



SKYWARNEWS



NATIONAL WEATHER SERVICE STATE COLLEGE, PA

SPRING 2014

“WORKING TOGETHER TO SAVE LIVES”



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Did you know the coldest temperature ever recorded in Pa was -42F in Smethport on Jan 5, 1904?



Run and Hide, It’s The Polar Vortex!

John La Corte—Senior Forecaster

Headlines were made and much was said in January when the coldest airmass in 20 years plunged into the northern and northeastern US. Somewhere in the mix, the term “Polar Vortex” was used and thanks to today’s 24 hour a day news and social media presence, a “new” star was born.

Media reports heralded this “new” phenomenon and questioned where global warming had gone, while others even referred to the Polar Vortex as a hoax made up by meteorologists. I can assure our readers it is not new and definitely not a hoax.

What is the Polar Vortex? Well it’s really not so mysterious. It’s low pressure that generally confines itself to the polar regions of each hemisphere, and since most of us don’t live at the poles, few of us have probably ever even heard of it. Simply put, it is the prevailing flow pattern that generally dominates the high latitudes, and it normally keeps the cold air that is present bottled up and well north of the mid latitudes which is where most of us reside. However, the polar vortex can weaken and when it does, pieces of cold air spill out and like this year, headlines result. Figure 1 (page 5) gives a simple overview of what a weakened polar vortex looks like and how the cold air sloshes about, invading far to the south. (cont. p. 5)

The Almanac Nailed it!

John La Corte—Senior Forecaster

Each year we semi-joke about what the Old Farmer’s Almanac has to say regarding the upcoming winter. We generally do this in a tongue and cheek fashion but this year may have earned the Old Farmer some new “street-cred”. Back in August they predicted that two-thirds of the country would experience below normal cold, and that the local area would be in the zone between bitter cold and just plain cold. They also predicted that much of the Mid-Atlantic area would be snowier than normal. Plainly put, in the weather business they pretty much hit a home-run. (cont. p. 6)

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2014 Near Earth Objects, Meteors and Eclipses

Barry Lambert —Senior Forecaster

Near Earth Objects –

2014 is slated to bring us some close brushes with Near Earth Objects (NEOs), especially during the September-October time frame, when a few asteroids will pass by Earth within the distance of the moon's orbit. The following table provides a complete listing of all known NEOs (passing within 0.1 AU or one-tenth the distance between the earth and sun) during the remainder of 2014.

Table of Near Earth Objects: http://neo.jpl.nasa.gov/cgi-bin/neo_ca?

[type=NEO;hmax=all;sort=date;sdir=ASC;tlim=far_future;dmax=0.1AU;max_rows=20;fmt=full;action=Display%20Table;show=1.html%20](http://neo.jpl.nasa.gov/cgi-bin/neo_ca?type=NEO;hmax=all;sort=date;sdir=ASC;tlim=far_future;dmax=0.1AU;max_rows=20;fmt=full;action=Display%20Table;show=1.html%20)

There are no huge NEOs, nor any very close passages of any expected for the rest of this year. However, considering that only about 10% of the total asteroids larger than 1 km in diameter are accounted for and tracked, there's always the potential for unforeseen and untimely encounters with one of these space rocks.

This link provides some interesting facts about the size, occurrence and impact effects of comets and asteroids, courtesy of NASA's Near Earth Object Program.

Near Earth Object Facts: <http://neo.jpl.nasa.gov/neo/>

Meteors showers –

This link from the American Meteor Society – www.amsmeteors.org/2013/12/2014-meteor-shower-list/ provides tables that lists various types of meteor showers during 2014 (major, minor, weak and variable). The Quadrantids, Perseids and Geminids are the highlight of the year, containing a maximum of 100 or more meteors per hour.

Lunar Eclipses -

Our attempts to monitor and even view any of the above listed NEOs and meteor showers will be handsomely rewarded with an excellent chance to view an unprecedented four consecutive “Total” Lunar Eclipses (known as a Tetrad) over the upcoming 18 months. Normally, there is an average of two Lunar eclipses per year (but not all of them are total). This Tetrad will be visible over all of the U.S. (and occur at a regular interval of every 6 months), so even if you're travelling out of town on those 4 days, there's still great reason to set aside some time to take in this celestial marvel. The first eclipse occurred beginning around 2 am EDT on Tuesday April 15th, 2014 with totality occurring along the East Coast of the U.S. around 3 am EDT. The following link and video illustrates all of the specifics about the upcoming set of eclipses. Hopefully you can enjoy at least one of these upcoming celestial events.

Tetrad of Lunar Eclipses: http://science.nasa.gov/science-news/science-at-nasa/2014/27mar_tetrad/



Which of the following is responsible for more weather-related deaths each year?

