting a region and a forecast period covering from that day or 6 days in the future.

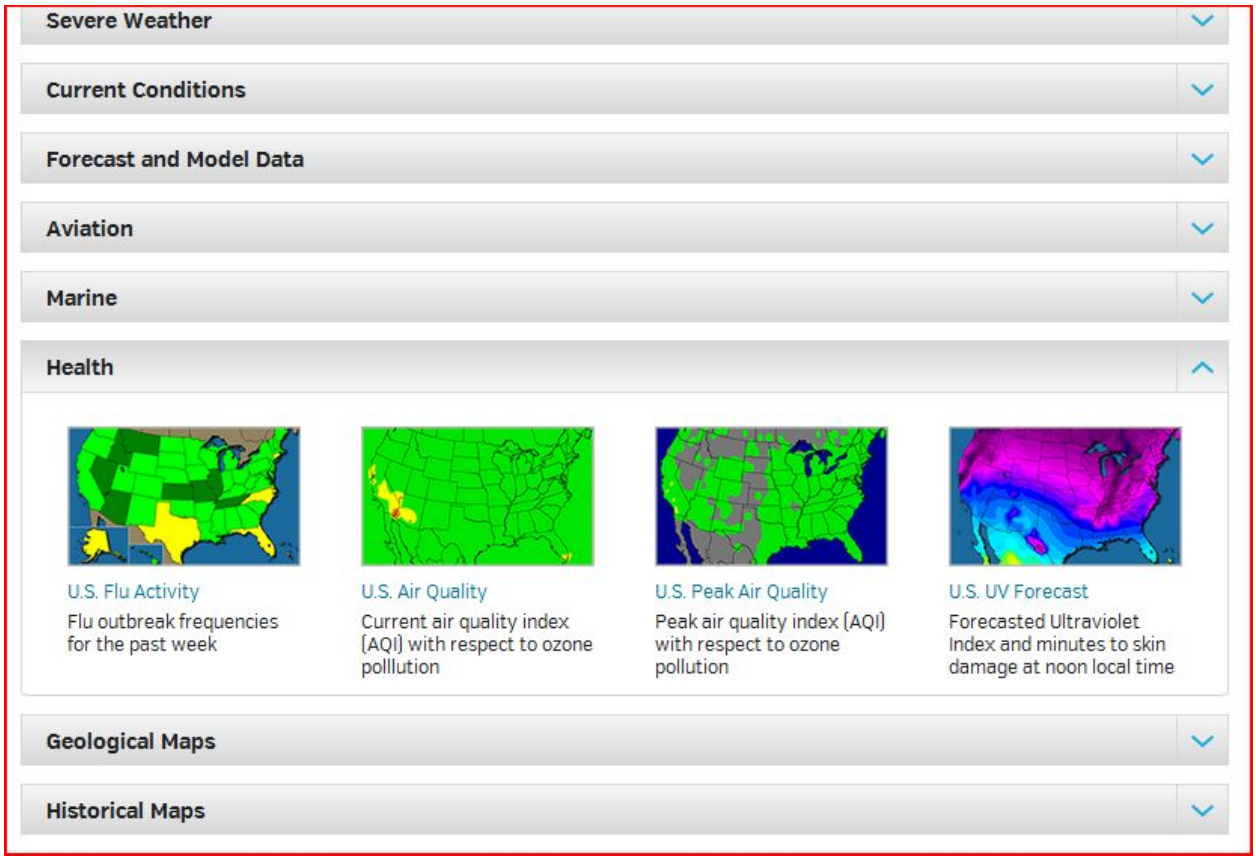


Below this big map, there are a collection of other maps that display temperature, precipitation, moisture and wind. This collection helps predict the weather by examining how different aspects of weather work with each other.

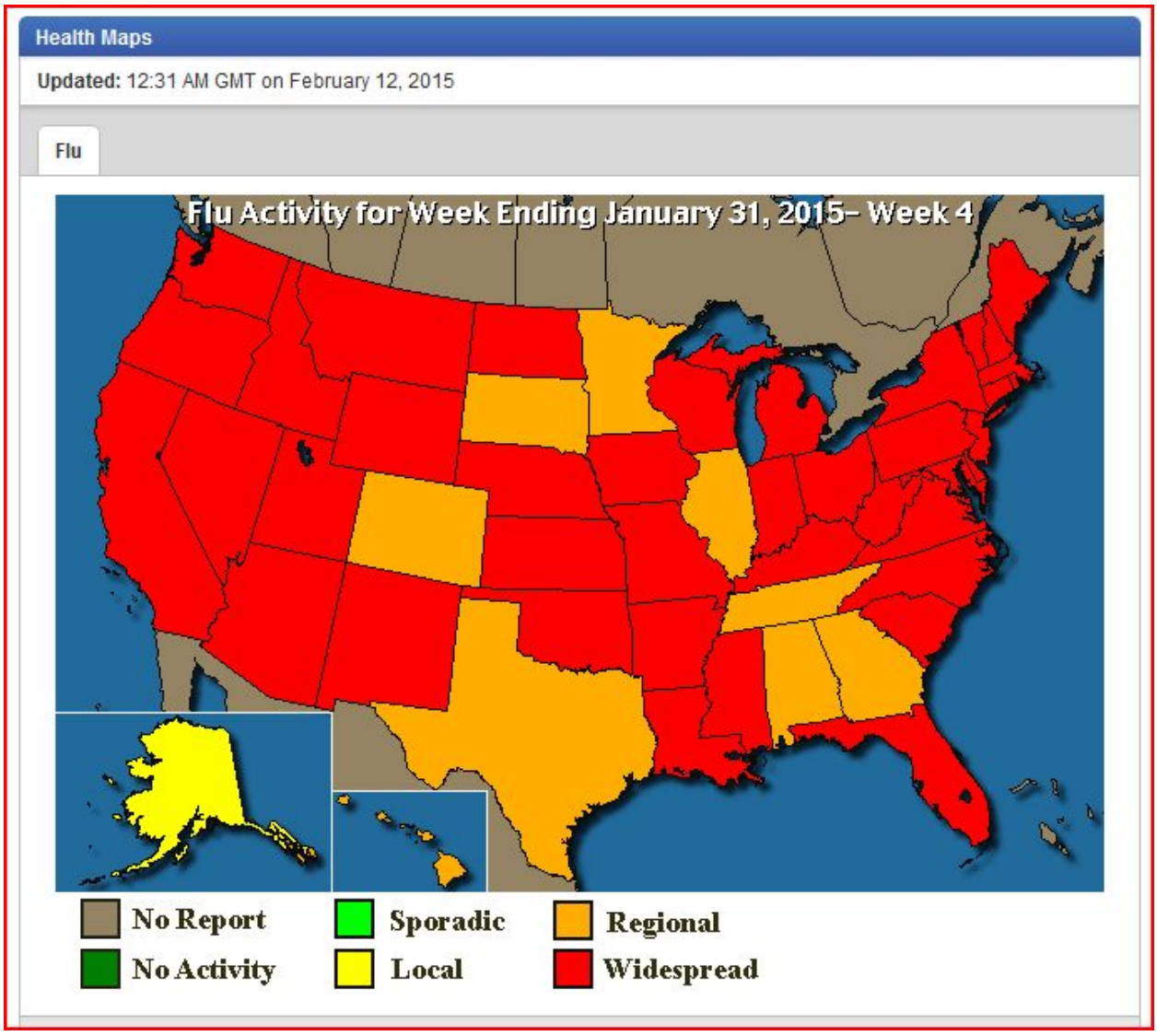
3.7 Maps Catalog

Now, the last item under the Maps and Radar tab is called *Maps Catalog*. This page holds all of the maps displayed at the Weather Underground® website, including those that are interactive.

You can view everything from the current conditions maps, to forecast maps, to miscellaneous maps such as the health maps and geological maps. Click and expand the categories to explore all the maps on this page. Below, we have clicked on *Health* maps.



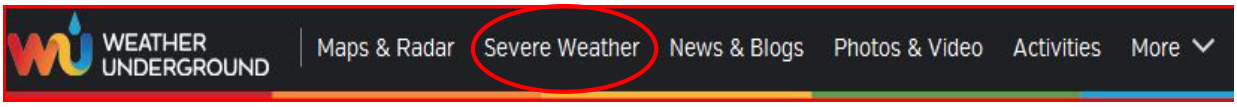
As you can see, you can view a variety of maps showing maps of the distribution on various health related issues. Clicking on the *U.S Flu Activity* map which shows the prevalence of flu across the United States (see below).



When you are done, return to the main page of Weather Underground®.

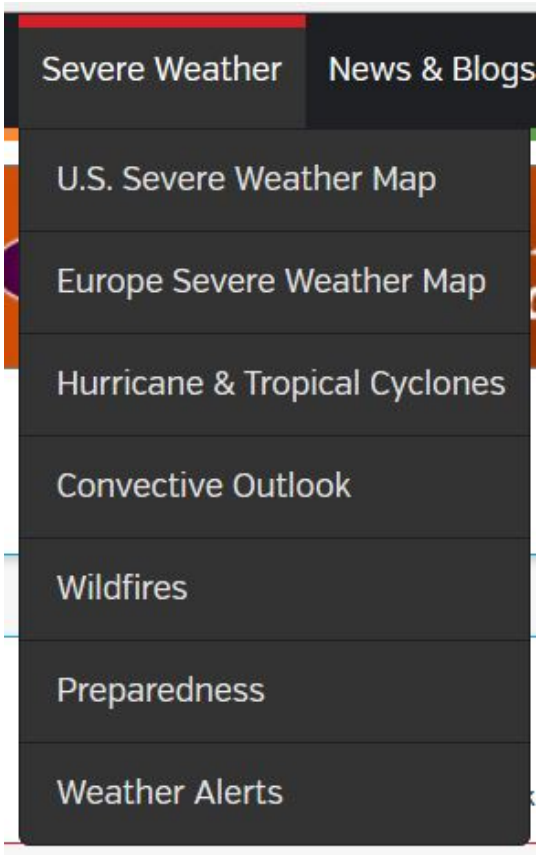
Chapter 4: Severe Weather

Severe weather refers to any meteorological condition, deemed by the National Weather Service, to be a risk for property damage or injury (including death) to people. Severe weather can take many forms from intense rainfall resulting in flooding, to high winds, snow storms and more intense named storms.

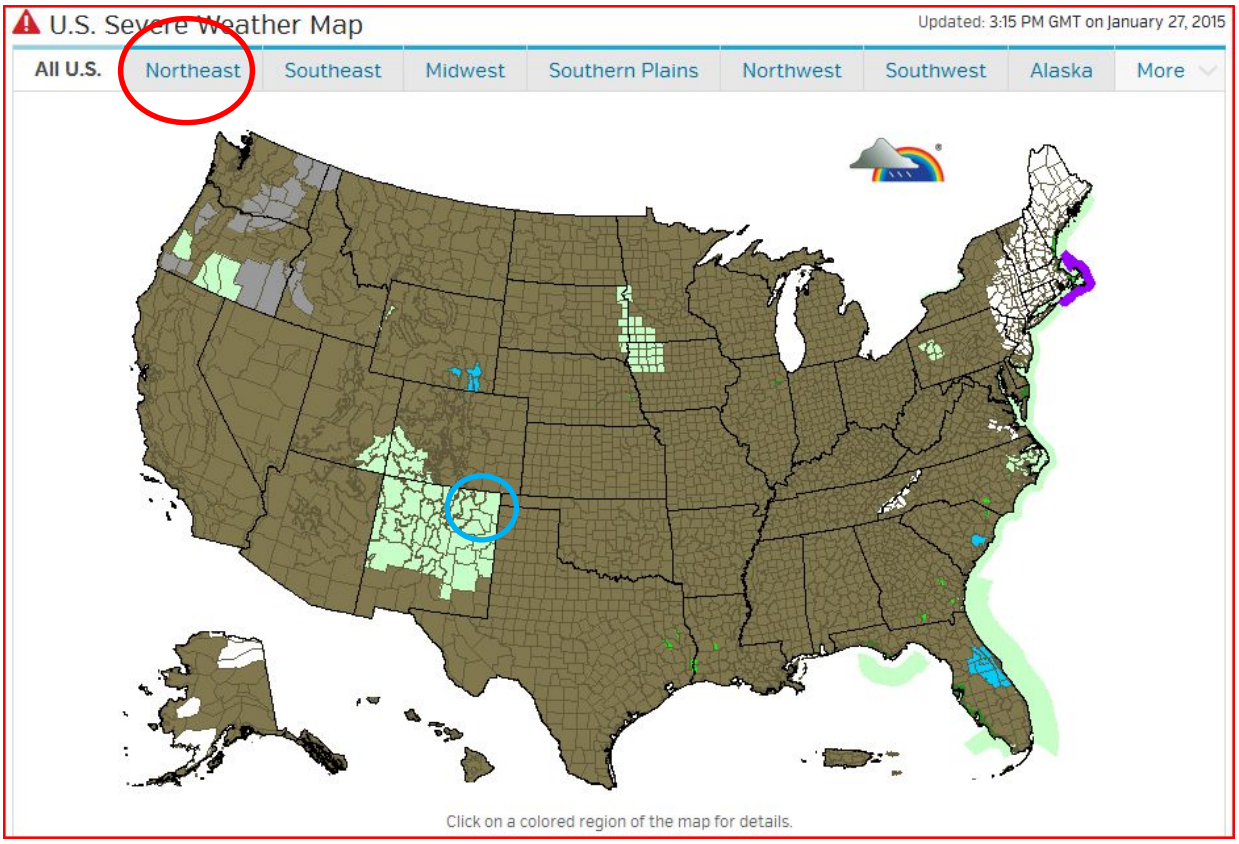


4.1 U.S. Severe Weather Map

At the top of the screen, the next tab is called "*Severe Weather*."



Clicking on the tab brings down a menu of seven more tabs. Click on the *U.S. Severe Weather Map* to start us off in this chapter.



Once the page opens up, you come to an interactive map of the United States. The map breaks down the U.S. into counties and displays the National Weather Service active warnings, watches, advisories or statements[5] currently in effect.

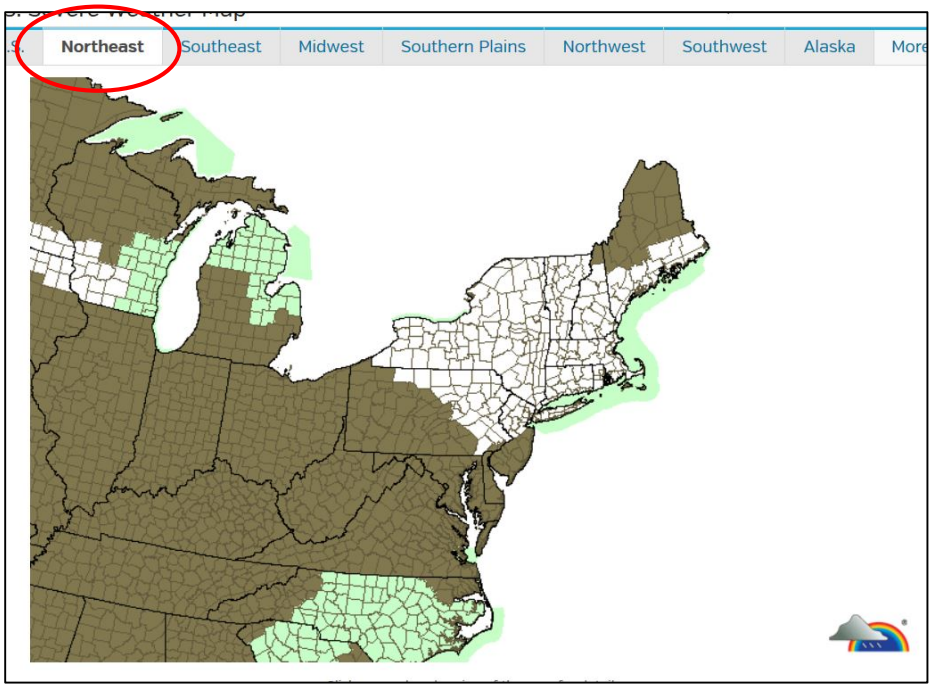
The legend underneath the map color-codes the severe weather warnings, watches, advisories or statements. For instance, in the above map, the light green at the Four Corners region and around the coasts of Florida refers to a *Specific Weather Statement*, the purple on the coast of New England is a *Hurricane Local Statement*, the turquoise in Florida is a *High Wind Advisory*,

[5] The National Weather Service defines each of these alerts at http://w1.weather.gov/glossary/index.php?letter=s. For instance, a Severe Weather Potential Statement is "This statement is designed to alert the public and state/local agencies to the potential for severe weather up to 24 hours in advance."

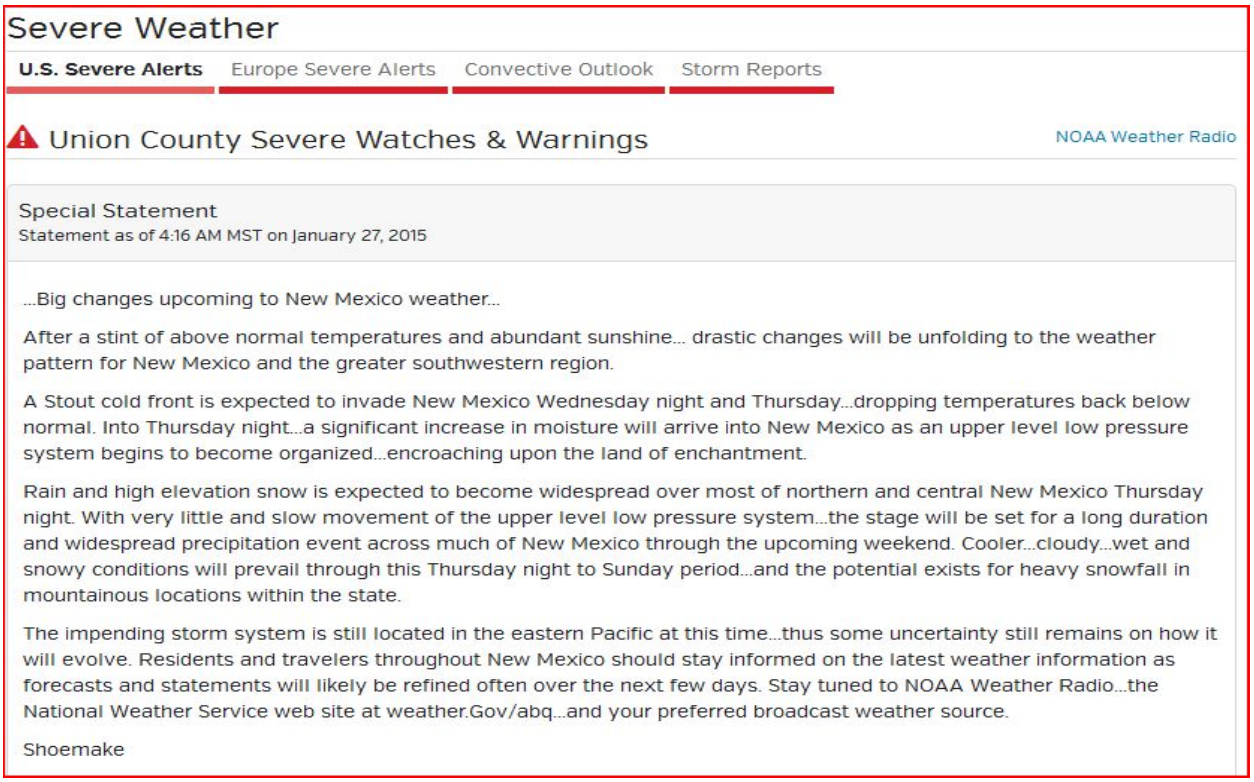
the gray in Washington and Oregon is a *Dense Fog Advisory*, and the white in New England is a *Winter Weather Statement*.

