



WORKING TOGETHER TO SAVE LIVES



SKYWARN NEWSLETTER

National Weather Service

STATE COLLEGE, PA

AUTUMN 2017

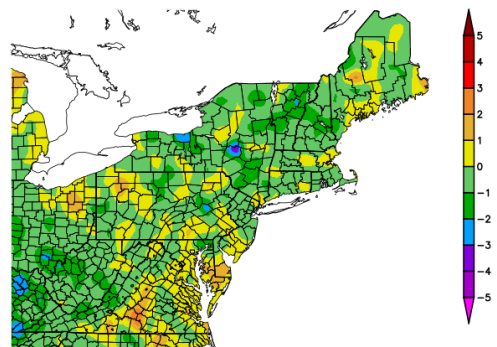
The Summer of 2017 in Review

John La Corte - Lead Meteorologist

After the summer of 2016 reminded everyone what a truly long hot summer could be like, this year was actually pretty pleasant for a change. Figure 1 shows that as far as temperatures go, most of the region did not vary much either side of normal. After June and July ended up about 1-2 degrees above average in most areas, August reversed the trend was rather cool. In the end, the summer concluded on the comfortable side when we went through a pretty good stretch where day time highs were warm and the low humidity led to very comfortable overnight lows. Something we seldom see here in Central Pennsylvania.

Rainfall on the other hand was plentiful. A wet July was sandwiched between a June and August where rainfall was close to or slightly below normal in most locations. Figure 2 shows that except for a small portion of the Northern Mountains, most areas ended up 3 inches or more above normal for the season.

Departure from Normal Temperature (F)
6/1/2017 - 8/31/2017

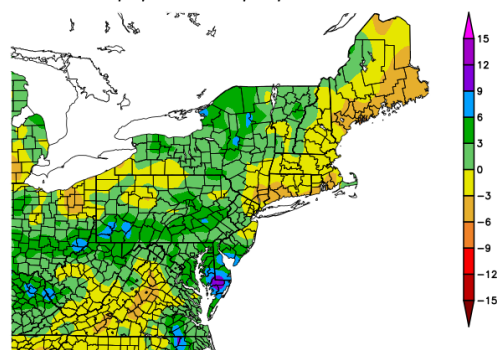


Generated 9/26/2017 at HPRCC using provisional data.

NOAA Regional Climate Centers

Figure 1. Average Temperature Departures Summer 2017

Departure from Normal Precipitation (in)
6/1/2017 - 8/31/2017



Generated 9/26/2017 at HPRCC using provisional data.

NOAA Regional Climate Centers

Figure 2. Precipitation Departure Summer 2017



Another measure of how warm a summer is involves the number of days we hit 90 degrees or warmer. Table 1 shows the comparison between this year and last and we can quickly see this year experienced fewer than half the hot days compared to the long hot summer of 2016.

Number of 90 degree days		
Location	2017	2016
MDT	12	34
IPT	10	25
AOO	1	12
UNV	1	6

Table 1. Number of 90 Degree Days

All in all, the summer was uneventful with heat waves not creating much in the way of headlines.

Winter Forecast?

So what may the upcoming winter have in store for the region? For that we turn to our Climate Prediction Center, the CPC and see what they have to say.

One of the ingredients (but by no means the only one) that get fed into the climate modeling system is the predicted state of the ENSO, or El Nino Southern oscillation. Simply put, will the water temperatures over the tropical Pacific be warmer, colder or near normal?

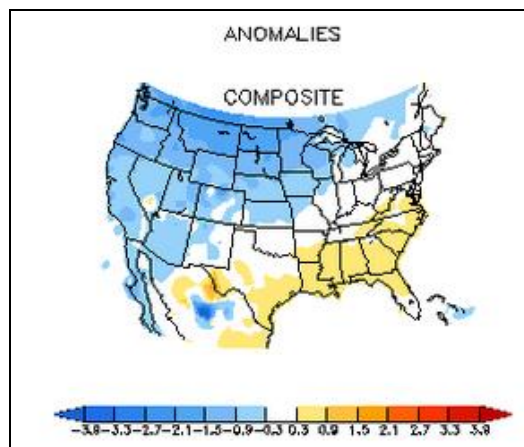


Figure 3. La Nina Temperature Anomaly Composite

The CPC has issued a La Nina watch meaning they expect the tropical waters to be cooler than normal. So what does that mean for our forecast?