- * **Lightning**
- * **Tornadoes**
- * **Floods**
- * **Hurricanes**
- * **Heat**



See the answer at the end of the Newsletter (page 12).

Growing Degree Days

David Martin —General Forecaster

Many plants and trees start growing as the days get longer and warmer in the spring. While sunlight is a big factor, the warm up is the real driver. Some years, such as 1982 and 1993, featured cold weather patterns persisting well in the spring season and this greatly retarded the seasonal green-up.

Temperatures across the northeastern states have averaged well below normal since November of last year. This is the coldest such period in many areas since the mid to late 1970s. While there have been a few mild days across the region, it is only recently that the combination of warmer temperatures and adequate rainfall has helped thaw the deep frost that formed in the ground and allowed the growing season to get started.

A growing degree day (GDD) is a measure of heat accumulation that is often used by horticulturists, gardeners and farmers to predict plant development rates, such as the date that a flower will bloom or a crop will reach maturity. Growing degrees (GDs) are defined as how much warmer the observed *average* temperature (maximum temperature plus minimum temperature divided by 2) is above a certain threshold *base* temperature. This threshold base temperature varies among crop species and is defined as the temperature below which plant growth is zero. Thus, growing degrees can be calculated by subtracting the *base* temperature from the observed *average* temperature. Normally, the GDD's are calculated starting on March 1st.

The *base* temperature for many plants and fruit trees is 50F. For example, a low temperature of 30 degrees and a high temperature of 70 would result in zero GDs $((70+30)/2=50)$.

While plants generally wait for the warmth to grow, it is possible to be too warm too soon for some. Fruit trees fall in this category. They normally do well in areas close to the Great Lakes. This is in part due to the lakes tending to temper the warm up in the spring. A too-rapid warm up can cause fruit trees to blossom early. In such cases, a late season cold snap can damage the buds or flowers. This occurred back in March 2012, when much of the region experienced the warmest March on record. Afternoon highs in the 70s and lower 80s, combined with mild overnight low temperatures, resulted in a rapid accumulation of growing degree days (GDD). Flowers on area fruit trees that spring came out as much as 4 to 6 weeks early. Freezing temperatures in late April resulted in much of the fruit crop being lost. Many areas saw a 70 to 100 percent reduction in production.

Even with normal temperatures in spring, damage can result if cold weather occurs after the trees have flowered. This was the case in 2002, when temperatures across central Pennsylvania fell into the 20s in late May. (Cont. page 4)

Growing Degree Days cont:

Growing degree days can be used for other things such as animal development and entomology. Figuring when a turkey would be mature enough to butcher or the best time to administer pest control are just a couple of examples.

Further information on growing degree days can be found on the Climate Prediction Center web site.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/

Many other sites have information on growing degree days, including the Northeast Climatic Center at Cornell. There are even “apps” for smart phones and tablets. Whether you are a professional farmer or just have a back yard garden as a hobby, we hope you find this information useful.



Amazingly, an acre of corn can transpire about 3,000 to 4,000 gallons of water per day!

Preparing for Rising Seas

John La Corte — Senior Forecaster

Super-Storm Sandy (October 2012) brought into stark reality what a major storm can do to low lying areas of our coasts when it caused erosion and flooding from North Carolina to Maine. Especially hard hit during Sandy was the city of New York, which saw large sections of its low lying areas go under water, including parts of the subway system.

Boston is a little more than 200 miles northeast of New York City and the potential for flooding from storms and sea level rise poses just as much of a problem. Since its inception in 1630, the city has grown geographically, but not simply by expanding to the west. Much of the physical growth resulted from reclaimed wetlands and marshes and plain old landfill. Figure 1 (page 7) shows a map of how Boston has grown throughout the last 300 plus years, and it also provides a glimpse of what the sea is likely to reclaim as it rises.

Using conservative numbers of sea level rise of around 2 feet by 2050 means that even in normal weather, low lying parts of the city will experience twice a day tidal flooding similar to what Venice Italy experiences now. During some of the bigger nor'easters or hurricanes as much as 30% of the city could flood.

Since 2007, Boston has produced a Climate Action Plan (<https://www.cityofboston.gov/climate/>). The document covers emission reduction, as well as climate change preparation. After Super-Storm Sandy the city also convened a task force and they developed the “Climate Ready Boston” report that came out in October of last year.