If you hold your mouse over any of the statements, watches, advisories, or warnings in the legend, you are provided with a definition of that specific item.

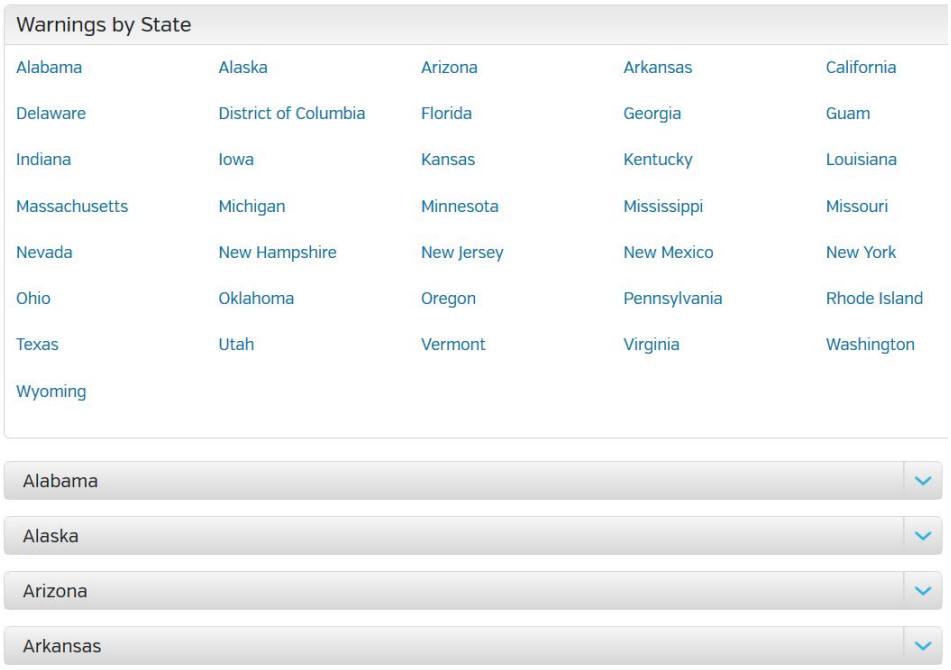
You can click on a county or region and the page will load up the current National Weather Service severe watches and warnings for that area. For example, if you click on a region, listed at the top of the map, you zoom to that region - clicking on *Northeast* (red oval), it zooms to:



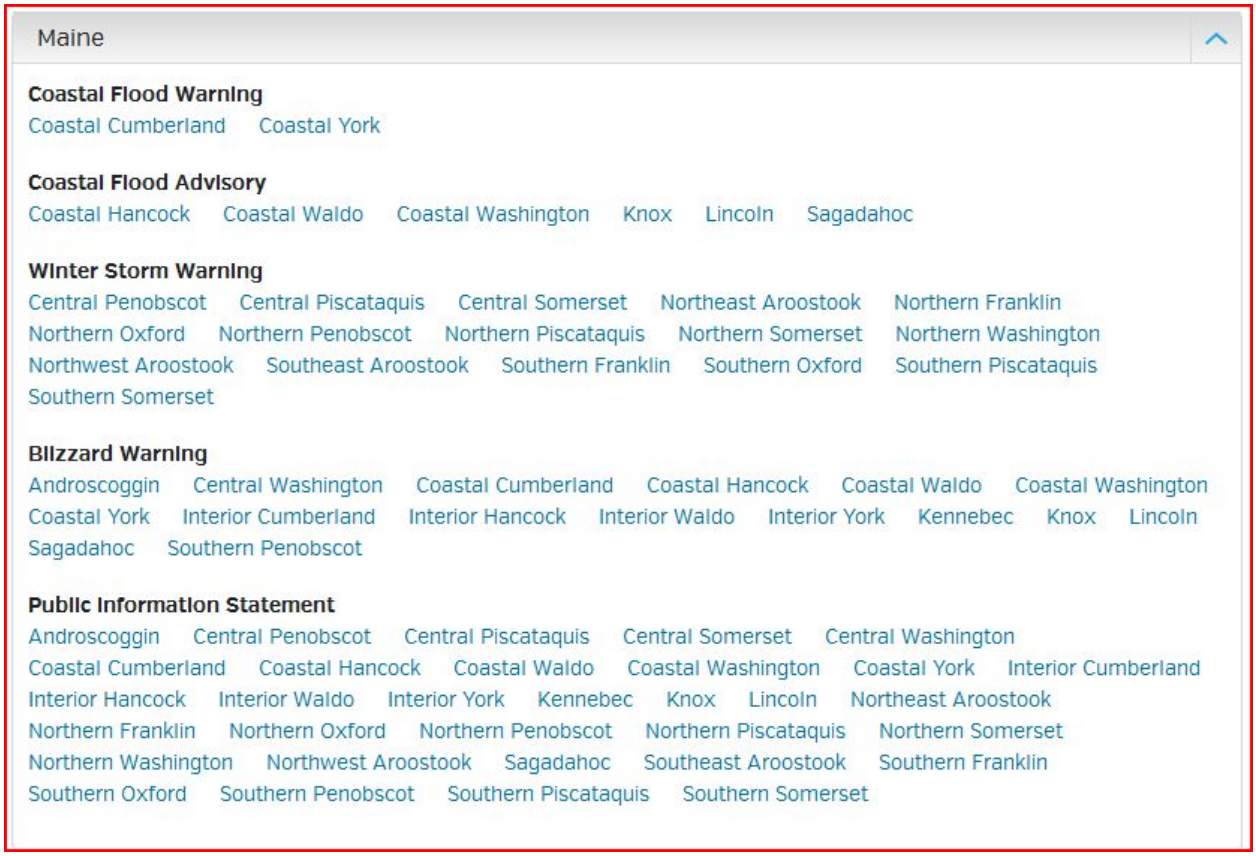
You can also click on one of the colored areas on the actual US map and it will take you to the warnings for that area. In this instance, we clicked on the area highlighted in the blue circle (in the larger map on the previous page) and obtained the following *Severe Watches & Warnings* information on Union County, New Mexico. This page displays details for that specific area.



Return to the previous page by pressing the back button on your computer. Back on the main page of the U.S Severe Weather Map, it is possible too search by state, and then select the county that is currently under a specific alert. State names are listed just under the color coded legend. You can click on a state name from the list or scroll down to the specific state and click on the down arrow.

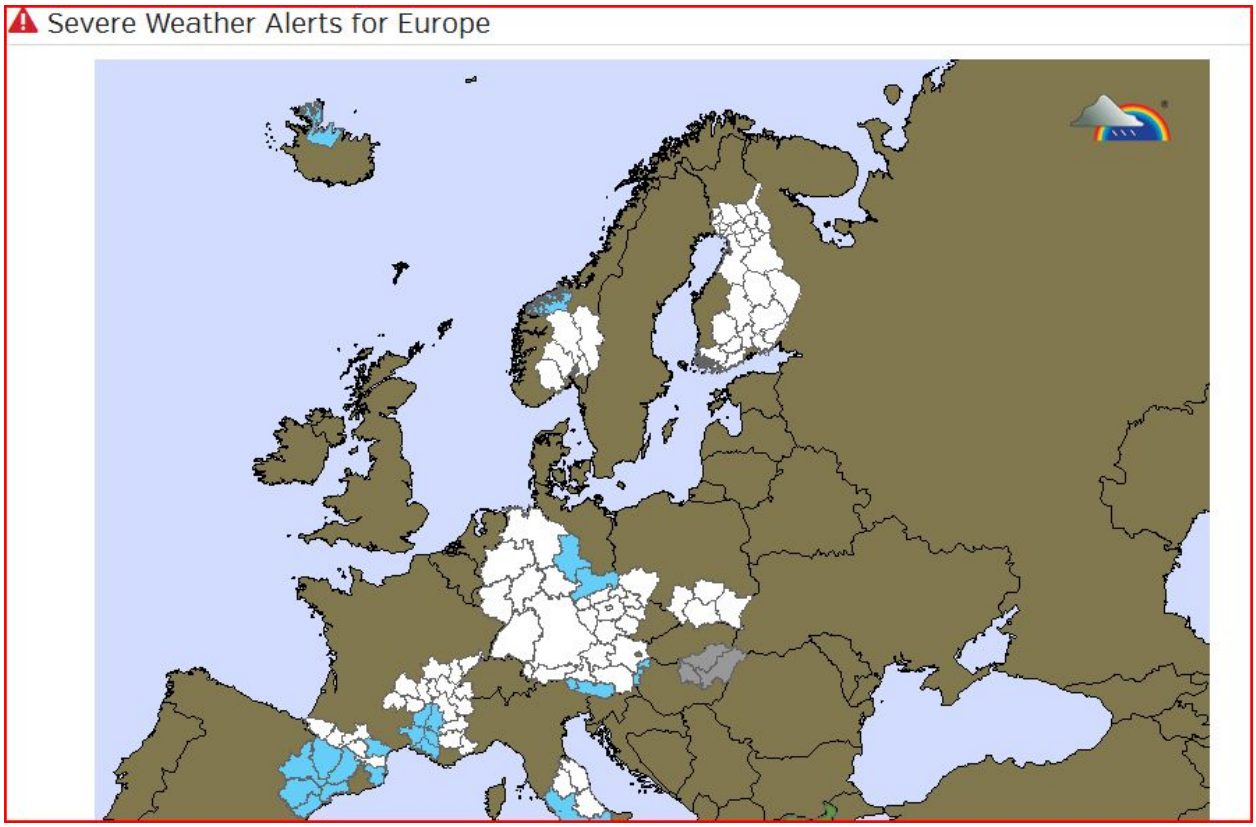


Clicking on the down arrow next to Maine provides a list of the counties/cities within Maine with the specific warnings, watches, advisories or statements. Clicking on the down arrow displays all alerts for the state of Maine, by type of alert and, underneath the alert, names of the counties/cities listed. Clicking on one of the names will provide the alert information (as you saw for Union County, New Mexico on the previous page).



4.2 Europe Severe Weather Map

On the top of the page, click on the *Severe Weather* tab and select the *Europe Severe Weather* Map. This brings you to an interactive map just like the U.S. map. This displays the European map of severe weather alerts.



The color coded legend for Europe is not as detailed as the one for the United States.

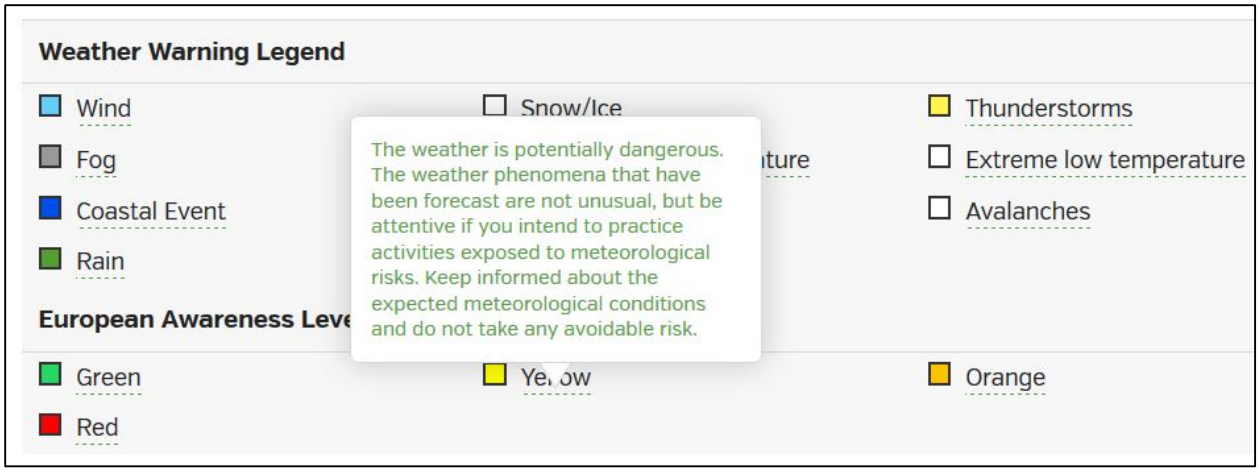
Weather Warning Legend

Wind	Snow/Ice	Thunderstorms
Fog	Extreme high temperature	Extreme low temperature
Coastal Event	Forest fire	Avalanches
Rain		

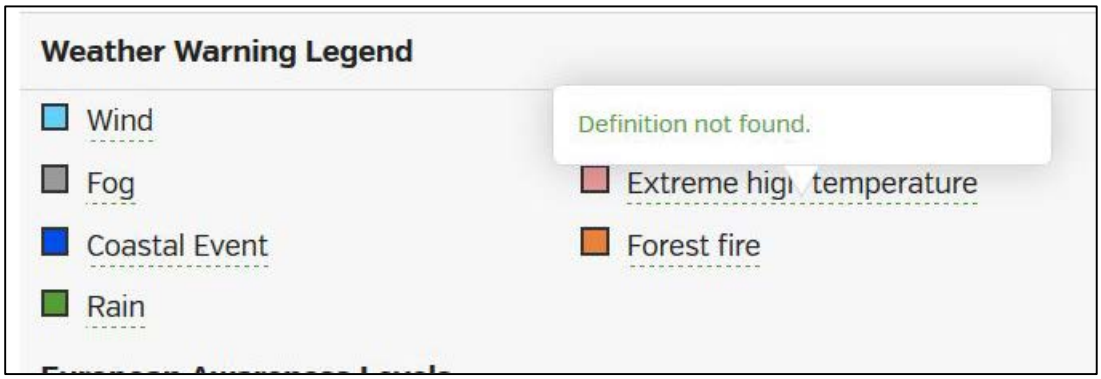
European Awareness Levels

Green	Yellow	Orange
Red		

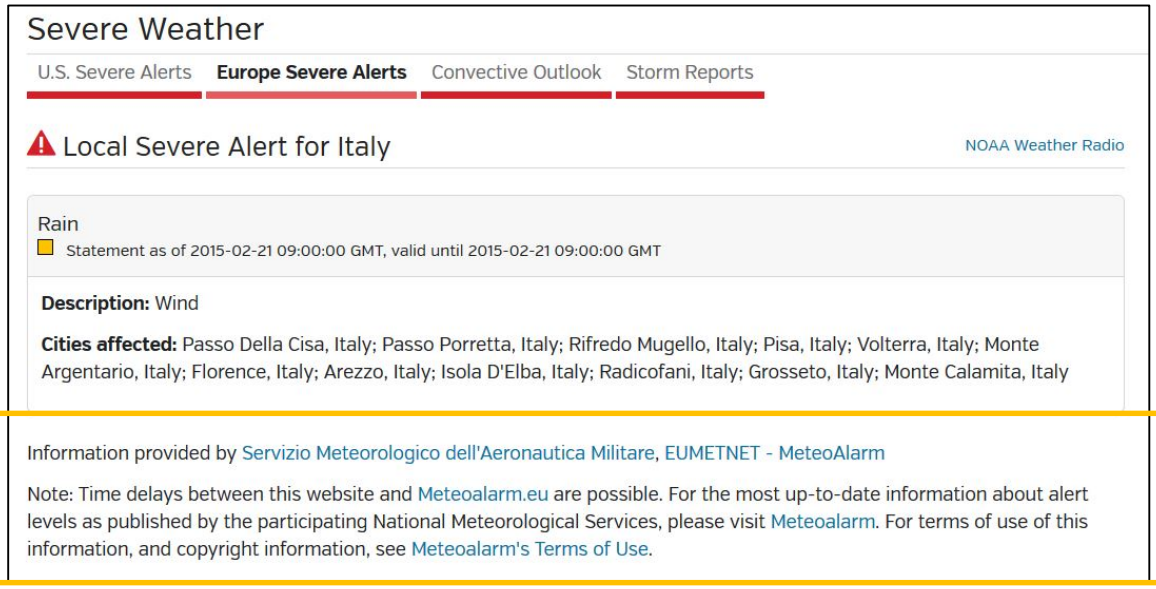
But you can hold your mouse over some of the alerts and receive a definition for that specific alert.



Although, not all alerts are defined for the European Severe Weather Map.

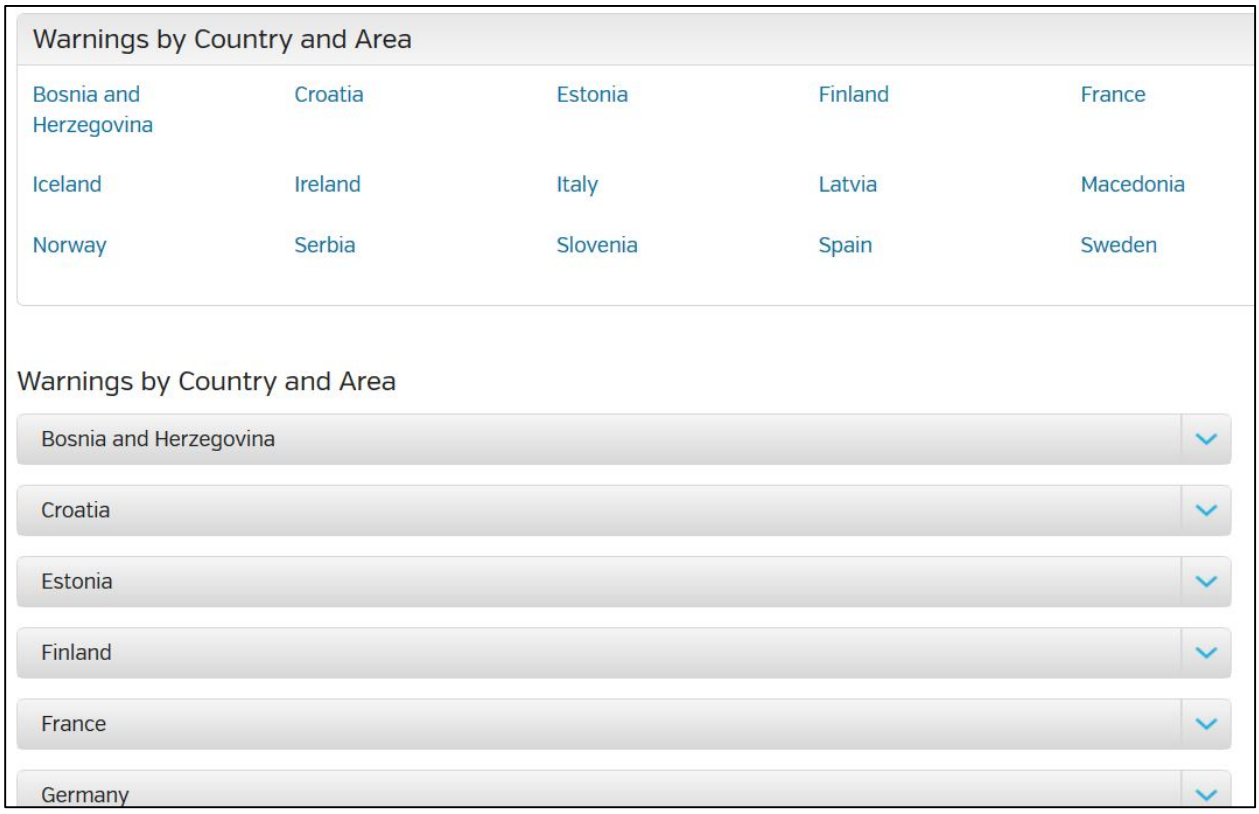


The map is also broken down by provinces/cities in Europe, and you can click on that particular area on the map and review the text for that location. In this case, we clicked on an area in Italy and received the following information.