During a “normal” La Nina winter, local temperatures tend to average close to average. (Fig 3). After factoring in all the forecast inputs, the official CPC forecast actually leans toward a slightly elevate probability of a warmer than normal temperature (Fig 4).

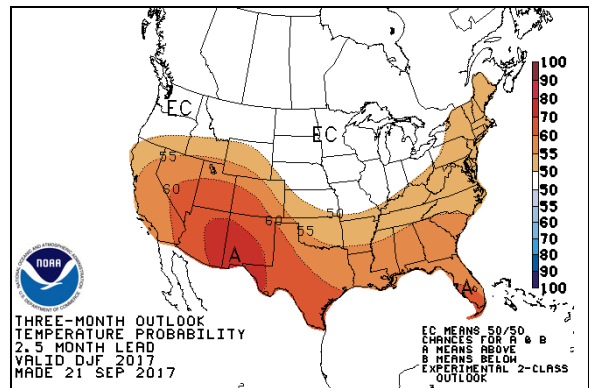


Figure 4. CPC Winter Temperature Outlook

The seasonal precipitation during a typical La Nina has the local area near to slightly above normal with storm tracks that favor moving up to our west through the Great Lakes (Fig 5).

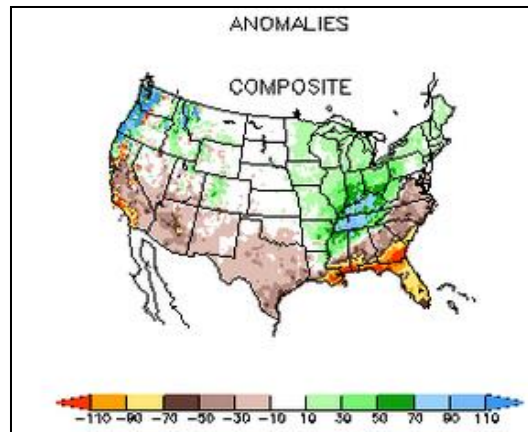


Figure 5. La Nina Precipitation Anomaly Composite

The CPC forecast (Fig 6) looks similar with the Ohio Valley favoring wetter than normal conditions and the local area in the transition



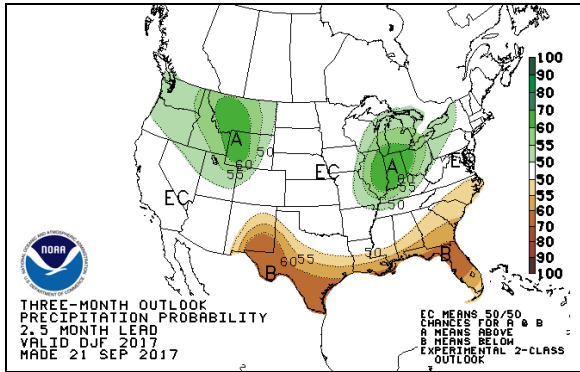


Figure 6. CPC Winter Precipitation Outlook

zone between increased chances for wet conditions to our west and dry to our south and east.

Lastly, what everyone wants to know is how much snow we will get? The CPC doesn't explicitly forecast snowfall, just the overall precipitation (above). But during a typical La Nina winter, with the storm track tending to be west of Pennsylvania, we typically experience below normal snowfall (Fig 7). But keep in mind; it only takes one big storm to turn those expectations on their head.

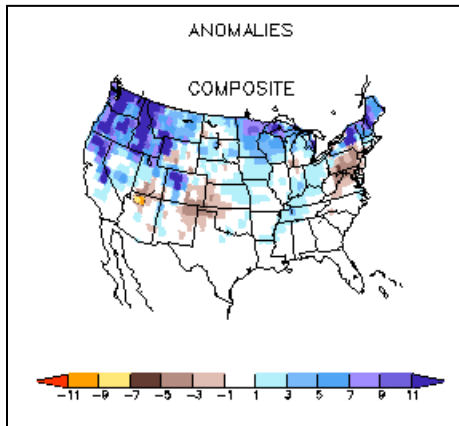


Figure 7. La Nina Snowfall Composite

We also take a look at the venerable outlooks provided by the winter forecasting gurus at The Old Farmer's Almanac. They have been providing these outlooks since 1792 and boast of a 90% forecast accuracy record. This year

they are forecasting a warmer than normal winter over central Pennsylvania. They also expect above normal precipitation but below normal snowfall. Since their forecast recipe involves highly secret ingredients and processes, we will never know what went into that forecast, but they do agree with the CPC on the temperature outlook. As always, we will take a look back next spring to see how it all unfolded. Have a happy and safe winter!