But of course plans do not always equate to actions. Many feel the city is not doing nearly enough to plan for climate change and what the effects will be on the city and surrounding communities. (Cont. page 7)

Polar Vortex cont:

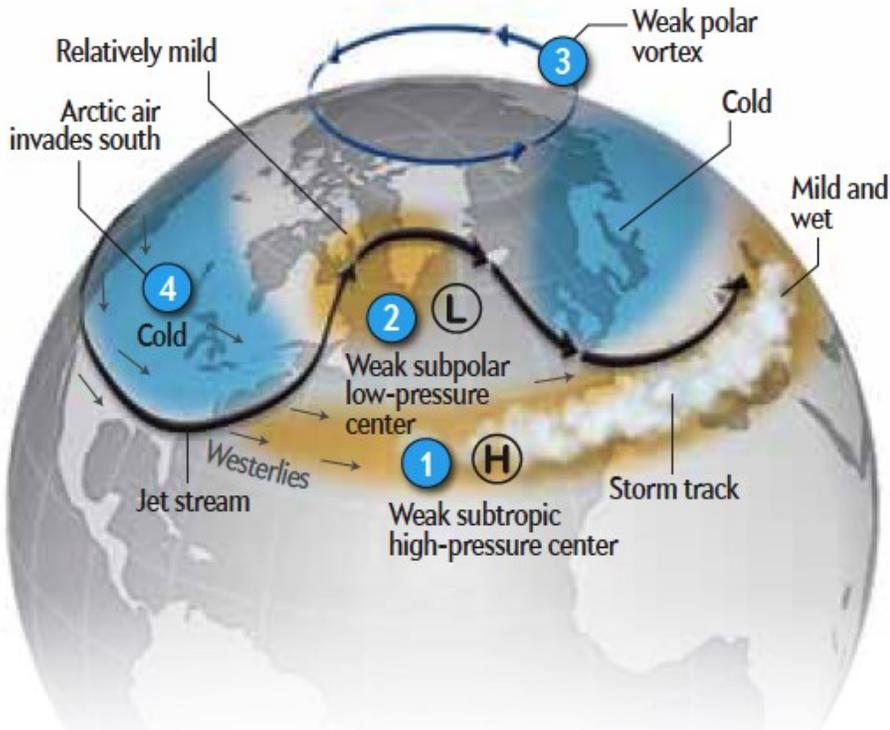


Figure 1. Polar Vortex and associated flow pattern. Graphic by XNR Productions.

While cold air outbreaks in the winter are not unheard of, this year the cold has been unusual for both its intensity and persistence. The cold air that swept across the region during the first week of January was the coldest we have seen since January of 1994! The only saving grace was that the worst of it was relatively short-lived. Most locations here in Pennsylvania only had a couple of bone chilling mornings before temperatures moderated. However, the cold air during the last two weeks of the month, while just a tad less extreme, was much more tenacious. Combine the intensity of the cold with the fact that visitations of air masses this frigid have become rare in recent years, and people are all wondering if climate scientists are wrong, and rather than the Earth heating up, are we are plummeting into a new ice age?

To answer that last question, let's try to put things into some perspective. While it has certainly been cold here, it hasn't been cold everywhere. In fact in Alaska it was downright balmy while over western Russia they were wondering where winter went. Figure 2 shows that the cold that we experienced in early January was more than balanced out by large areas that were warmer than normal (reddish colors represent temperatures above normal, blue below normal).

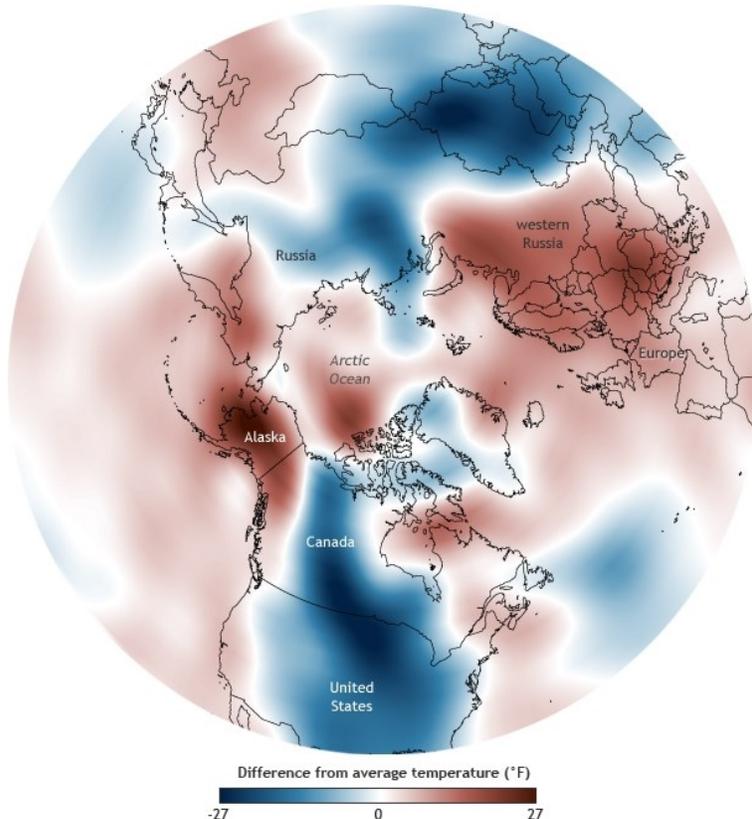


Figure 2. Air temperature anomalies for the period of January 5-7, 2014.