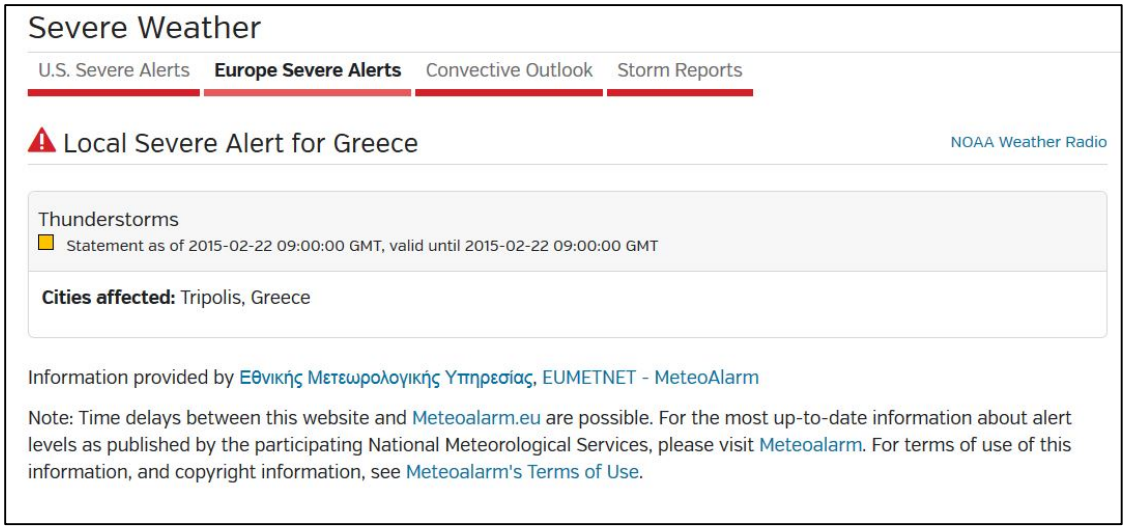


In this case, the information is from a meteorological authority in the European Union (orange rectangle). You cannot click on a city name and receive more information.

Just like the U.S. map, below this image are a list of European countries and regions, which you can select by either clicking on the country name or the down arrow next to the country name.



In this instance, we chose Greece. As you can see, this information is also from a meteorological authority in the European Union



4.3 Hurricane and Tropical Cyclones

The National Weather Service defines a Tropical Cyclone as

> "A warm-core, non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters with organized deep convection and a closed surface wind circulation about a well-defined center" (http://forecast.weather.gov/glossary.php?letter=t).

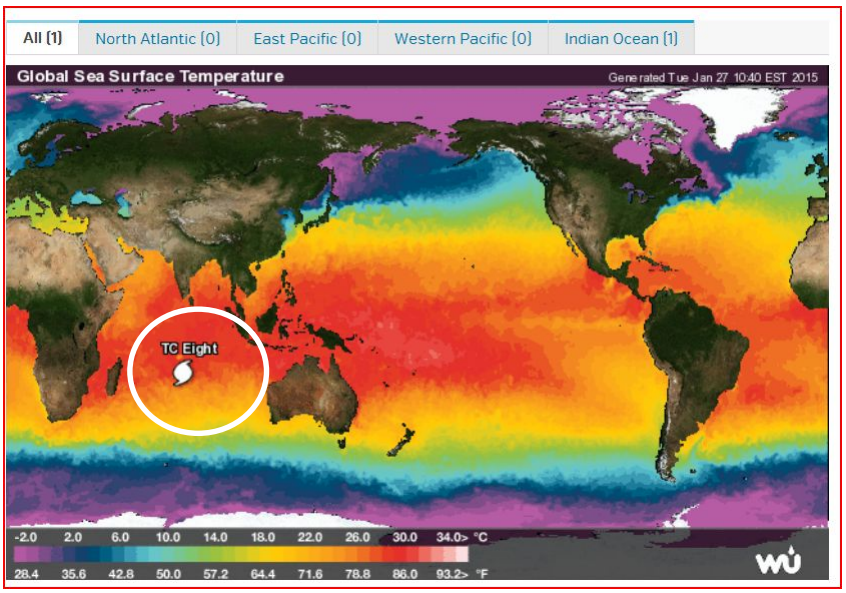
The National Weather Service defines a Hurricane as

> "a tropical cyclone in the Atlantic, Caribbean Sea, Gulf of Mexico, or eastern Pacific, which the maximum 1-minute sustained surface wind is 64 knots (74 mph) or greater" (http://forecast.weather.gov/glossary.php?letter=h).

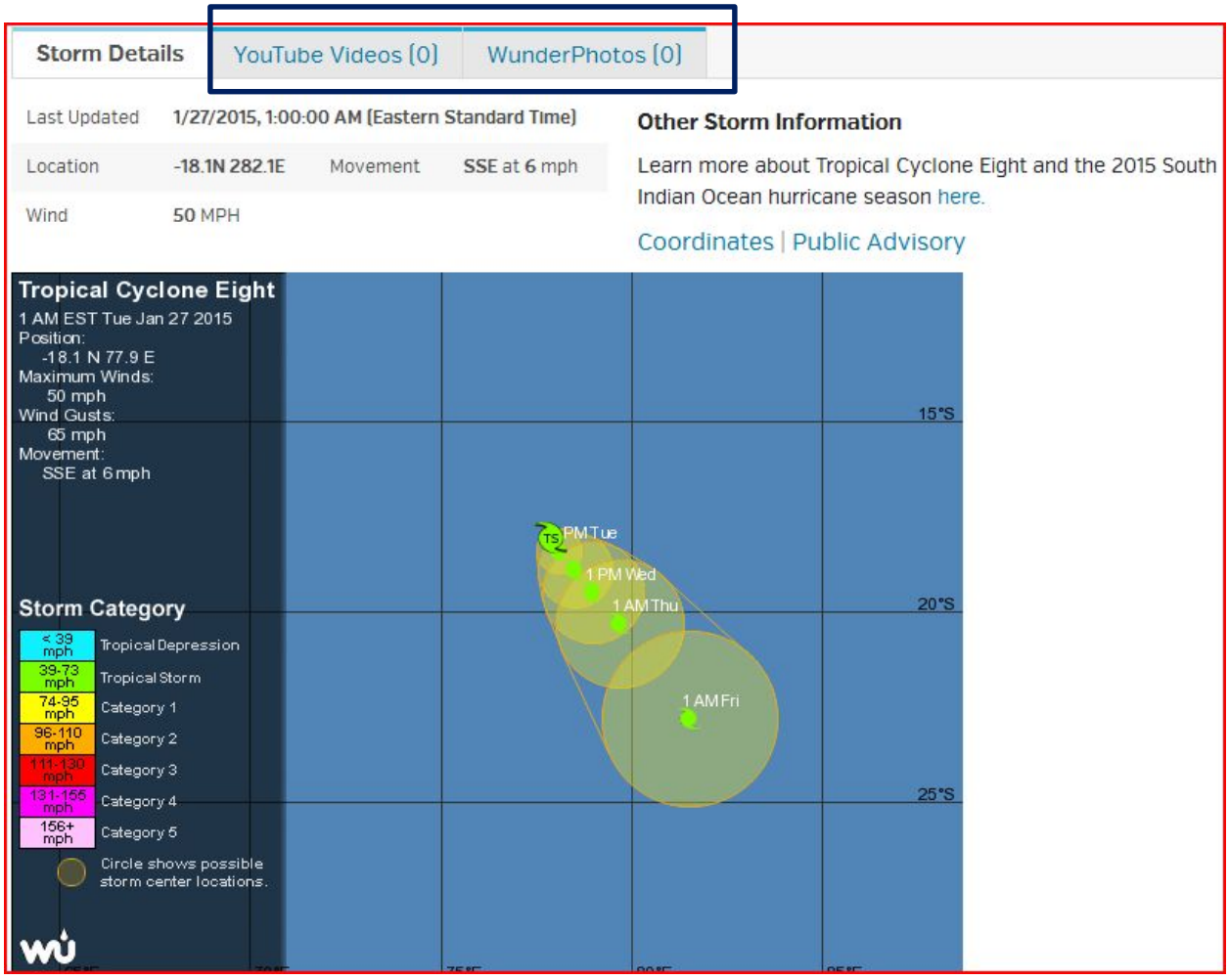
Another important definition to know, for this section, is Typhoon:

> "a tropical cyclone in the Western Pacific Ocean in which the maximum 1-minute sustained surface wind is 64 knots (74 mph) or greater" (http://w1.weather.gov/glossary/index.php?letter=t).

Under the *Severe Weather* tab is the site for *Hurricane and Tropical Cyclones*. This page loads a world map of the global sea surface temperature as well as the current activity of hurricanes and tropical cyclones. You can view *Current Activity* or the *Hurricane Archive*.

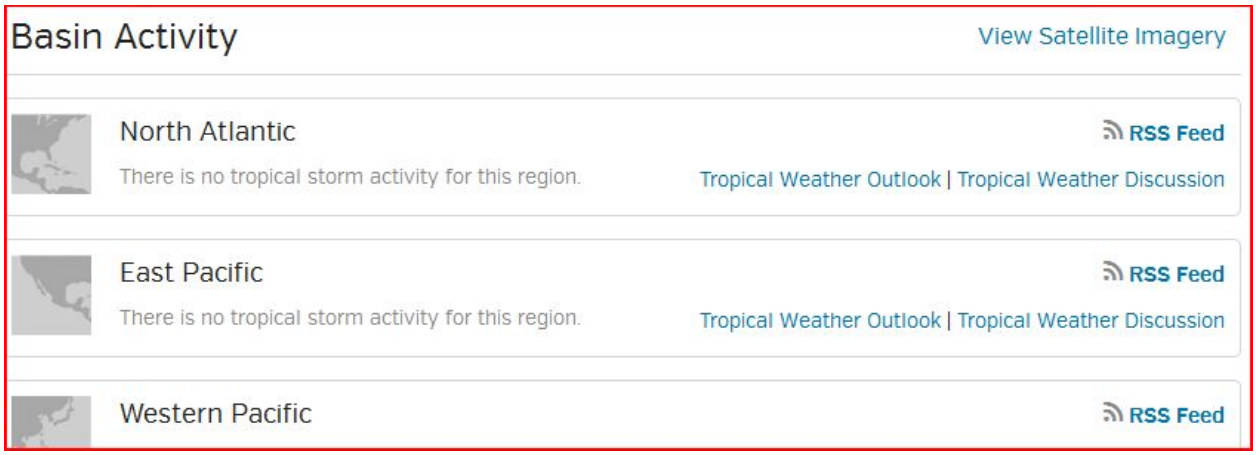


We will start with *Current Activity*. This map is interactive and you can click on the current activity and display that systems' information. The map above displays only one weather system – within the white circle (at the time you are using this document, there may or may not be an active tropical cyclone or hurricane, so your map will look different). In this instance, we clicked on the TC (Tropical Cyclone) Eight icon showing on the map. Below displays the TC Eight's details such as the current status, location, movement, and wind speed. It also displays the systems' five-day trajectory. If any videos or photos have been uploaded, you can view them under the other two tabs (black rectangle). In this case, none have been uploaded.



Below this map allows you to look at different maps of this system and displays its storm track statistics at the bottom of the page.

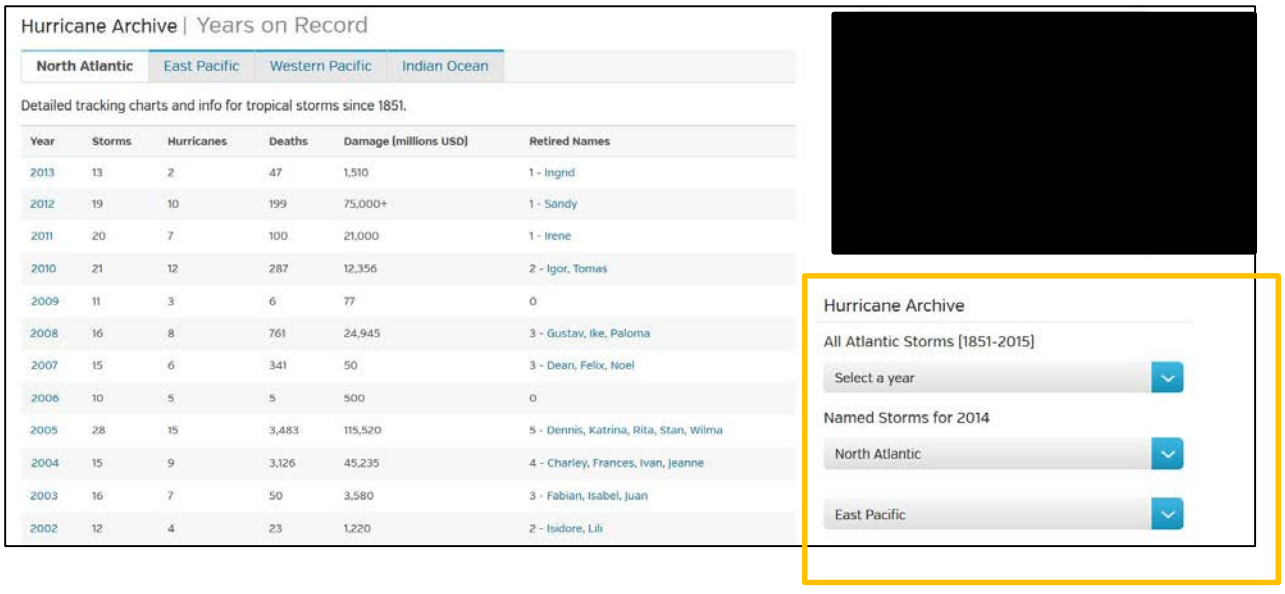
Returning back to the main page of the Hurricane and Tropical Cyclones, scroll down to the Basin Activity.



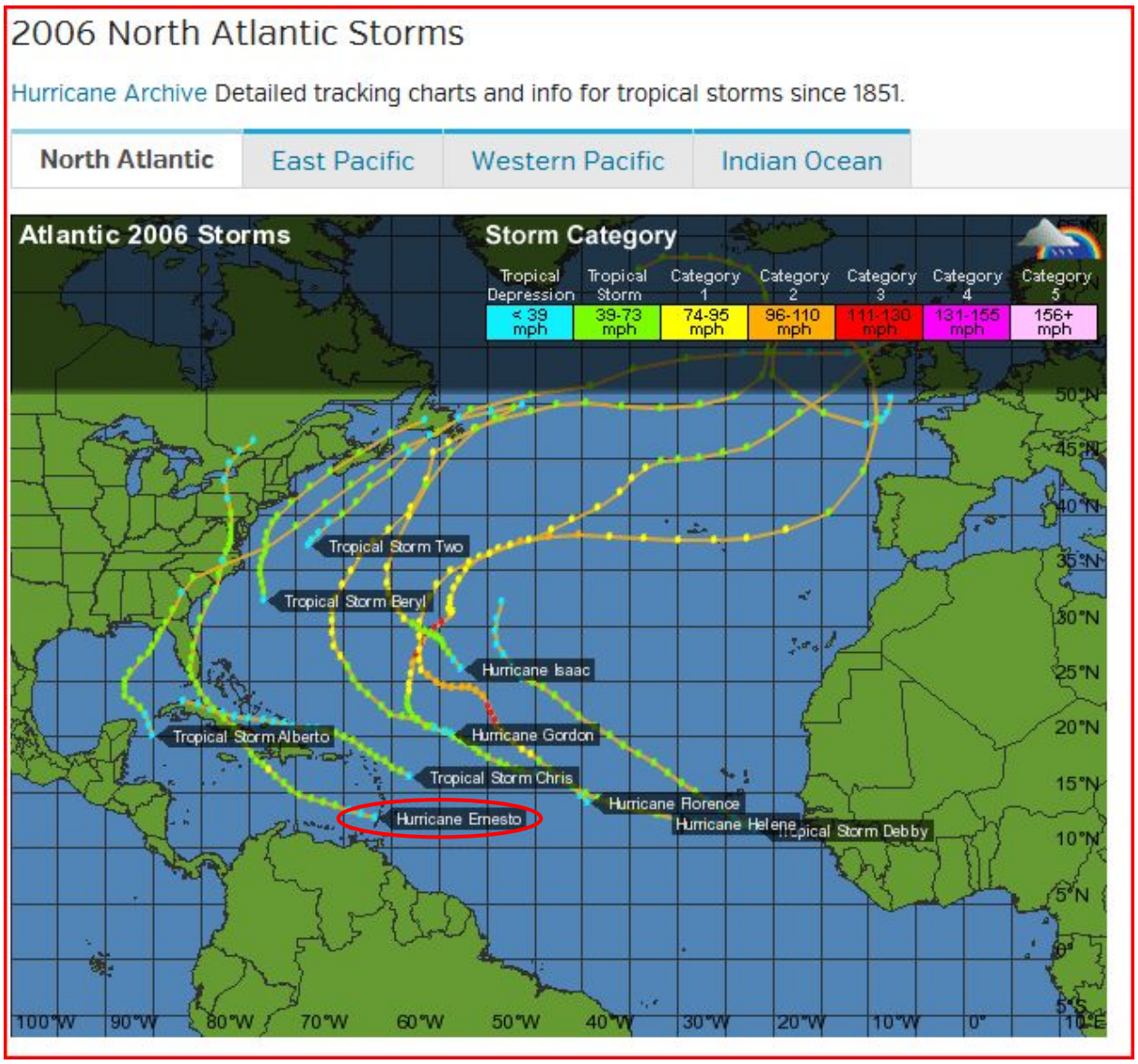
Here you can look at the Tropical Weather Outlook in the different parts of the oceans to locate the current active storm in the region. Scrolling down a little further brings you to a satellite view of the North Atlantic.

Now, let's look at *Hurricane Archive*. Go back to the top of the page under the title *Hurricane and Tropical Cyclone*, click on *Hurricane Archive*.