Oh What a Hurricane Season it Was!

John La Corte - Lead Meteorologist

Technically the hurricane season runs until the end of November, but even if it was over today it was one for the ages. Hurricanes Harvey and Irma struck the US mainland within 2 weeks of each other from late August into early September. Harvey blasted the Texas coast and dumped record setting rains on the Houston area, and Irma devastated the Florida Keys and southwestern Florida. Then of course, what happened and is still happening in Puerto Rico remains in the news after Hurricane Maria bulldozed a direct hit on the island.

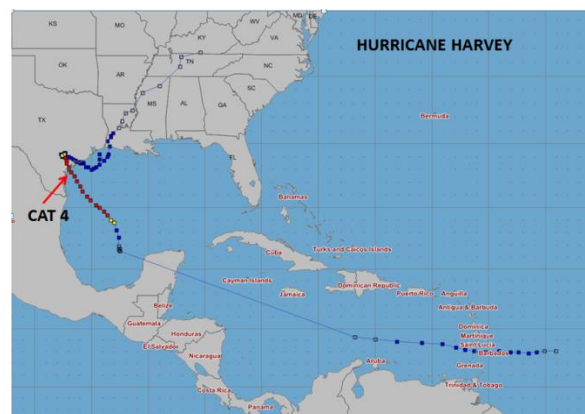


Figure 1. Hurricane Harvey

Figure 1 shows the track of Hurricane Harvey. It rolled through the southern portion of the Windward Islands as a relatively weak Tropical



Storm late in the day on August 18, and in fact it weakened sufficiently by the 19th that the National Hurricane Center (NHC) stopped issuing bulletins on the storm. The remnants of Harvey could be tracked west across the Caribbean over the Yucatan Peninsula into the Gulf of Mexico where conditions became favorable to breathe new life into the storm.

By the 23rd Harvey was once again a Tropical Storm and it intensified steadily to a Category 4 storm before crashing ashore between Corpus Christi and Aransas Texas. While the smaller coastal towns were hit very hard, the real damage was done in and around Houston where the rain was measure in feet, not inches. The flooding was record setting and will be the standard against which future storms will be measured for years to come.

Irma (Fig 2) began way out in the Atlantic Ocean and for almost the entirety of the storm's life, conditions for intensification proved to be nearly ideal. As a result, the storm intensified steadily and rapidly and spent a record setting amount of time as a Category 5 hurricane plowing through the northern Leeward Islands, devastating St. Martin and Anguilla.



Figure 2. Hurricane Irma

The storm passed just north of The Dominican Republic and moved through the southern Bahamas on September 9th. Irma tracked just along the northern coast of Cuba before turning

north and roaring through the Keys into southwestern Florida where category 4 winds and storm surges brought widespread heavy damage.

Irma was a huge storm areal-coverage wise, bringing hurricane force wind gusts to much of the east coast of Florida, a hundred or more miles away from the eye of the storm! It eventually moved up the entire length of the peninsula weakening along the way, before dying over the southern Tennessee Valley.

The last of the big storms (so far?) was Hurricane Maria (Fig 3). The storm came together just east of the Windward Islands in mid-September before it underwent a period of explosive intensification, hitting the island of Domenica as a Category 5 storm late on September 18th. More than 95% of the island's buildings were damaged or destroyed. That would have been bad enough except for what Maria still had in store for the region.