Another way to keep things in perspective is to see how cold it actually got compared to other cold outbreaks of the past. Here in State College, the low on January 7th was 9 below zero, good for only the 38th coldest morning ever. The coldest morning was back in February of 1899 when it hit -20 on the 10th. The table below summarizes how cold it can get versus what occurred. As you can see, it can and has been a lot worse.

<i>Location</i>	<i>2014</i>	<i>All Time Record</i>
State College	-9	-20 Feb 10, 1899
Altoona	-8	-25 Jan 19, 1994
Bradford	-15	-30 Feb 11, 1979
Harrisburg	0	-22 Jan 21, 1994
Williamsport	-5	-20 Jan 21, 1994
Lancaster	-1	-16 Jan 21, 1994
York	-1	-21 Jan 21, 1994

A comparison of the low temperatures during the first week of January of 2014 with the all time record lows.

The Almanac cont:

The winter as we now well know, was cold and snowier than normal in our area. In contrast to recent winters when we wondered where the snow and cold had gone, this year shocked us back to reality and introduced many to the term “Polar Vortex”. (see the lead story)

While December was chilly, the bitter cold set in during January and has been pretty much relentless even as of late March. The arctic air mass that invaded much of the eastern United States in January delivered the coldest local temperatures that we have seen in Pennsylvania in 20 years! Headlines were made for frozen water pipes, paralyzing snow and ice storms, soaring energy costs and sadly, people and pets freezing to death.

While the local winter will probably register in most people’s memories as severe and very long, it was barely a blip in the historical record books. The below normal temperatures and above normal snowfall were not really close to the worst of all time for central Pennsylvania’s climate sites. Harrisburg and Williamsport for example, where record data exists back into the 1880’s, could only register 13th and 16th for both cold and snow respectively. Memorable, but not record setting.

	Temp	Dep	Snowfall	Dep
Harrisburg	28.1	-4.1	42.6	+18.2
Williamsport	24.8	-4.4	43.6	+17.4
Altoona	26.2	-3.1	52.2	M
State College	25.0	-4.4	47.8	+16.5
Bradford	20.0	-4.1	54.4	+1.8
Lancaster	27.2	-7.6	59.3	M
Johnstown	23.6	-3.8	43.3	M

Table 1. Winter 2014 Season Summary (Dec-Feb)

Table 1 shows a summary of temperatures and snowfall for a handful of climate sites around our region. While the cold and snow have continued into March, which is still technically astronomical winter, for the sake of record-keeping, the meteorological winter consists of the months of December through February.

Figure 1 shows how extensive the cold was this winter, with the core of the bitter chill centered over northern Minnesota and Wisconsin. By early March the Great Lakes were more

than 90% ice covered, the most extensive ice coverage since 1979. (Records of ice cover began in 1973).