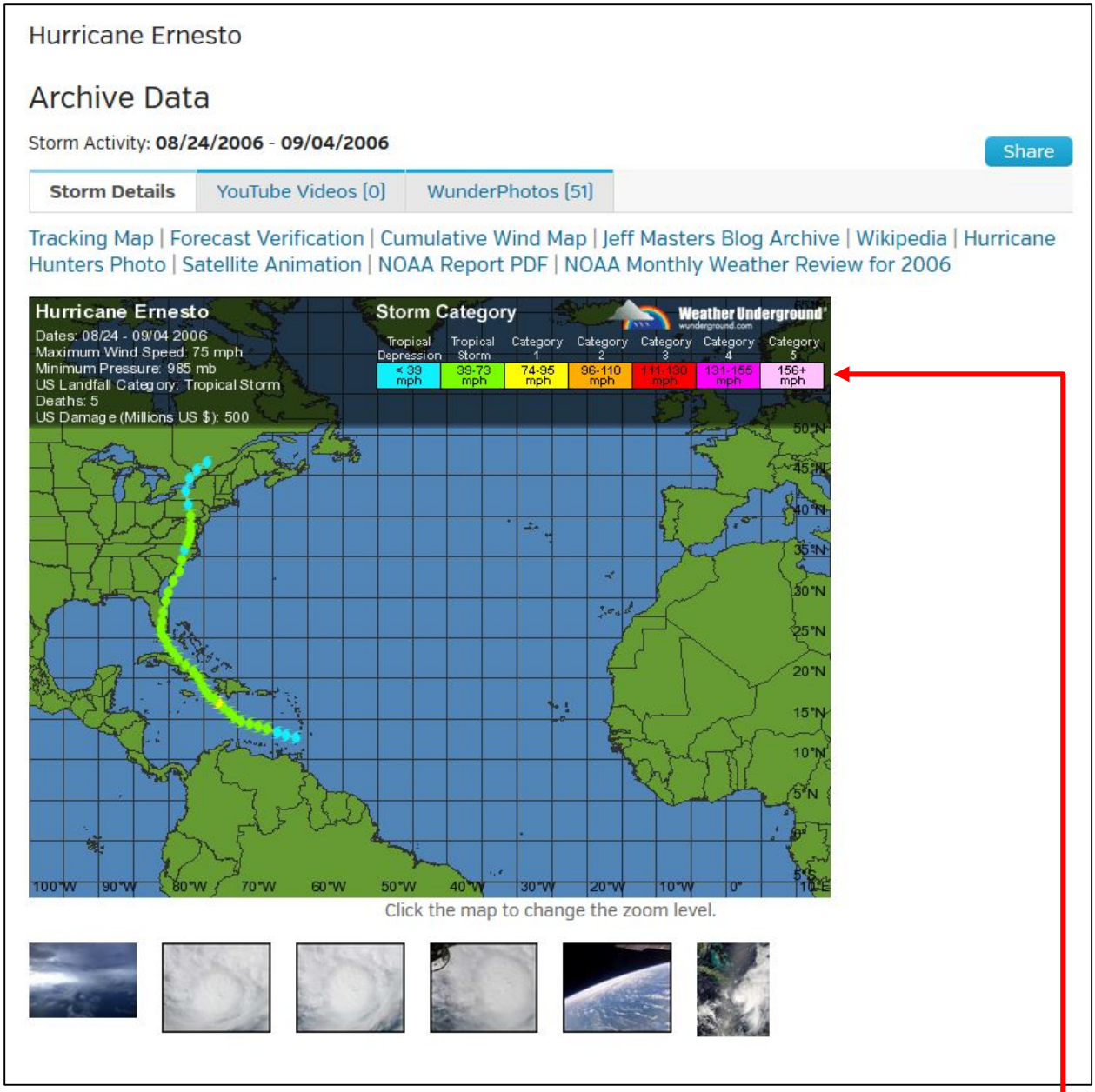
Here you can look at all the tropical storms on record for every year from the year 2013 to the year of 1851. You can view them by region, view them by year, by named storm, or do a search using the search engine (orange rectangle).



Let's start by selecting an ocean region and view the data on tropical storms from number of hurricanes, to number of deaths, and the names of the storms. Click on 2006 and it will bring you to a map of the storm tracks of every storm on record for that year.



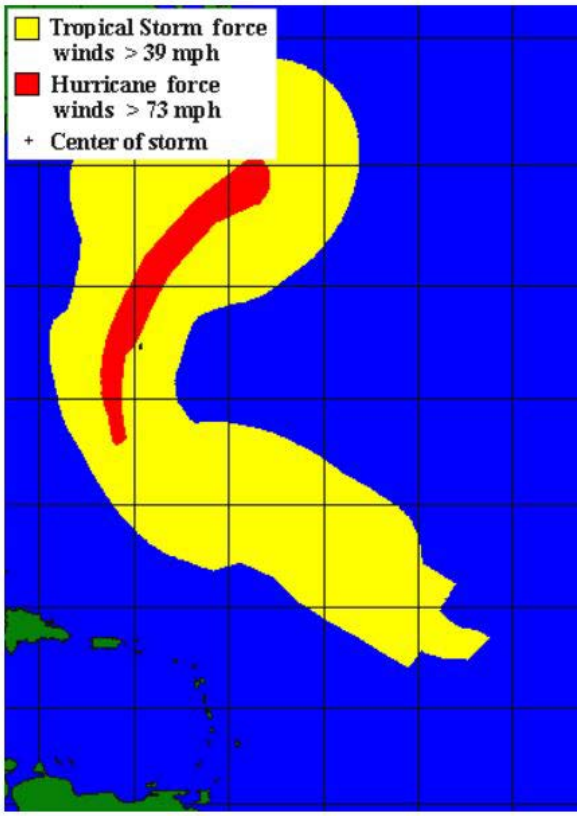
You can click at the beginning of an individual storm to view just that storms trajectory during that year. For this case, we clicked on the start of Hurricane Ernesto (red oval). This leads you to the page specifically for this named storm, similar to what you saw for the active storm (TC 8) on the previous pages.



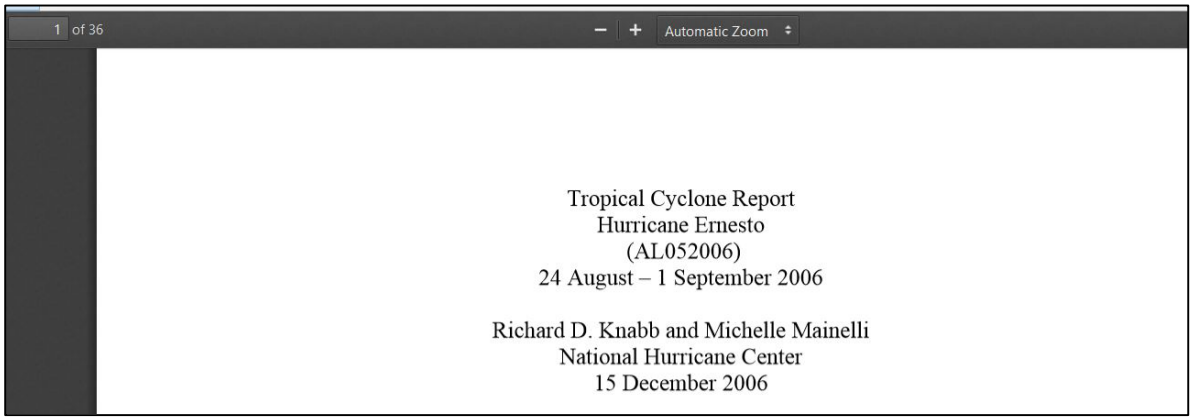
The above map shows the track for Hurricane Ernesto from August 24, 2006 – September 4, 2006. Each color of the hurricane icon within the track represents the different strength of the storm at that particular point in time. The legend for the colors is found at the top of the map. You can see that this storm started just north of Venezuela, proceeded through the Caribbean, crossed Florida, and made landfall a second time in North Carolina, and made its' way over land to Canada.

For this storm, there is no *YouTube Videos*, but 51 *WunderPhotos*. You view these pictures of the storm and comment on them. In addition, there are several other tabs that you can access to provide details. The *Tracking Map* is what we viewed above. The *Forecast Verification*, takes you to what the various forecasted tracks were for the storm.

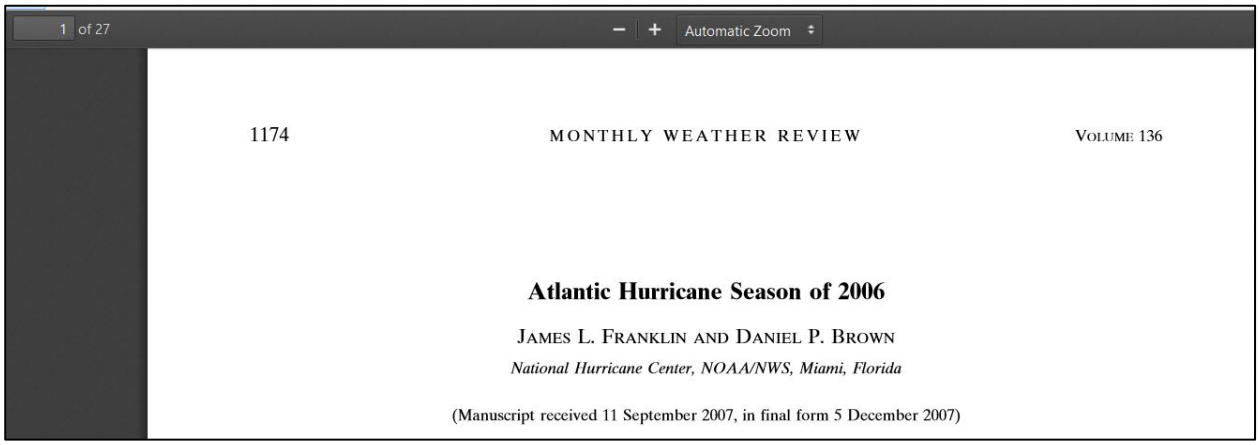
The wind of tropical cyclones affects a wind range of areas around the storm itself. The *Cumulative Wind Map* displays this range, along with the speeds within those ranges.



Jeff Masters Blog Archive. Jeff Masters is a co-founder of Weather Underground® and this blog is his observations about the storm. *Hurricane Hunters' Photos* are additional photos of the storm. *Satellite Animation* is the radar animation of the storm. *NOAA Report PDF* is a comprehensive report issued by NOAA scientists on the storm and can be downloaded. The report for Ernesto is 36 pages.



The final tab – *NOAA Monthly Weather Review for 2006* is another PDF that can be downloaded. This document is a 27 page comprehensive report of the *Atlantic Hurricane Season of 2006* produced by NOAA scientists.



Near the bottom of the page is the *Storm Track Coordinates* table. Here you can view the storms location, pressure, and storm type for every 6 hours, for each day it was recorded. The times displayed are for Greenwich Mean Time.

Storm Track Coordinates

Date	Time	Lat	Lon	Wind (mph)	Pressure	Storm Type
08/24/2006	18 GMT	12.7	61.6	35	1008	Tropical Depression
08/25/2006	00 GMT	13.0	63.0	35	1007	Tropical Depression
08/25/2006	06 GMT	13.3	64.4	35	1005	Tropical Depression
08/25/2006	12 GMT	13.7	65.8	40	1005	Tropical Storm
08/25/2006	18 GMT	14.0	67.1	40	1004	Tropical Storm
08/26/2006	00 GMT	14.3	68.3	45	1002	Tropical Storm
08/26/2006	06 GMT	14.6	69.5	50	999	Tropical Storm
08/26/2006	12 GMT	15.1	70.4	60	997	Tropical Storm
08/26/2006	18 GMT	15.7	71.2	65	997	Tropical Storm

Go back to the original 2006 map that shows all the storm tracks. Below that map is a storm list of all the storms occurred that year, the dates that the storm occurred, the maximum wind speed of that storm, the minimum pressure recorded in millibars, the number of human deaths that occurred as a result of the storm, the total amount of the damage in US Dollars, and the category of the storm when it made landfall in the United States. You can click on an individual name and go to the page related to that specific storm.

Storm List

Storm	Dates	Max Winds (mph)	Min Pressure (mb)	Deaths	Damage (millions USD)	US Landfall Category
Tropical Storm Alberto	06/10-06/19	70	969	0	0	Tropical Storm
Tropical Storm 2	07/16-07/19	50	998	0	0	No US Landfall
Tropical Storm Beryl	07/18-07/22	60	1000	0	0	Tropical Storm
Tropical Storm Chris	08/01-08/06	65	1001	0	0	No US Landfall
Tropical Storm Debby	08/21-08/28	50	999	0	0	No US Landfall
Hurricane Ernesto	08/24-09/04	75	985	5	500	Tropical Storm
Hurricane Florence	09/03-09/19	90	963	0	0	No US Landfall
Major Hurricane Gordon	09/10-09/24	120	955	0	0	No US Landfall
Major Hurricane Helene	09/12-09/27	120	955	0	0	No US Landfall
Hurricane Isaac	09/27-10/03	85	985	0	0	No US Landfall

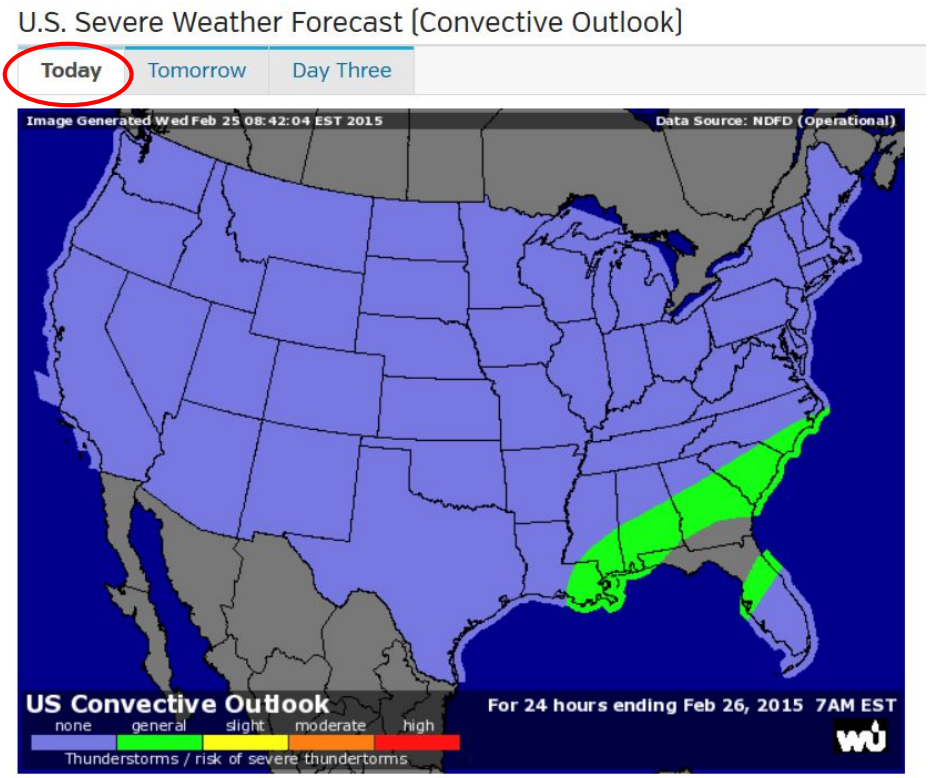
Now, let's return back to the main screen of Weather Underground®.

4.5 Convective Outlook

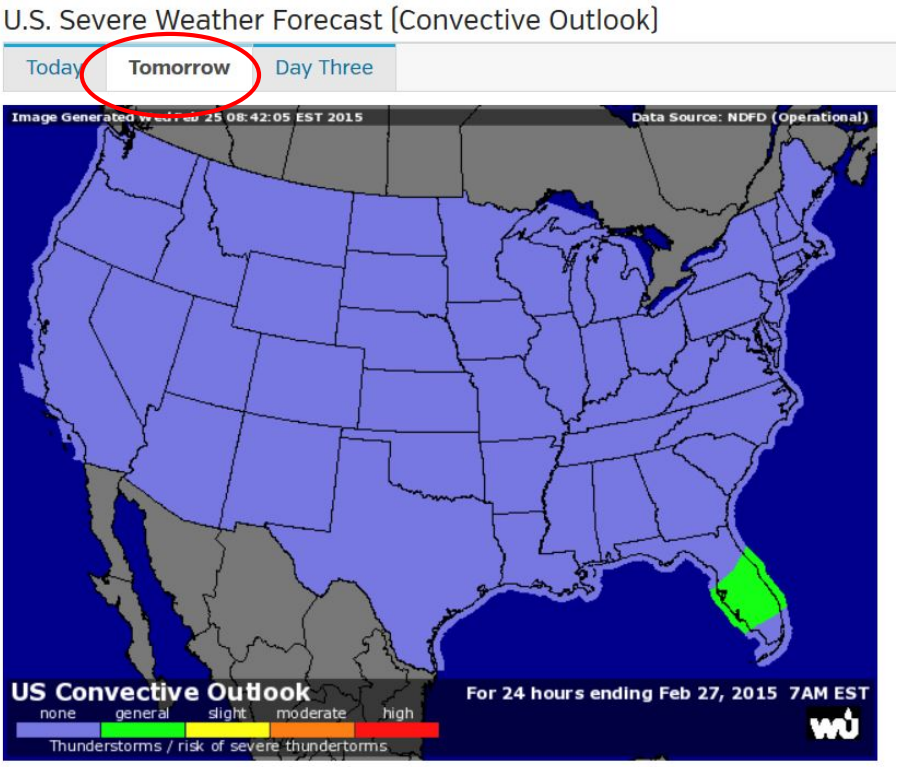
The National Weather Service defines convective outlook as:

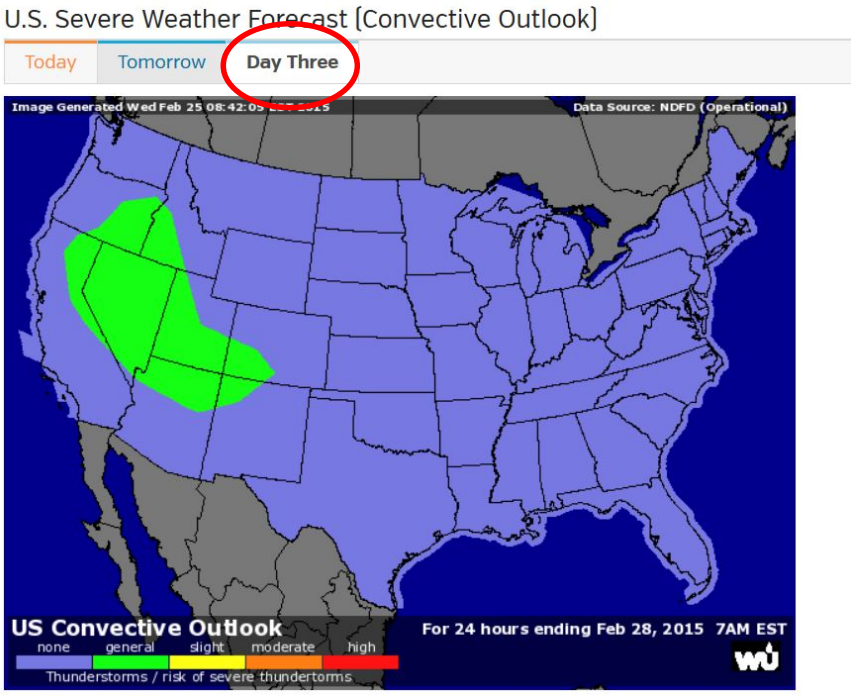
> "a forecast containing the area(s) of expected thunderstorm occurrence and expected severity over the contiguous United States, issued several times daily by the Storm Prediction Center (SPC). The terms approaching, slight risk, moderate risk, and high risk are used to describe severe thunderstorm potential" (http://w1.weather.gov/glossary/index.php?letter=c).

Under the Severe Weather tab click on *Convective Outlook*. The non-interactive map shows the convective outlook on the United States.



You can select the convective outlook for today, tomorrow, and day three (red ovals).





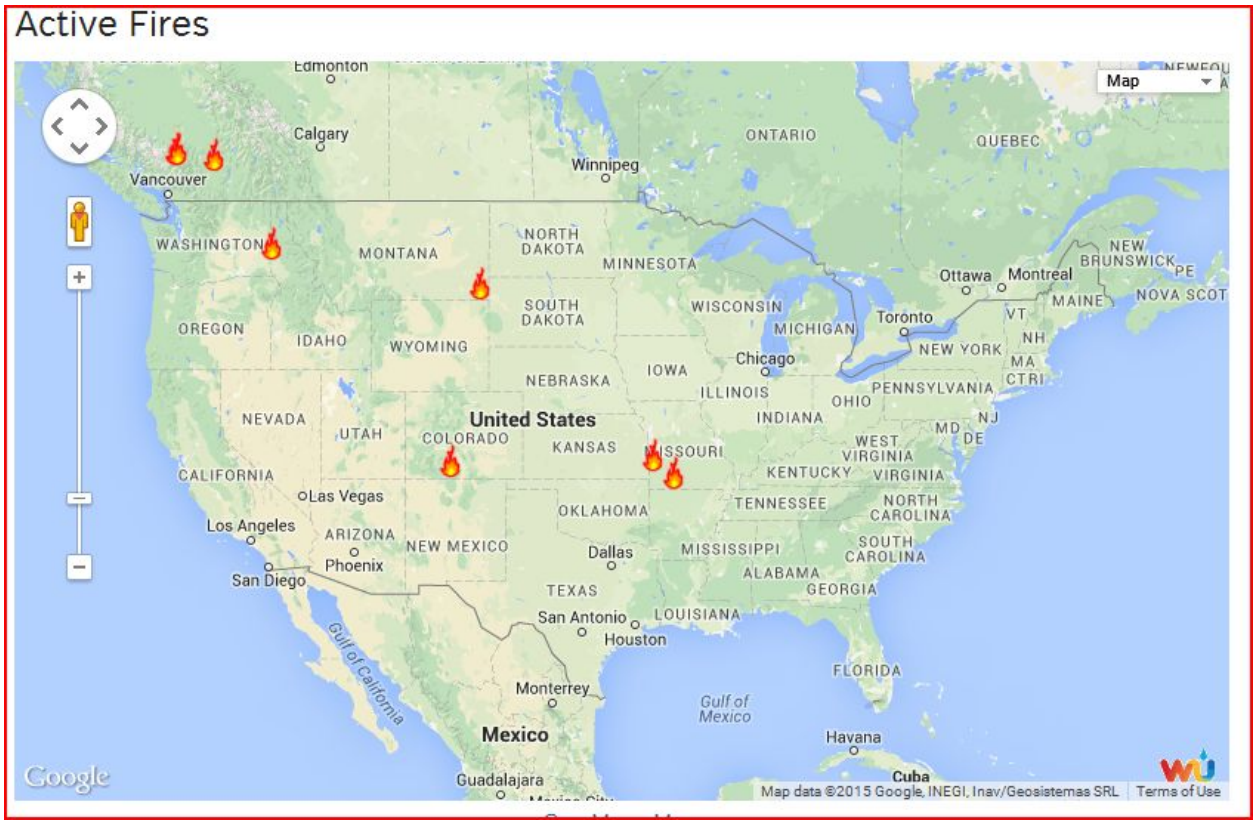
Below the map, the National Weather Service posts a statement on the *Convective Outlook* in detail for that day for your convenience. Below is a portion of the details for the *Convective Outlook* displayed in the prior three maps.

```
000
acus01 kwns 251250
swody1
Storm Prediction Center ac 251249


Day 1 convective outlook
National Weather Service Storm Prediction Center Norman OK
0649 am CST Wednesday Feb 25 2015


Valid 251300z - 261200z


..there is a marginal risk of severe thunderstorms across the Florida Panhandle...North
Florida... and S Georgia tonight...


...
Showers and thunderstorms are expected across the southeast United
States today and tonight. Isolated damaging winds and a tornado
could occur tonight from the Florida Panhandle across North Florida
and south Georgia.
```

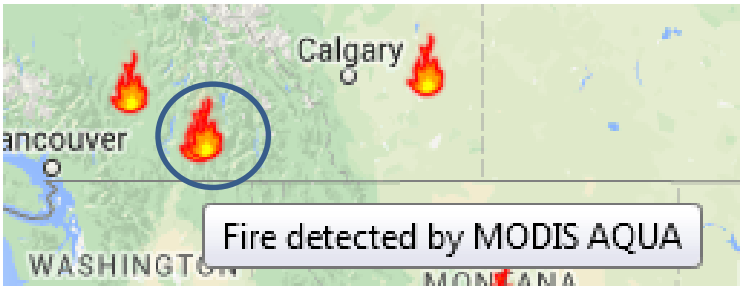
This competes the *Convective Outlook* tab. Return to Weather Underground's® main screen.

4.6 Wildfires

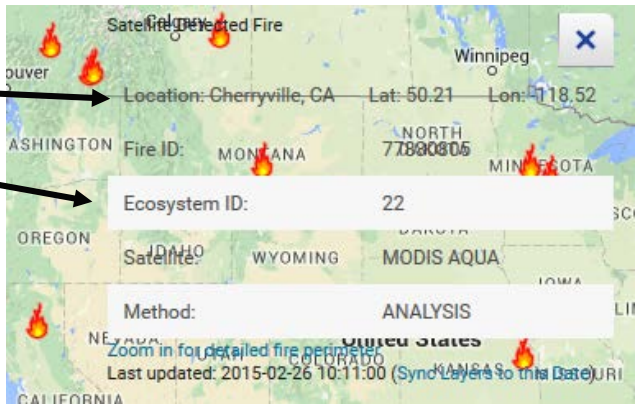
Under the Severe Weather tab, click on the *Wildfires* tab. Here is an interactive map of *Active Wildfires.*



Hovering over a fire icon, give you information as to how the wildfire was detected. In this case, the fire icon (blue circle) was detected via the MODIS AQUA satellite (http://modis.gsfc.nasa.gov/).



Clicking on that same fire icon on the map brings up a small box that provides the location (Cherryville, Canada, along with the latitude and longitude) and the Ecosystem ID of the fire.



Below the map is a record of the *Largest Fires in U.S. History* and displaying the number of acres burned from the fire.

Largest Fires In U.S. History

Display: 25 Search:

Year	Fire Name		Location	
1997	Inowak	AK-AKS	AK	610,000
1999	Dun Glen Complex	NV-WID	NV	361,658
1999	Sadler Complex	NV-EKD	NV	297,000
1999	Battle Mountain Complex	NV-BWD	NV	208,031

Underneath the list of fires, Weather Underground® provides a link to the source of their information and also links to other sources on fires.

Source: National Interagency Fire Center (NIFC)

Extrenal Fire Information

Fire danger and reports

- Wildland Fire Assessment System (WFAS)
- Incident Information System (Inciweb)
- FireWhat.com

Return to the main menu.

4.7 Preparedness

Under the *Severe Weather* tab, click on the tab called Preparedness. This page provides details on preparation for varied weather situations, survival myths, and weather events.

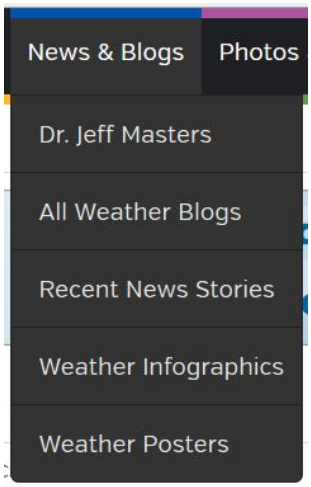
Clicking on each these links takes you to a page describing and explaining about different weather events. There is a guide to help build a disaster supply kit and links to becoming prepared for landslides and tsunamis. Click on the different links and check them out. Once you are done return to the main menu page.

4.8 Weather Alerts

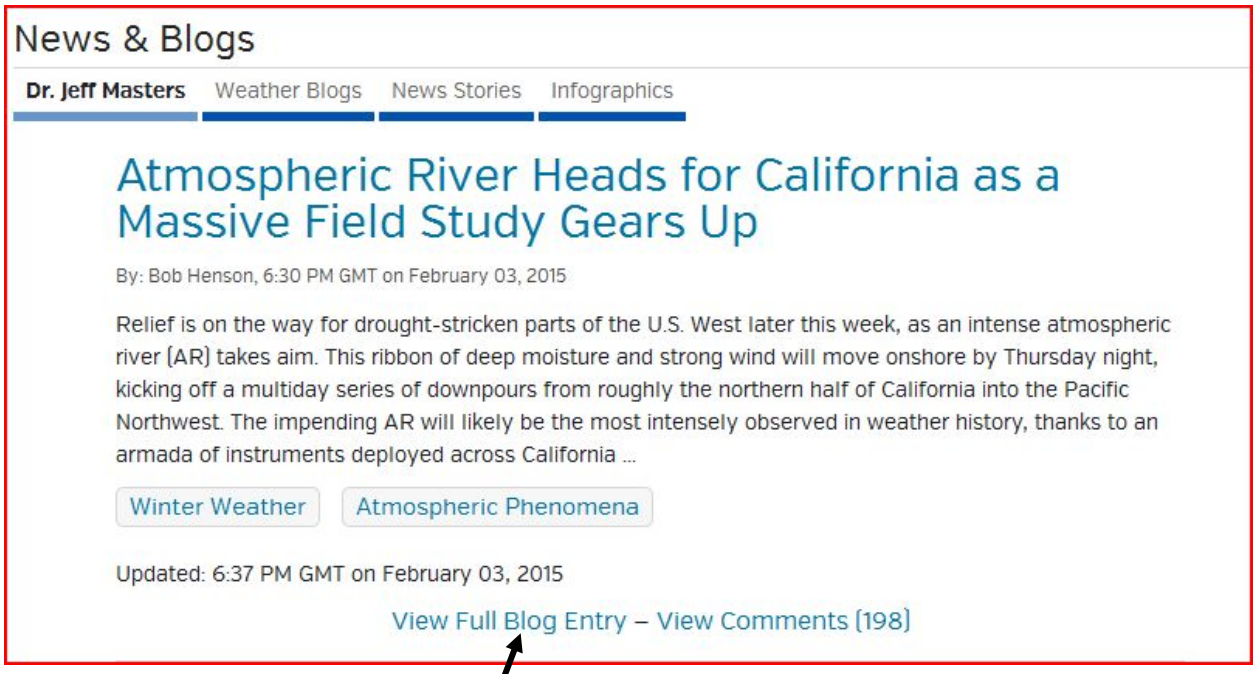
This section requires a membership to Weather Underground®. This tab provides details on the different types of memberships and how to join.

Chapter 5: News and Blogs

In this chapter, we will explore the *News & Blogs* tab, the third tab at the top of the screen, which contains weather blogs of different events around the world.

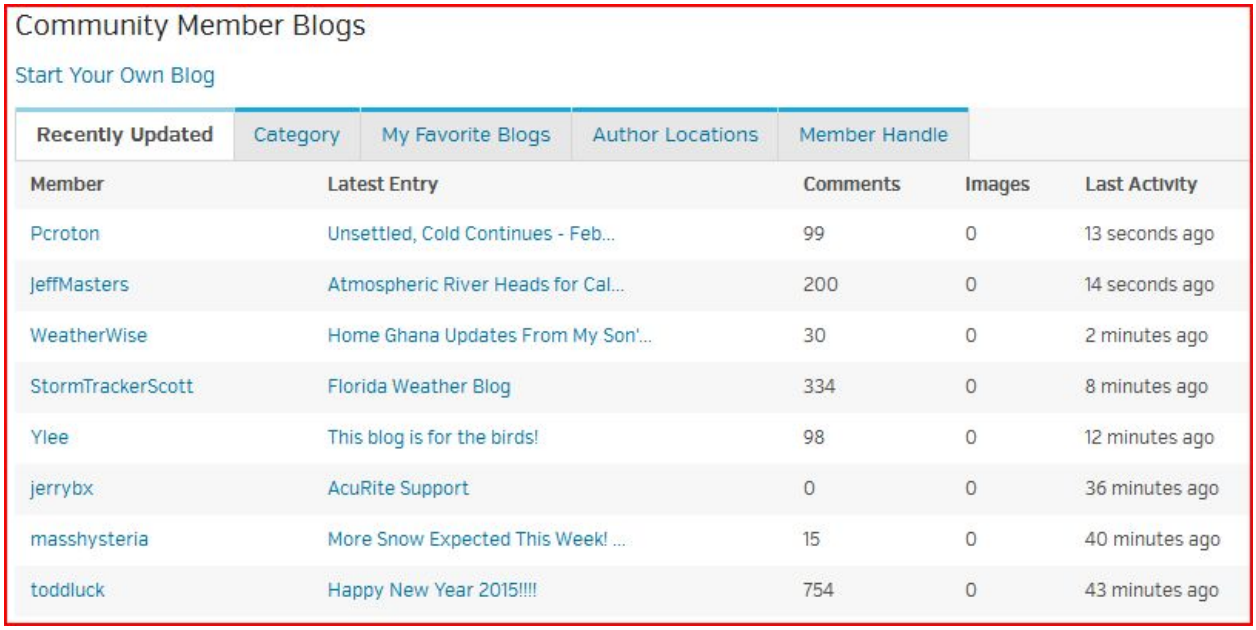


Clicking on the Dr. Jeff Masters tab will bring you to the blogs of the big headlines of current weather events.



You can click on the blog and see the full story as well as commenting on the blog.

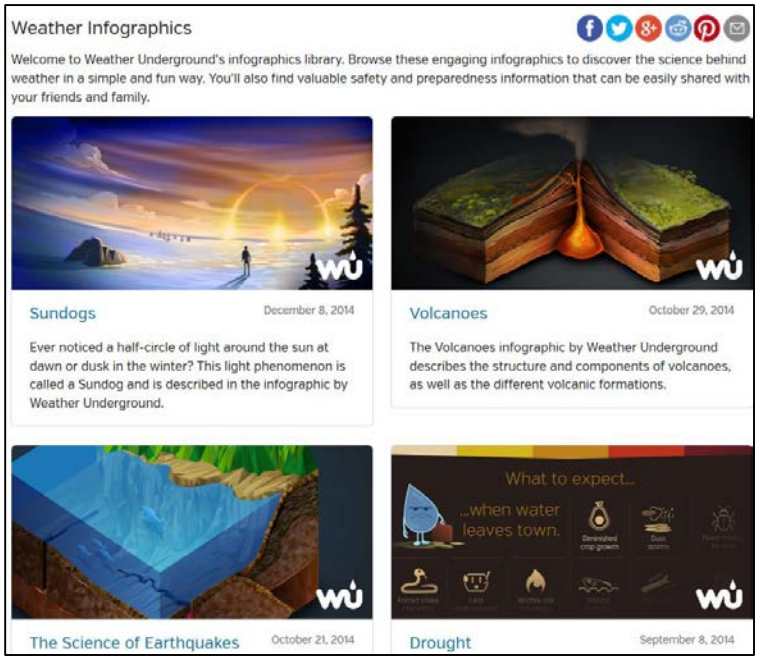
Clicking on *All Weather Blogs* tab under *News & Blogs* menu, brings you to all the blogs that have been posted. Scrolling down to about half the page brings you to a table of blogs in sequence from the most recent to the oldest blog posted.



Here you can choose a particular blog or browse through categories or your list of favorite blogs. Clicking on a blog will take you the location of the blog.

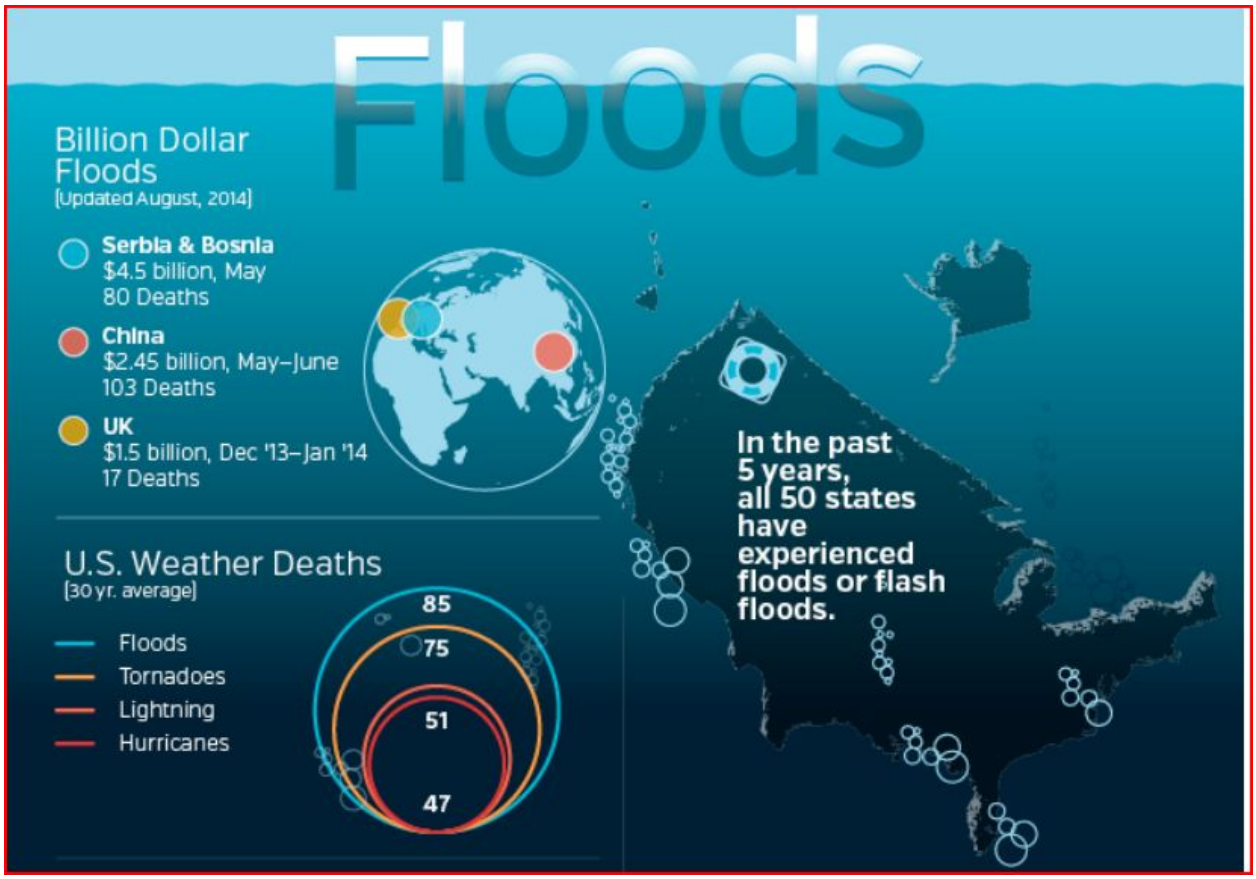
The third menu tab down on the *News & Blogs* menu is called *Recent News Stories*. Clicking on this tab takes you to the weather articles of recent news stories from around the world, in reverse chronological order (i.e. most recent first).

The last menu tab under the *News & Blogs* menu is called *Weather Infographics*. Clicking on this tab directs readers to Weather Underground®'s library of information.



Clicking on any one of these sections, takes you to more information with regards to that phenomena.