Departure from Normal Temperature (F) 12/1/2013 – 2/28/2014

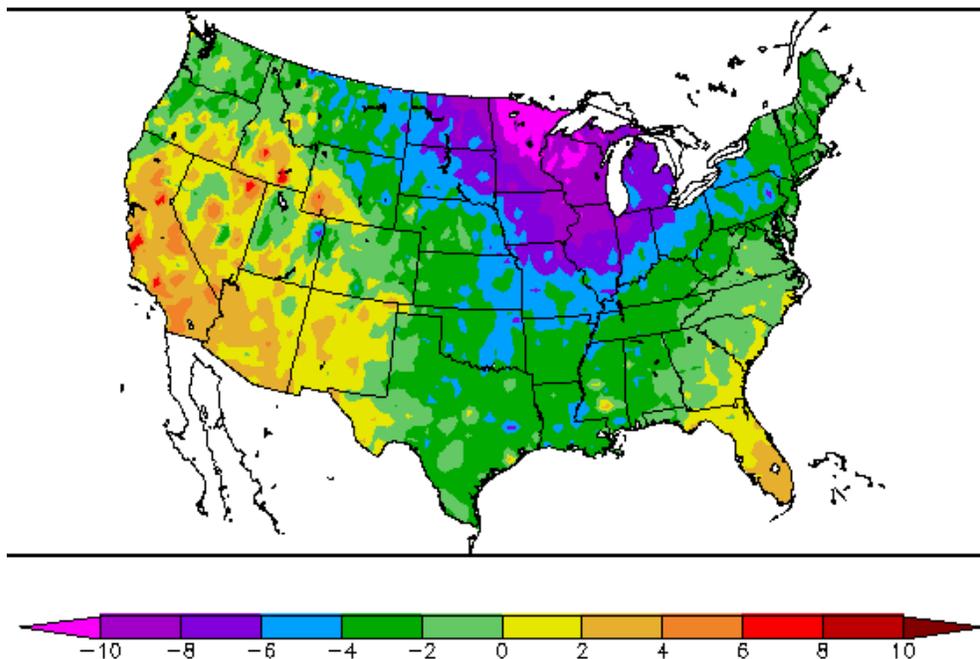


Figure 1. Winter 2014 Temperature Departure from Normal.

While we do not have a chart that shows snowfall departures, a winter precipitation departure map (not shown) would depict much of Pennsylvania actually near normal or even slightly drier than normal. The exception being a stripe of above normal precipitation, much of which fell as snow, from Virginia up over southeastern Pennsylvania to over Long Island and southeastern New England. This was the track of several east coast snow storms (nor’easters) that The Old Farmer’s Almanac called for back in August! Far be it for this author to argue with success. Well done Old Farmer, well done!

For more check out <http://www.post-gazette.com/local/region/2014/03/16/winter-no-surprise-to-farmers-almanacs/stories/201403160072>

Rising Seas cont:

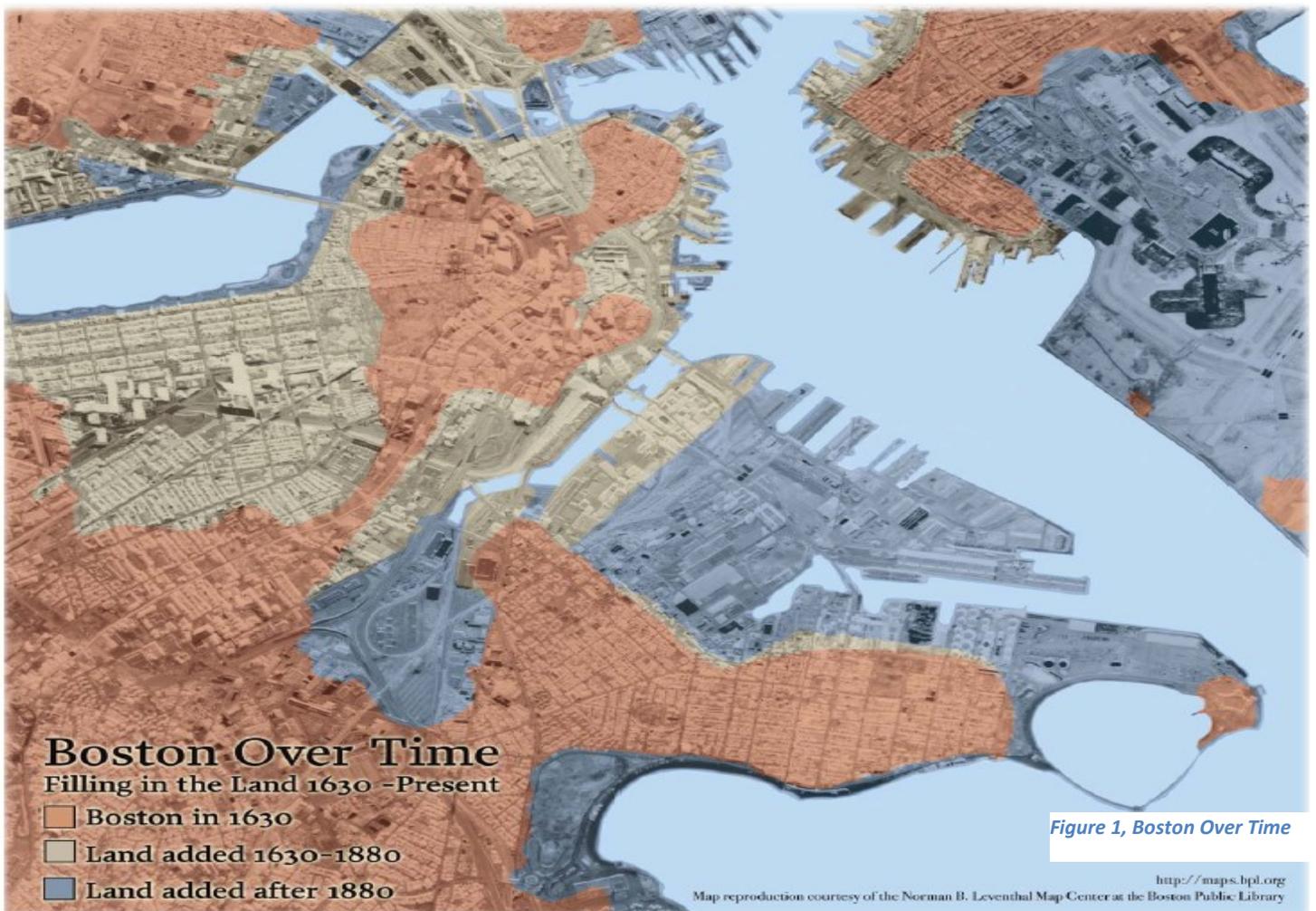
There are some things Boston is doing right now to prepare for climate change. They have begun working directly with politicians and private sector executives from a myriad of industries to begin preparing for the impacts of changing climate conditions. They have already begun considering the likelihood of high water with regards to new construction. One such example is its Spaulding Rehabilitation Hospital that was built in the Charlestown Navy Yard (home of the USS Constitution –Old Ironsides). The first floor has been built nearly 4 feet above the normal 100 year flood height. No critical patient activities take place there, and all electrical and mechanical systems are on the roof. The building is not flood proof, but it has been designed to keep functioning even during and after a storm of Sandy’s magnitude.