Below is a snapshot of the *Floods Infographic*. This *Infographic* provides flooding information, including death tolls, causes, and hazardous uses of cars in flooding conditions (the entire page is not displayed below).



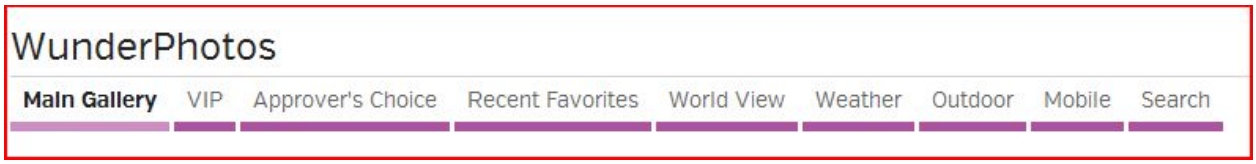
The final tab under *News & Blogs* menu is *Weather Posters*. This tab directs readers to Weather Underground®'s poster library. Posters can be viewed by clicking on any of the poster icons. Below that poster are printing and downloading options.

This brings the chapter to an end.

Please return to the main page of Weather Underground®.

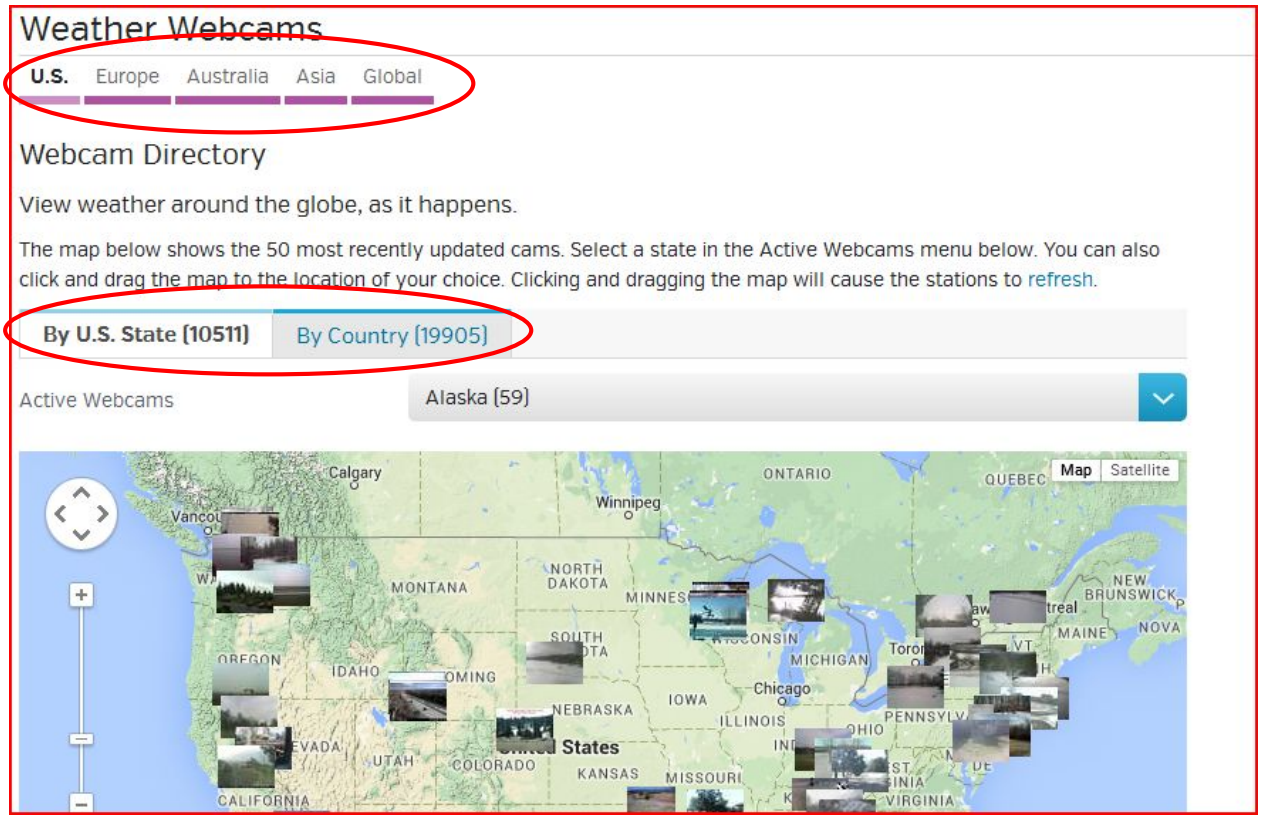
Chapter 6: Photos & Video

The fourth tab at the top of the Weather Underground® web page is the *Photos & Videos* tab. From this tab, click on the *WunderPhotos* menu tab, which directs users to Weather Undeground®'s photo gallery.

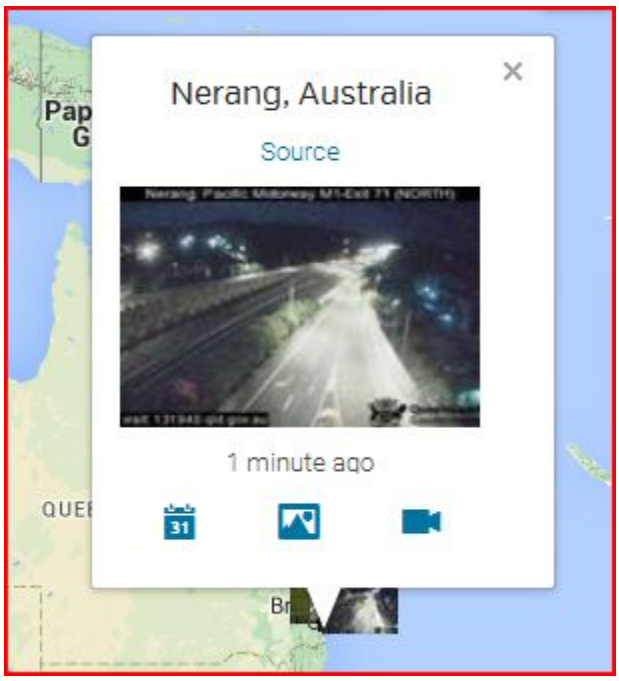


You can click on the above categories to view different kinds of photos from all over the world. Clicking on a photo will bring you to a larger view of the photo as well as a caption, the date it was taken, and what kind of camera was used.

Under the Photos and Videos tab, the second menu item is Webcams. Clicking on this tab takes you to a map that shows available photos and webcam photos.



Users can select different parts of the world or search by ether *By U.S. State* or *By Country*. The number within the parenthesis indicates the number of webcams available.



Clicking a picture such as that shown above will bring this box up where you can look at the monthly overview, the latest image, and view a time lapse video.

The last menu item under Photos and Videos is the "Videos" tab. This brings you to the Weather Underground® Videos.

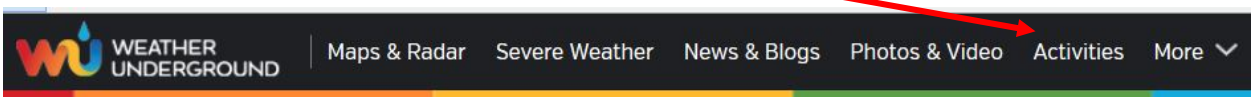
Users can browse through the different categories show above to view that collection of videos. The range from videos of scenes of weather events to informative science and history videos all related to weather.

Please note that we do not advocate downloading or copying any photos without express permission, as noted by Weather Underground® or the photo's owner.

Please return to the main page of Weather Underground®.

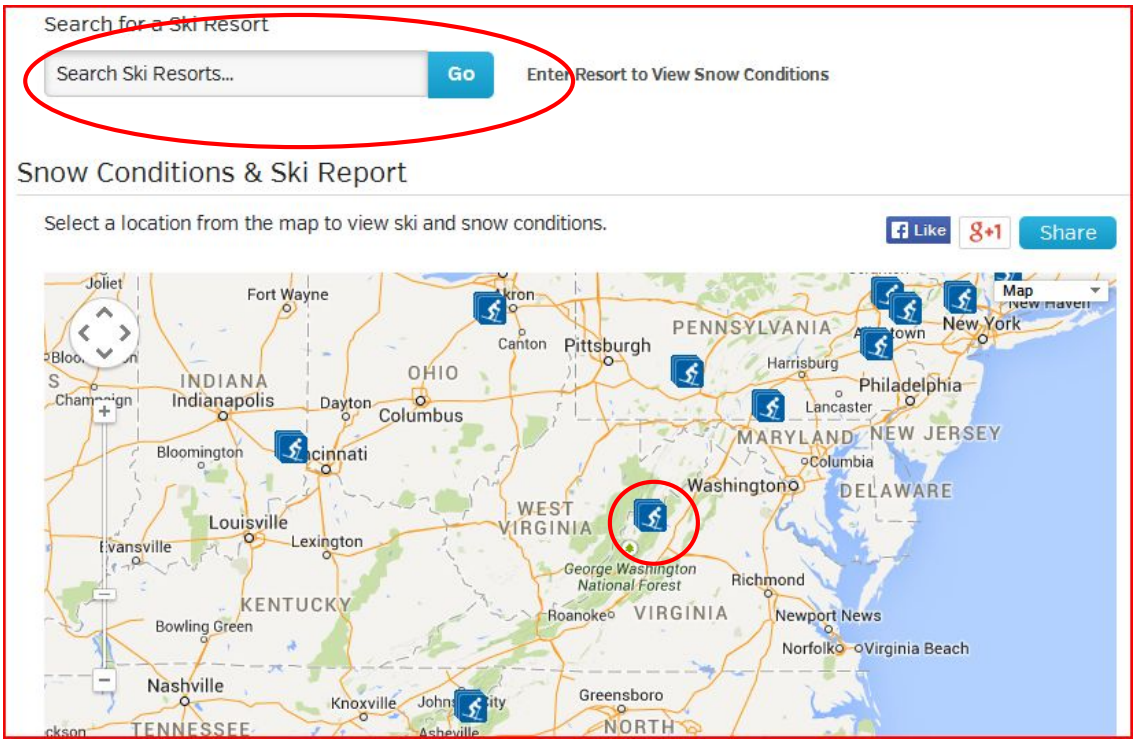
Chapter 7: Activities

The fifth tab down the top of the page is called *Activities*.

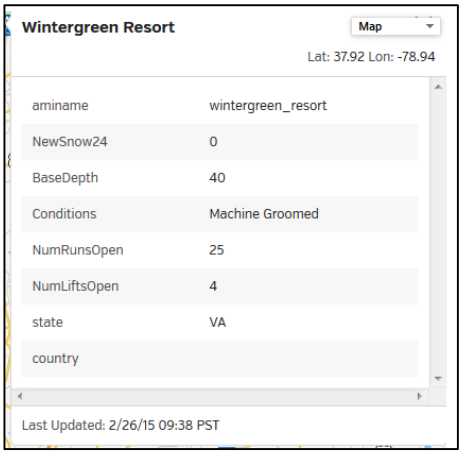


7.1 Ski and Snow Reports

Clicking on this brings down a menu with four sub tabs. Click on the first *Ski and Snow Reports* to see an interactive map with ski locations.



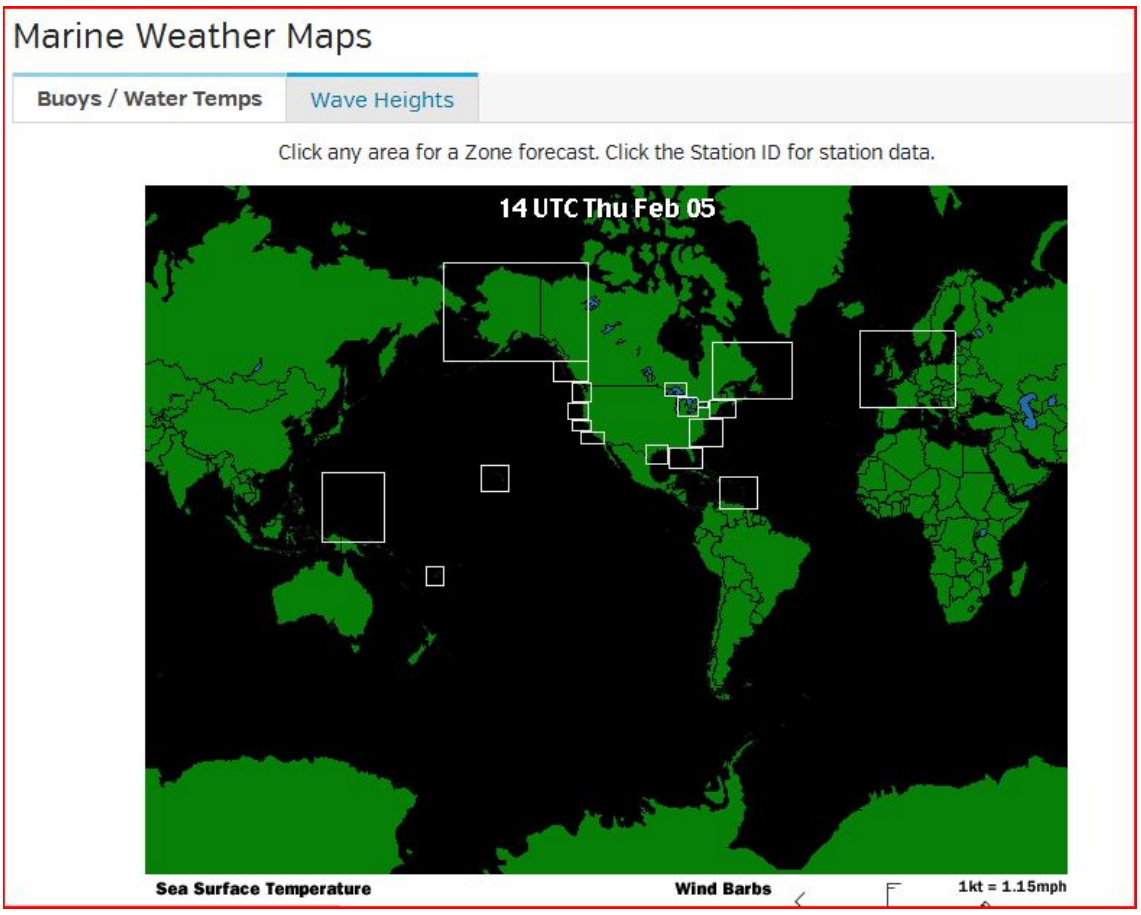
Users can either search for the ski location in the search bar or click on the ski icons on the map (red circle). Clicking on a ski location brings up a box that contains information such as snow depth and the number of runs and lifts open.



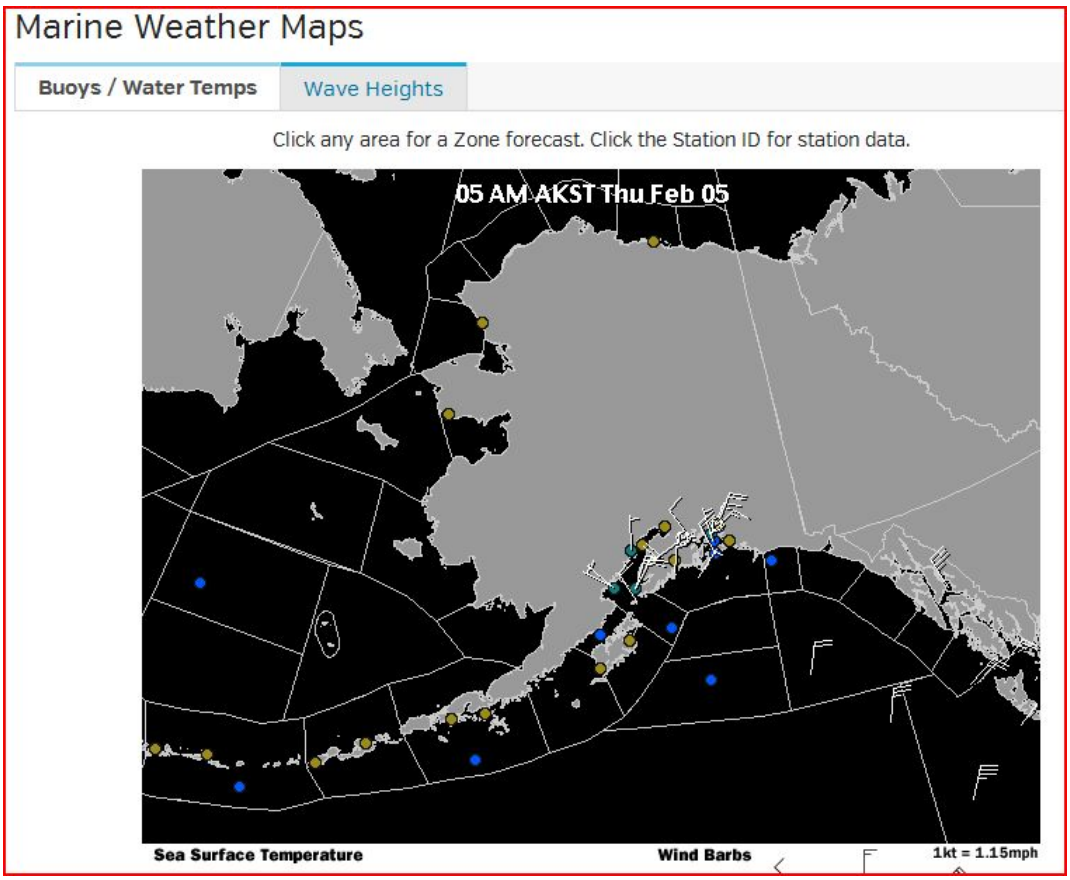
Scrolling down a little permits a search for ski locations by country and state.

7.2 Marine Weather

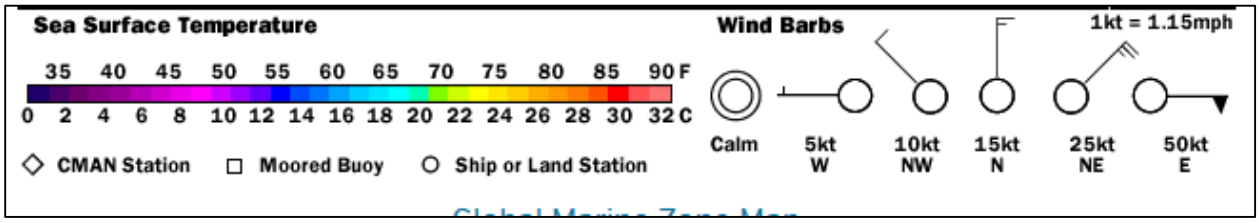
Under the Activities tab, the second tab down on the menu is *Marine Weather*. The page loads an interactive map of buoys and water temperatures. Below this map are links to the locations where you can receive information on buoys, water temperatures, and wave heights.