They have done other things like create emergency back up systems for traffic lights and emergency radio repeaters at major intersections of evacuation routes. They are urging new developers to plan to design their projects to keep functioning even during a major storm and the city is developing “micro-grids” which are meant to survive flooding and get heating and cooling systems back online quickly after the worst weather.

Of course these are just a start, and much more needs to be done to prepare many of our coastal cities for the inevitable.

Much of the information for this article was taken from the Boston Globe, “How Boston is — and should be — preparing for rising seas” by Michael Fitzgerald.

Read more at <http://www.bostonglobe.com/magazine/2014/04/04/how-boston-and-should-preparing-for-rising-seas/8mF4YVWgAMzDGQexMF35FK/story.html>



El Niño May Not Be the Answer to California's Drought

John La Corte — Senior Forecaster

The *FiveThirtyEight* blog (538) and its founder Nate Silver became famous by using statistical models and method to correctly predict the outcome for 49 of 50 states during the 2008 presidential election and going 50 for 50 during the last election. But that's politics and we are interested in weather, right? Well his 538 blog also addresses science issues and one of those is the El Niño that is predicted to develop in the South Pacific.

A simplistic view of El Niño has always been that it brought great rains (and perhaps flooding) to California, as we saw in the winters of 1997-98 and 1982-83. Well Steven Stirling writing for the 538 blog applied some statistics to El Niño events dating back to 1950 and what he found was sobering; there is little or no direct relationship between El Niño and a wetter than normal winter in the Golden State.

Of course we in the weather community knew that. If merely having an El Niño meant California would be guaranteed a deluge, who would need forecasters? What we have learned is that El Niño comes in different "flavors". Exactly where in the Pacific ocean the warming develops has everything to do with the upcoming seasonal pattern, specifically where it is most likely to be wetter or drier, as well and cooler or warmer, than normal. A more complete explanation of what El Niño is, where it is measured and what the weather effects tend to be can be found at:

<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>

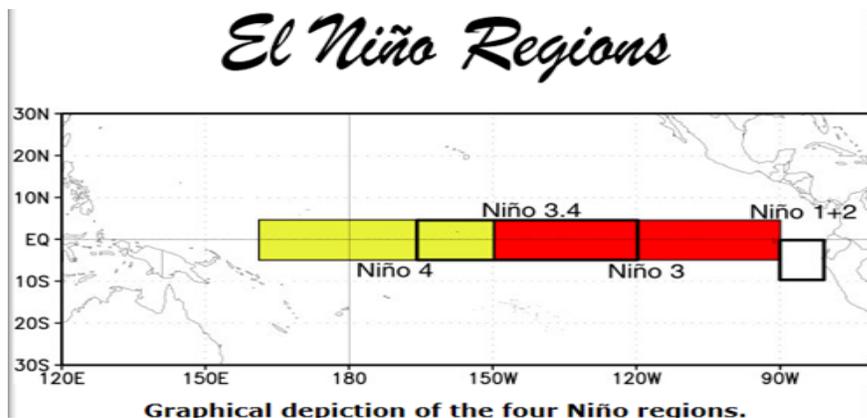


Fig. 1 El Niño regions.

The regions where water temperatures are measured to determine the "ENSO" state (El Niño Southern Oscillation) lay along the equatorial Pacific from the coast of South America almost all the way to New Guinea. (Fig 1.)