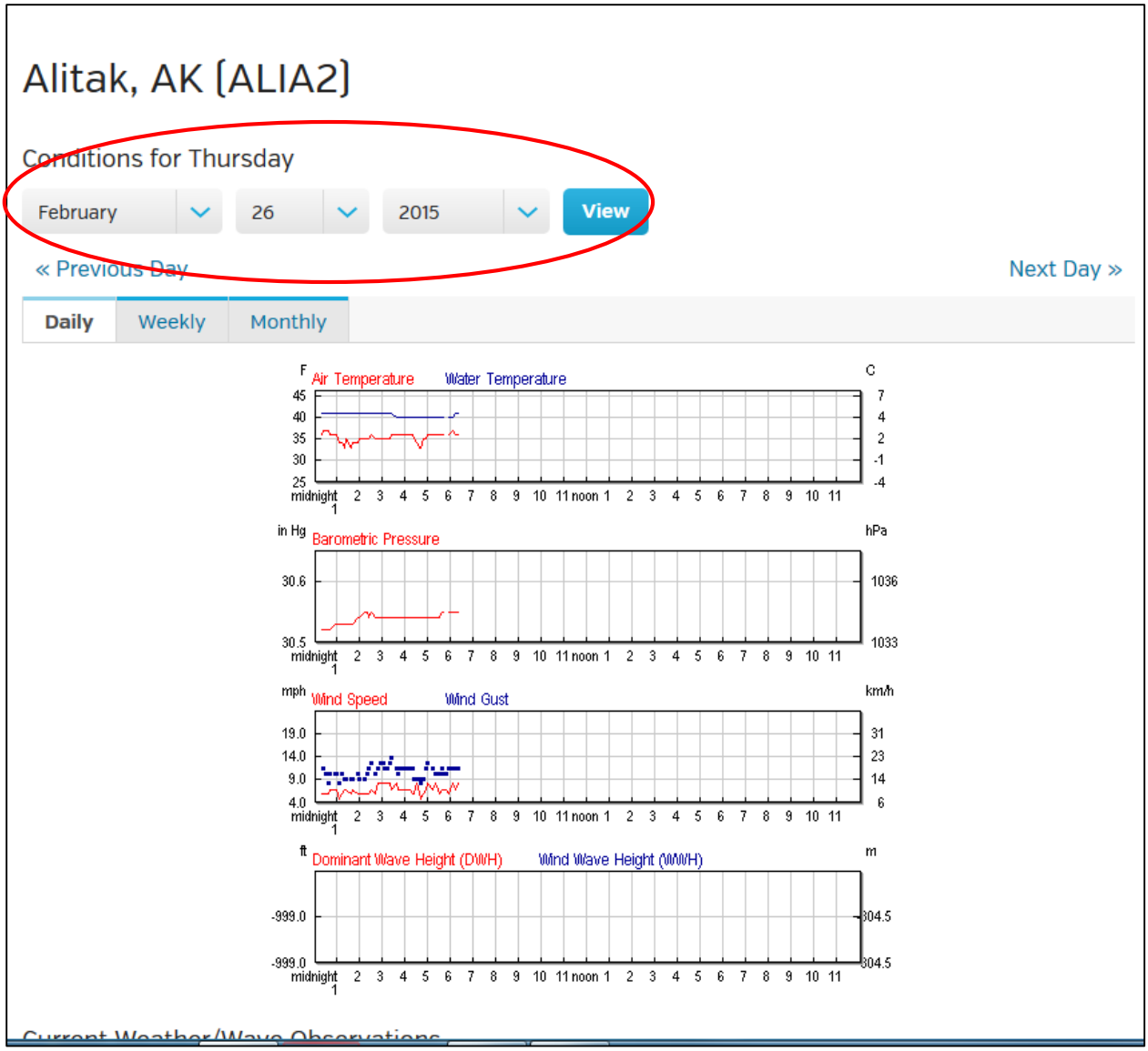
On the map, click on the Alaskan box to view a map displaying the buoys.



The legend below the maps helps identify sea temperature and wind direction.



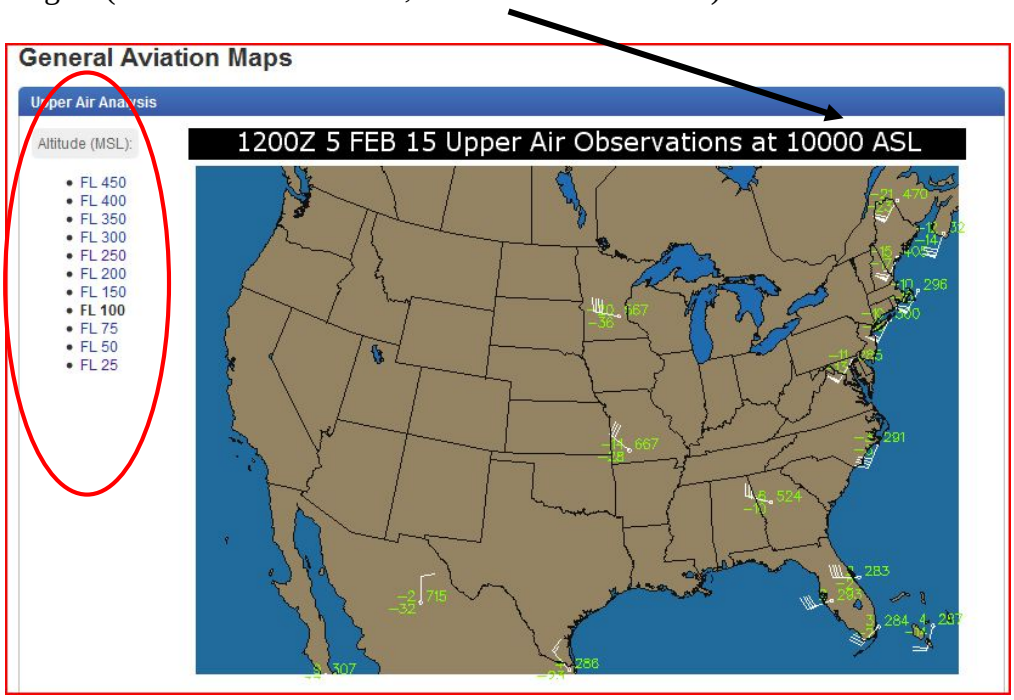
Clicking on a buoy (blue dot) will display information from the buoy on the top of the page. Clicking on a brown buoy will connect to another page displaying weather information recorded by that buoy, including air and water temperatures. As you can see from the image below, the water is much warmer than the air.



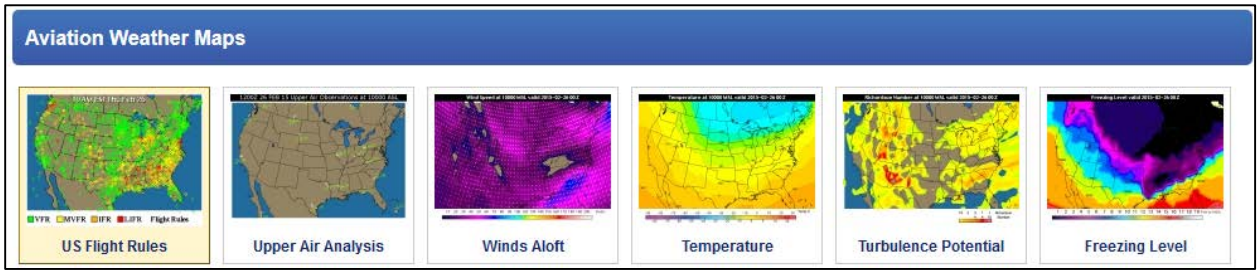
You can view the information recorded from the buoy as far back as the 1990s.

7.3 Aviation

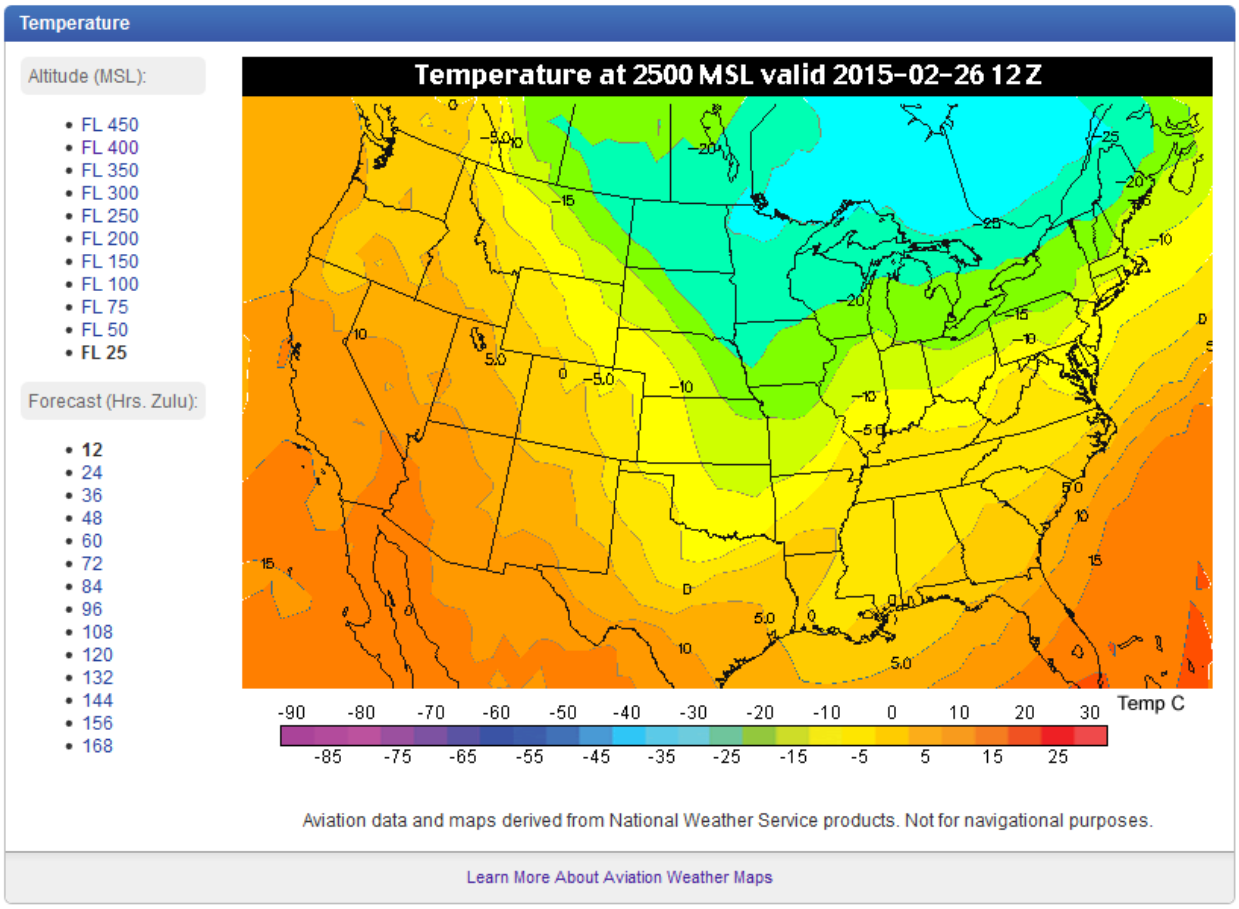
The third menu item down on *Activities* is called *Aviation*. Clicking on this tab leads to a new Weather Underground® website. Here, an aviation map shows upper air data. By clicking on one of the altitudes on the left hand side of the map, you can view the data for different altitude heights (MSL = mean sea level; ASL = above sea level).



Below the map is a list of other maps that display other types of information.



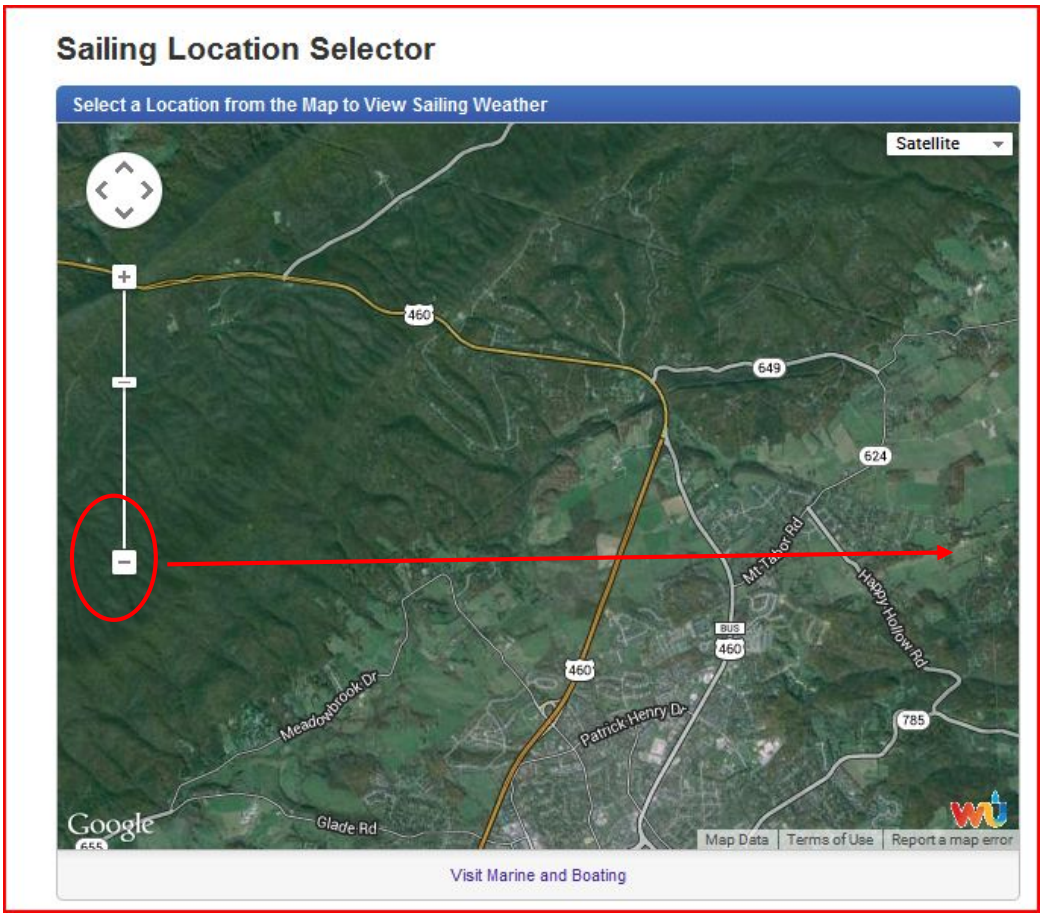
If we click on *Temperature*, it provides a chloropleth map of upper air temperatures, again as an interactive map that allows the user to change the altitude on the left hand side.



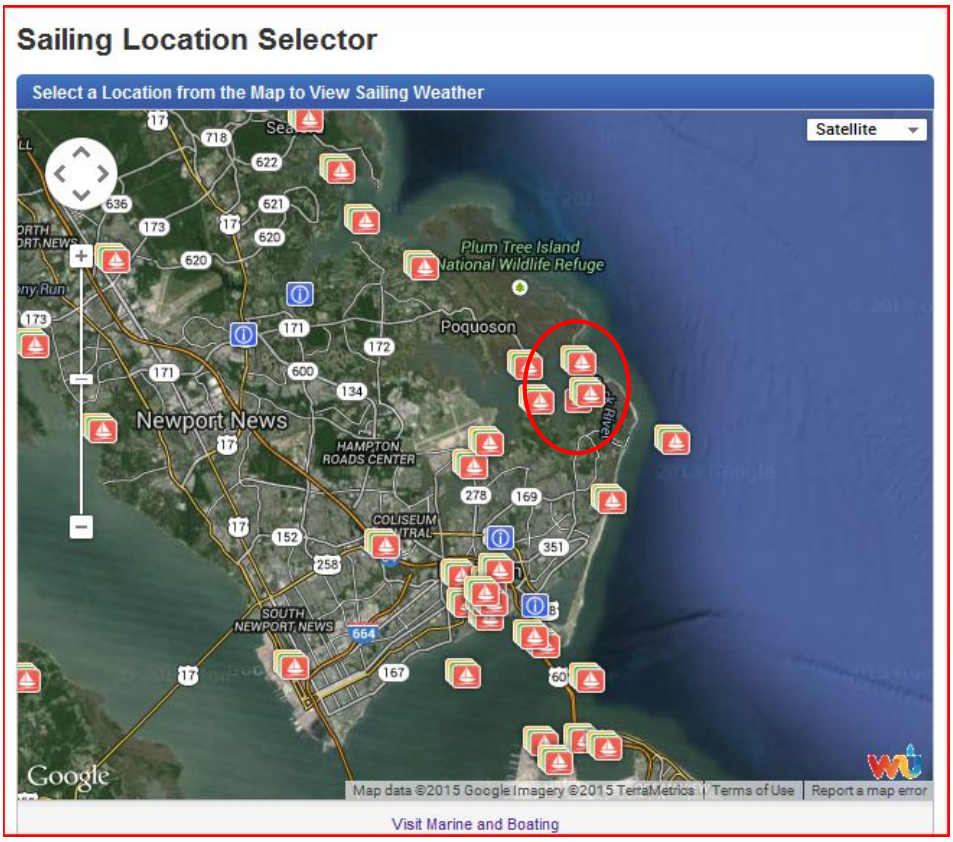
To return to Weather Underground® main page, click the back button at the top of the page or search for Weather Underground® in the browser.

7.4 Sailing Weather

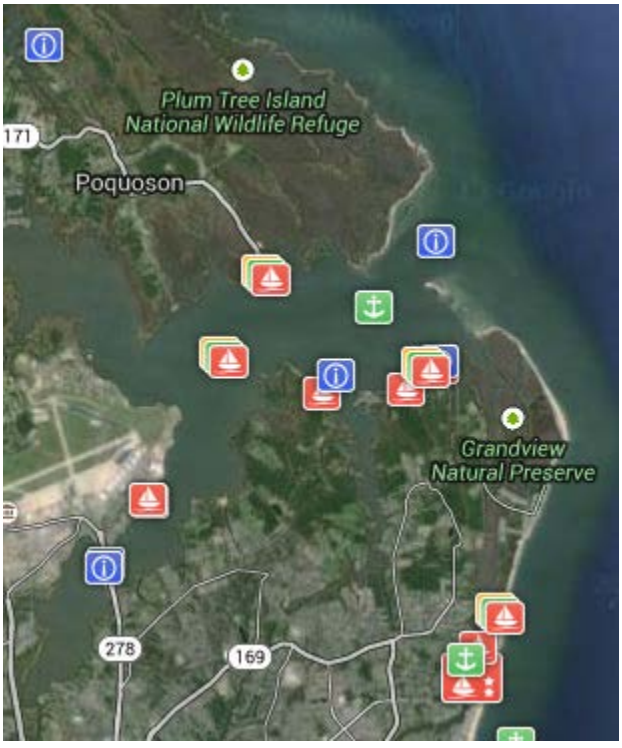
Under the *Activities* menu click on the last tab item called *Sailing Weather*. The map that displays shows your current location, in this case, it shows the area near Blacksburg, Virginia.