What Mr. Stirling found was that since 1950, California experienced widely different outcomes, sometimes even year to year with similar states of the El Niño. The weak El Niño of 1977-78 was dry while 1978-79 was much wetter than normal.

Since 1950, 17 of the 22 El Niño patterns have been weak to moderate. This tended to provide greater variability in California's precipitation trends than during the stronger El Niño years. The data tended to show that if the expected El Niño is weak, it is more likely to remain drier than normal than be rainy.

There are indications that the expected El Niño later this year will be a strong one. Mr. Stirling noted that this has only happened six times since 1950. This is a very small sample size, especially for a meteorological event, but five of the six events were wetter than normal in California. A notable exception was the El Niño of 1965-66, which saw it remain very dry over the state.

What will happen remains to be seen, but what we do know is the old conventional wisdom of El Niño breaking California's droughts needs to be re-examined. As with almost all things weather, the answers are not simple but hopefully we will learn more with each new experience.

To read more of Mr. Stirling's article, go to:

<http://fivethirtyeight.com/features/el-nino-probably-wont-quench-californias-thirst/>

Update Your Spotter Information

Bill Gartner—General Forecaster

NWS/WFO State College
328 Innovation Blvd, Rm #330
State College, PA 16803

If you are not sure if we have the most up to date information on file, go ahead and send us an email or note with your current information and we will verify it.

Please note that your personal information (address, phone #, email mail address, etc.) is NOT shared with or given to anyone outside of the NWS (unless your permission is gained first) and is used only to contact you in the event of severe weather, send you SkyWarn News, or communicate important program changes.



If you grew wary of our long and relentless winter, blame Punxsutawney Phil

Our New Web Page

John La Corte —Senior Forecaster

If you are like most, you are a creature of habit and change may make you a little uneasy. Sorry, but we changed our home page.

The screenshot displays the National Weather Service website for the State College, PA office. The page features a top navigation bar with links for HOME, FORECAST, PAST WEATHER, WEATHER SAFETY, INFORMATION CENTER, NEWS, SEARCH, and ABOUT. Below this, there is a section for local forecasts and news headlines. The main content area includes a map of the region and various weather-related links. A red arrow points to the new navigation menu, which is located at the bottom of the page and includes links for Current Hazards, Current Conditions, Radar, Forecasts, Rivers and Lakes, Climate and Past Weather, and Local Programs.

The old format has been relegated to the internet dust-bin in favor of a new “standardized” version. The goal is to be more consistent from one National Weather Service office to another. After a short familiarization, I am sure you will see that all your favorite weather information is still there and it should be easier to find similar information on the pages of other offices as well.

The biggest change besides the layout is the elimination of the old menu section that used to run down the left side of the page. This has been replaced by two different “drop-down” menus highlighted in red below. Hovering your PC computer mouse over the menu expands it. Tapping the menu header on your smart phone or tablet similarly expands the menu, making available a plethora of information and product links.

I am sure after a few “test drives”, you will forget the old page and become comfortable with our new and improved version. Remember, the only consistent thing in life is change. Hopefully, you will grow to embrace it.

NWS State College Spotter reporting Procedures

Pete Jung —Warning Coordination Meteorologist

Greetings Spotters! I wanted to first express our thanks for all your snow and ice reports during this past long and cold winter. Your reports are invaluable to us! Now, as another severe weather season is upon us, it's time again to review some basics of our reporting procedures for SkyWarn Spotters and highlight some changes.

First and foremost, if you haven't already noticed, our traditional web page has changed location (and look). The new address is <http://www.weather.gov/ctp/>. We are working hard to make most of the availability of items on our new web page match the old site. We're not quite there yet...so bear with us as we continue to make improvements to the new site. Spotter information can be found by choosing "SkyWarn" from the "Local Programs" drop down menu on the front page.

A second big change is that the E-Spotter web portal will be going away. While this site will be replaced with a new interface (good news), the bad news is the new site is not fully rolled out for offices in the eastern U.S. The plan is that E-spotter will remain for another month or so, until the new system is up and running. Check our web site (<http://www.weather.gov/ctp/reportSevere>) for updates on this transition.

Other methods to communicate with us:

PHONE – This is an old, but tried-and-true method. As a SkyWarn Spotter, you can always call in your reports, using our unlisted Spotter Number. Remember that this number is UNLISTED and reserved for SPOTTERS ONLY! Our 24-hour public line for forecasts (and even to speak to a forecaster) is 814-231-2408. This method is preferred to report any real-time, threatening weather (i.e. tornado on the ground, large hail occurring, etc.)

FACEBOOK – You can find us (and post) via Facebook at US National Weather Service State College PA.