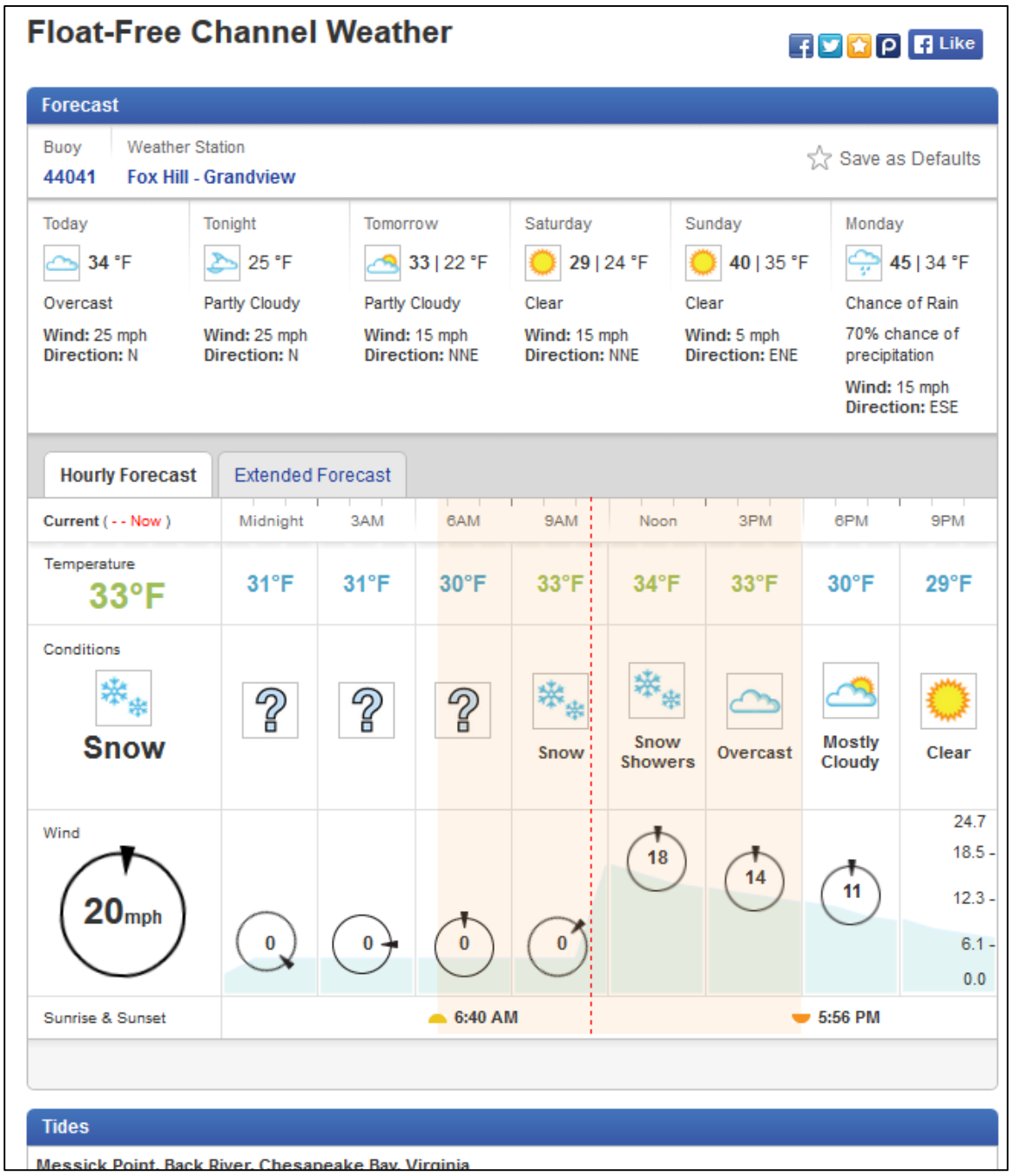
You can zoom out to find the coast to the east (red circle), or hold your left mouse button down and manually move the map. Once at the coast, images of a sailboats are displayed on the map.



But if you zoom in, individual icons are visible, including sailboats, anchors and an *i* within a blue circle.



Clicking on an individual icon displays current weather conditions for the area. It displays maximum wind gust velocities and heights of tides and waves.



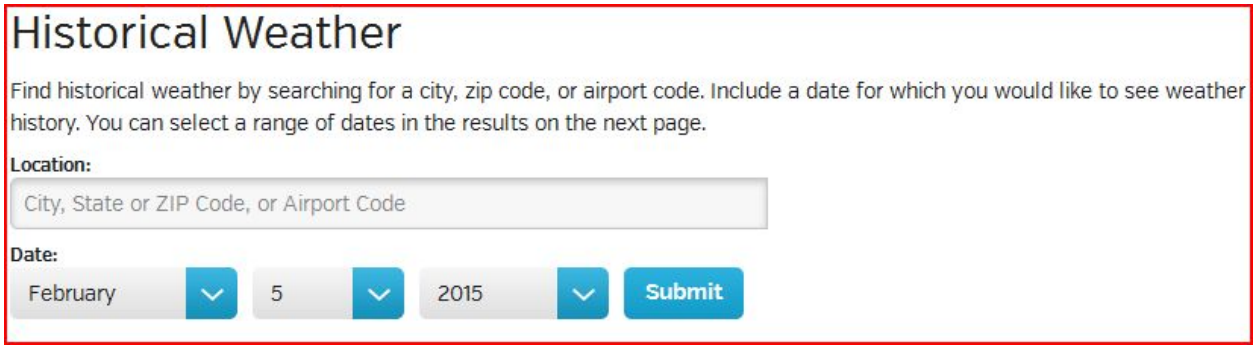
Return to the main page of Weather Underground® by typing in the search bar or click on the back button on the computer.

Chapter 8: More

The last tab at the top of the main page of the Weather Underground® website is the *More* tab. I will explain about the first two sub-tabs on the menu and the last sub-tab. The remainder provides information concerning purchase a weather station, its registration on Weather Underground, and signing up for a site.

8.1 Historical Weather

The first sub-tab is called *Historical Weather*. Here you can look at data as far back as 1945 to find that date's weather data.

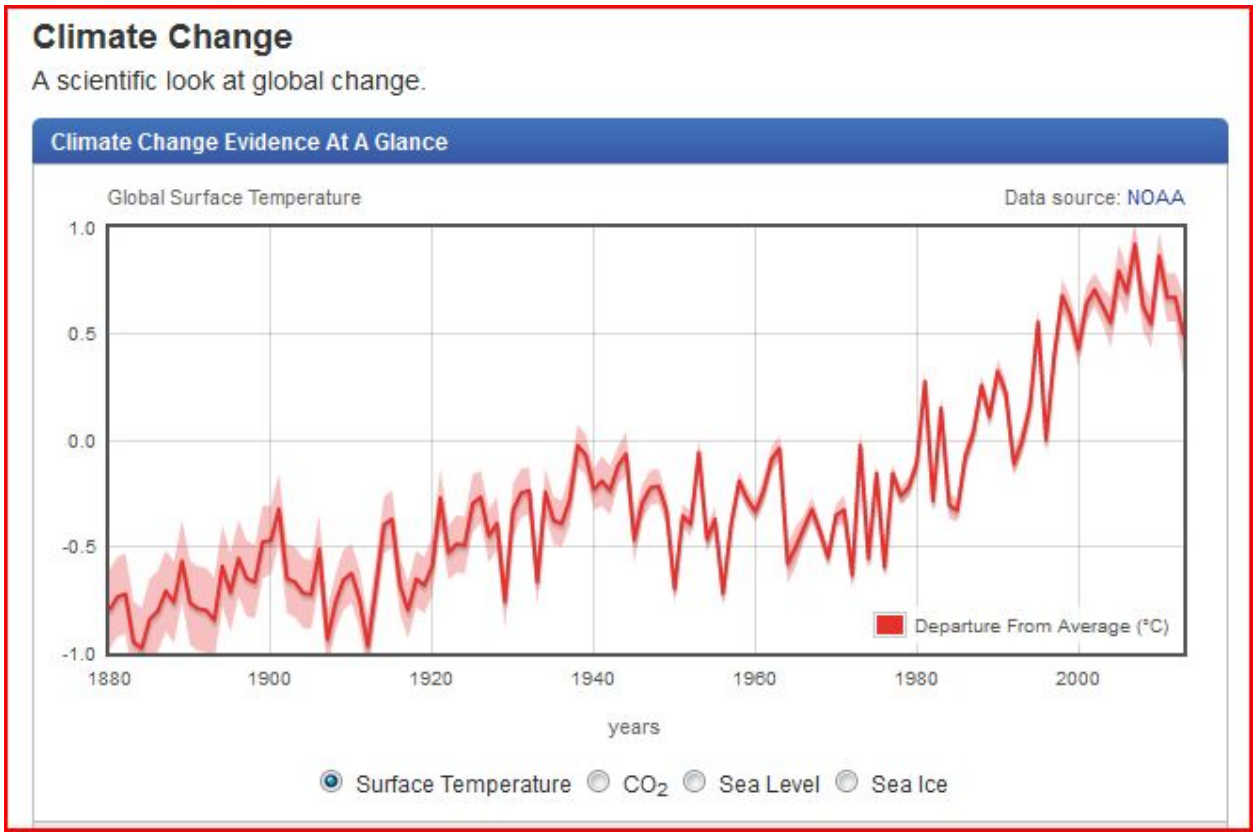


Just enter a location and date. I choose Sept. 12, 1999.

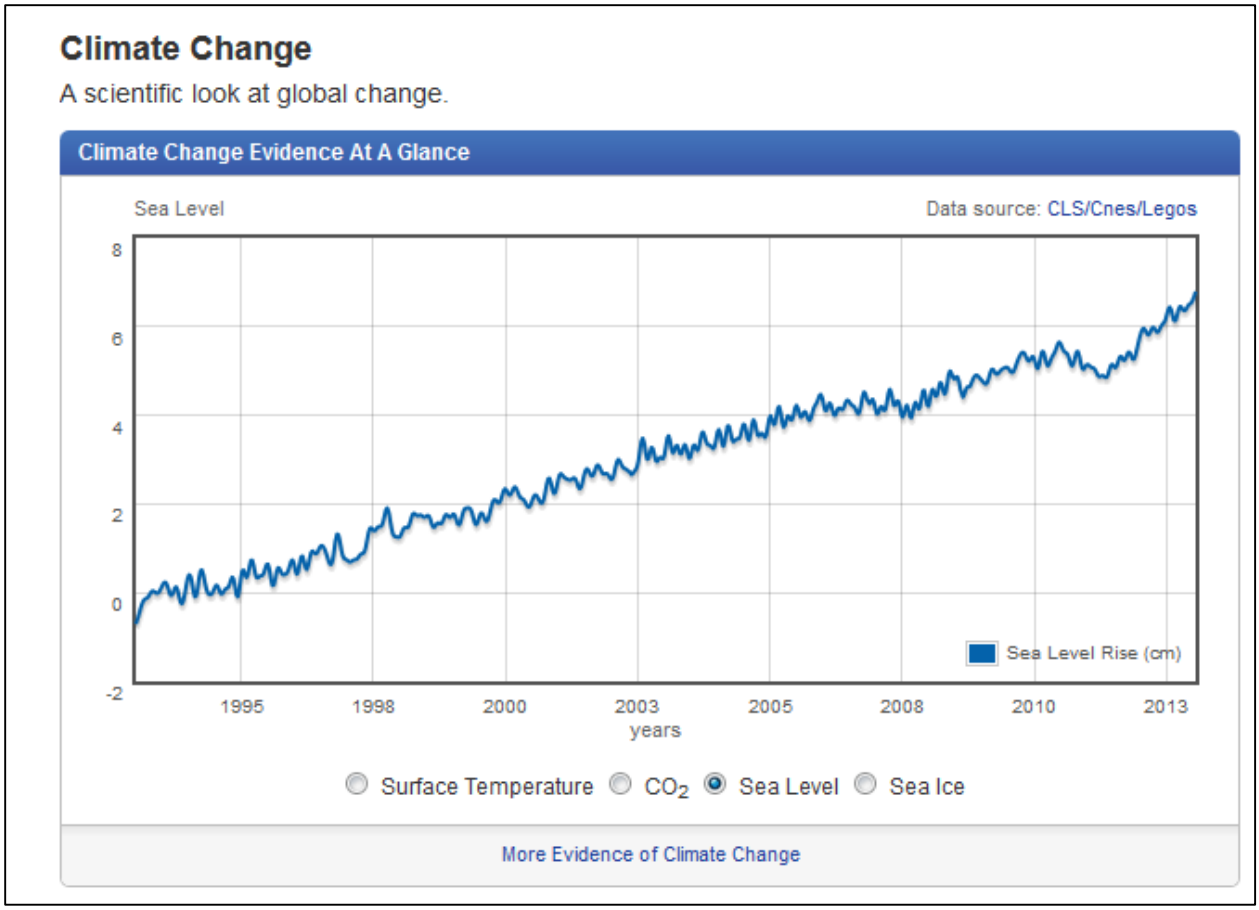
You can view this Daily, Weekly, Monthly, and Custom to view past weather data, just as you could under Chapter 2.

8.2 Climate Change

The *Climate Change* tab under the *More* menu displays the data on climate change. The screenshot below shows changes in surface temperature from 1880 through the current time.



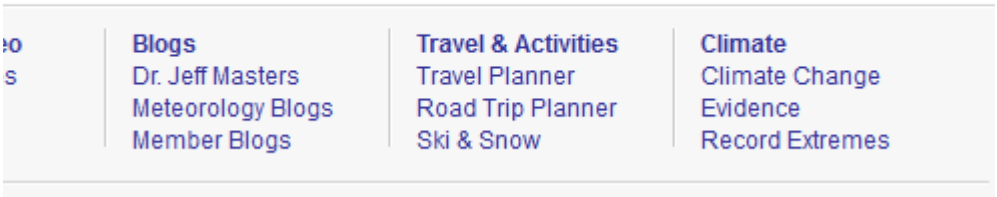
Users can change the type of data displayed at the bottom. Below, it displays the sea level change. This graph shows the change in sea level from 1990 to 2013.



If you click on *More Evidence of Climate Change*, it displays all the graphs on one page.

Below the graphs, on the main *Climate Change* page, more information and links are provided, including *Climate Change News*.

If you scroll all the way down on the Climate Change page, on the bottom right under Climate Change is Record Extremes. If you click on this, it takes you to a page to enter a zip code and it will list the record extreme temperatures for that zip code.



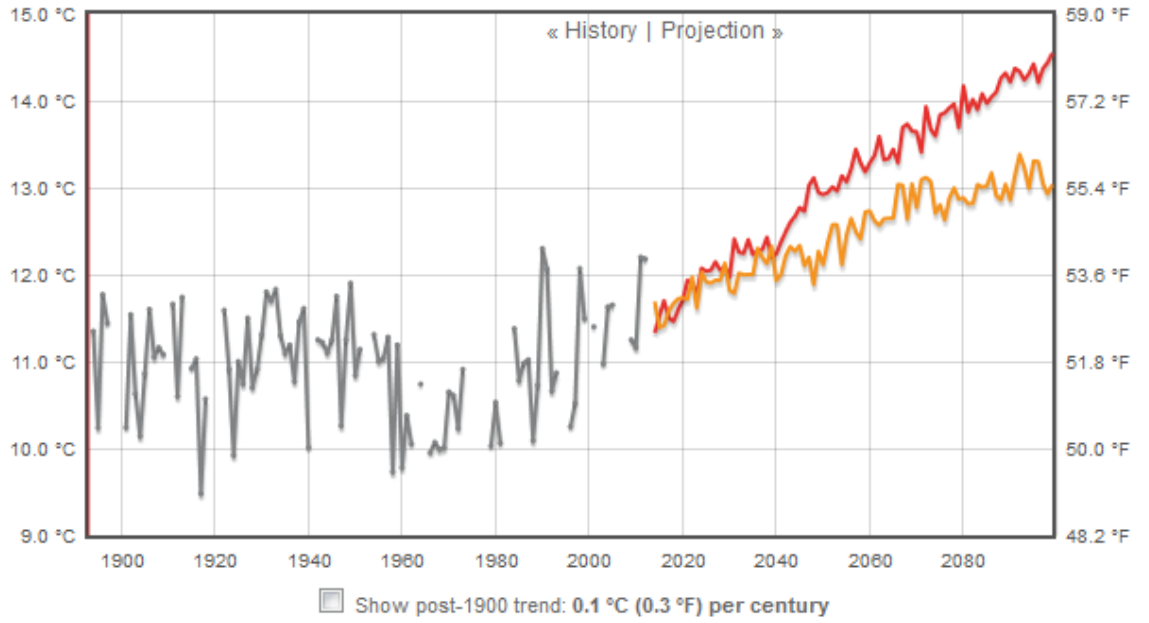
For example, we put in 24060 for Blacksburg and received the following information:

Local Climate Change for Blacksburg Nwso

Average Temperature

Average Temperature | Precipitation | Snow

Data sources: GHCN; Maurer et al. (2009)



Year: 1893

Avg. Temperature: (N/A)

High Emissions: (N/A)

Low Emissions: (N/A)

Average Temperature Disclaimer

The above plot is average annual temperature for the selected station. Switch stations by using the map below. In grey is historical data from the Global Historical Climatology Network (GHCN). The post-1900 trend is in black. GHCN includes approximately 6,000 temperature stations across the globe, and is the primary source for temperature data for global temperature records. Records in this GHCN database date back to as early as 1700. There are some gaps in the GHCN data, and when this occurs, the legend will say "N/A."

In red and orange are the projections from global climate models under two IPCC greenhouse gas emissions scenarios: high (red, A1B) and low (orange, B1). The result is an average of many global climate simulations, which can be found here. The low emissions scenario projects a 1.8°C global rise in temperature through 2100, while the high emissions scenario projects a 2.8°C global rise in average temperature through 2100. Note: The high emissions scenario is not the highest in the IPCC scenarios. The highest scenario is A1F1, which projects up to 6.4°C warming, globally. Our current emissions are on a pace greater than A1B, and close to A1F1.

8.3 *Site Map*

The last sub-tab menu item under the *More* category is the *Site Map, which serves as* an index of the Weather Underground® website. It contains a list of all maps, current conditions, blogs, and many more links to everything on Weather Underground®. Click on the link to explore Weather Underground®. Once finished, return to the main page of Weather Underground®.

Appendix A

Additional Resources

For more information on fire go to NASA: Fire Energetics and Emissions Research go to http://feer.gsfc.nasa.gov/

For more information on the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) go to www.weather.gov

More information on fire by year-to-date and acres burned go to National Interagency Fire Center http://www.nifc.gov/fireInfo/fireInfo_stats_YTD2012.html

For more information on fire go to U.S. Fire Administration http://www.usfa.fema.gov/training/nfa/courses/online.html

For more information on Fire Management go to U.S. Forest Service: Fire and Aviation Management http://www.fs.fed.us/fire/training/index.html

For more information on Ski routes visit http://www.onthesnow.com/?XE_AFF=weather%20underground

For more information on the National Weather Service and radar visit http://www.nws.noaa.gov/asos/

For more information on MADIS (a worldwide meteorological observational database and data delivery system) visit http://madis.noaa.gov/

For more information on the USGS (United States Geological Survey) and earthquakes visit http://earthquake.usgs.gov/earthquakes/index.php

The National Weather Services' Weather Education and Outreach Site: http://www.weather.gov/education This site includes information for teachers and students, and contains documents, videos and online activities.

The National Geographic Society – weather education site: http://education.nationalgeographic.com/education/topics/weather/?ar_a=1

Weather Wizkids: http://www.weatherwizkids.com/

The Weather Channel's Discovery Education (a site for teachers, students and parents): http://www.discoveryeducation.com/connectwithweather/

NASA's Weather and Climate: http://pmm.nasa.gov/education/weather-climate

The American Meteorological Society's Weather Education Resources: http://www.ametsoc.org/amsedu/educationresources.html

North Carolina State University Climate Education for K-12: https://www.nc-climate.ncsu.edu/edu/k12/