TWITTER – @NWSStateCollege and use #CTPWX or #PAWX

EMAIL – You can send us pictures and videos via our office Email Address: ctp.stormreports@noaa.gov Remember, this is just an email, so for fast breaking weather, use the Phone or social media!

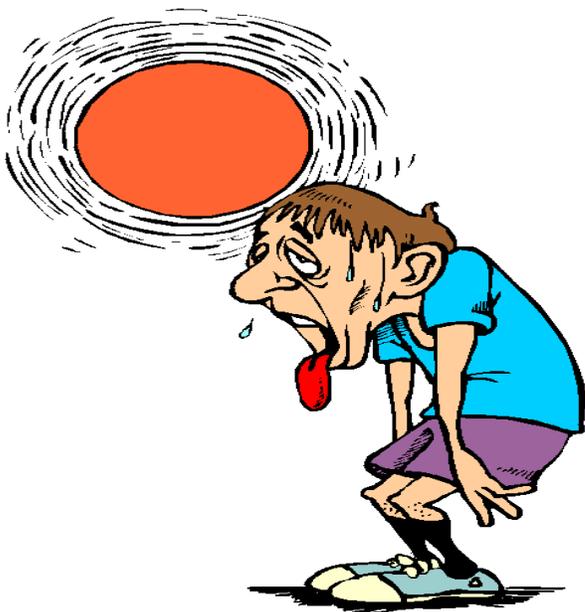
For amateur radio operators, we suggest that reports are gathered via a net control, and then forwarded to us via one of the methods above (most likely phone). We do not have a dedicated amateur radio operator in the office to monitor radio traffic.

Thanks again for bearing with us as we transition some of our technologies. Remember...YOUR reports are vital to our severe (and winter) weather operations and forecasting!

The answer to the Weather Fatality Quiz: **HEAT:**

	Lightning	Tornado	Flood	Hurricanes	Heat	Cold	Winter
1986	68	15	94	11	40	69	395
1987	88	59	70	0	38	30	349
1988	68	32	31	9	41	17	55
1989	67	50	85	38	6	121	63
1990	74	53	142	0	32	13	48
1991	73	39	61	19	36	13	45
1992	41	39	62	27	8	14	59
1993	43	33	103	2	20	18	66
1994	69	69	91	9	29	52	29
1995	85	30	80	17	1,021	22	17
1996	52	25	131	37	36	62	86
1997	42	67	118	1	81	51	90
1998	44	130	136	9	173	11	68
1999	46	94	68	19	502	7	41
2000	51	41	38	0	158	26	41
2001	44	40	48	24	166	4	18
2002	51	55	49	51	167	11	17
2003	43	54	86	14	36	20	28
2004	32	35	82	34	6	27	28
2005	38	38	43	1016	158	24	34
2006	48	67	76	0	253	2	17
2007	45	81	87	1	105	47	16
2008	27	126	82	12	71	44	21
2009	34	21	56	2	45	33	28
2010	29	45	103	0	138	34	21
2011	26	553	113	9	206	29	17
2012	28	70	29	4	155	8	28
10 Year Average	35	109	76	109	117	27	24

Number of Weather Fatalities - Ten Year Average



As many of you know, we have established a presence on both **Facebook** and **Twitter**. This provides new and easier ways for us to interact with you. These social media outlets allow us to post updates that may pique your interest on the weather system or event of the day. Perhaps more importantly, they also allow us to hear from you in a more informal and robust fashion. We encourage everything from reports on the amount of snow or rain you have had, to information on what is going on that may or may not be in the forecast.

Facebook allows for posts of varying lengths and is very friendly to graphical posts while **Twitter** is limited to posts that are no more than 140 characters in length, thus geared more to short precise information bursts that may or may not contain links to pictures or videos.

Using either platform, we look forward to hearing from you!



Remember when using **Twitter** keep messages short and concise (140 character limit). Because of this, abbreviations and punctuation may be used in such a way to keep the messages brief but still decipherable. A key characteristic of **Twitter** is the use of "hash tags". While not necessary, they are encouraged as they allow for easy categorizing and searching. Hash tags start off with the "#" (pound sign) character and help other **Twitter** users to find and procreate (re-Tweet) your information. An example we use here at the State College office is **#ctpx**. CTP is the "call sign" for our office and "wx" is the abbreviation for **weather**. So a report may look something like **#ctpx 4 inches of snow in your town and it's still snowing hard**. Another hash tag we search for is **#pawx** but these aren't the only ones. If you have a severe thunderstorm you may want to tweet something like **#ctpx #severethunderstorm in your town at the time**. The idea is to fit as much information into that 140 character limit as possible and still be descriptive enough to convey what is happening and where.