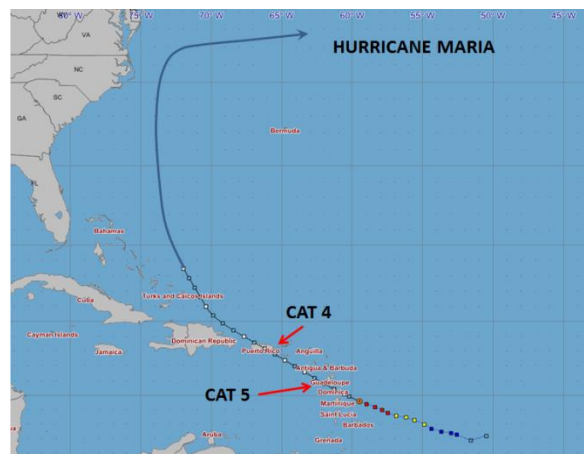


Figure 3. Hurricane Maria

The storm soon rampaged through the southern Virgin Islands and took direct aim at the southeast coast of Puerto Rico during the overnight hours of September 20th. It was still an extremely dangerous category 4 storm and



the damage done to the islands was severe and is still being evaluated.

Maria was soon to move just east of the Turks and Caicos Islands in the Bahamas before meandering north off the Eastern Seaboard where the main effects were rough surf along the beaches and some gusty Tropical Storm force gusts over the Outer Banks of North Carolina. Maria would eventually take a hard right turn weakening over the colder Atlantic waters well southeast of New England.

It will take months for the final tallies in lives lost and property damaged or destroyed to be done, but there is no doubt the Hurricane Season of 2017 certainly cemented its place in the record books as one for the ages!

Update on Warm and Cold Season Hazards

David Martin – General Meteorologist

In recent years, there has been a tendency for more extreme weather events. There is increasing evidence that this has an influence on insects, animals, and disease. In the last several newsletters I have written articles on various subjects such as the decline of Monarch Butterflies and Lyme disease and why.

Another concern showing up in Pennsylvania in recent years is chronic wasting disease (CWD). CWD (transmissible spongiform encephalopathy) occurs in mule deer, white-tailed deer, elk, moose, and reindeer. The first case of this disease was noted in Colorado in 1967.

Chronic wasting disease results in weight loss and death. In recent years CWD has spread to many states and parts of Canada. No cure is

available. CWD has been noted in south central Pennsylvania and is now into Clearfield County.

Persons engaged in animal production, deer hunting and other outside activities should use care when processing deer. The most updated information from the Pennsylvania Game Commission is that the spongiform can stay in the soil for upwards of 16 years and plants can absorb it. It is not a virus or bacteria, but an abnormal protein. There is no evidence of CWD making a jump to the human population, but care needs to be taken when handling deer and elk. Hunters should avoid eating tissue that can harbor the CWD agent such as the brain, spinal cord, eyes, spleen, tonsils, and lymph nodes. This is especially the case for animals from areas where CWD has been identified.

We should not feed wild animals.

Some things to watch for with deer and elk beside weight loss is decreased interactions with other animals, listlessness, lowering of the head, tremors, repetitive walking in set patterns, excessive salivation, and grinding of the teeth. Other symptoms also include increased drinking and urination with affected animals. This may lead in part to the spread of the disease.

Chronic wasting disease was first noted in Adams County in 2012 and in Bedford, Blair, Cambria, and Fulton Counties between 2012-2017, and in Clearfield County this year.

UPDATE ON TICKS

An update on Lyme disease and ticks is listed below.



Aside from Lyme disease, ticks can carry the Powassan virus. The Powassan virus is not as common as Lyme's disease, but has no cure. Unlike Lyme, the tick only has to be on a person for a few minutes for transmission. Within two to three hours of being bitten by a tick infected with the Powassan virus, one may notice headaches, nausea, vomiting, muscle weakness, memory loss, and problems with speech. Unlike Lyme, no rash forms.

MONARCH BUTTERFLY UPDATE

The winter Monarch Butterfly population in Mexico last winter was down by about 27 percent from 2015-2016 levels. This was largely due to a series of severe storms that hit Mexico at the worst possible time for the butterflies.

We can help out by not destroying milkweed. Monarch Butterflies need this plant to survive and breed.

NWS State College to Test Operational Snow Squall Warnings This Winter

Greg Devoir – Lead Meteorologist

Intense snow squalls, frequently accompanying strong arctic cold fronts, are a critical wintertime weather hazard in Central Pennsylvania. Severe local impacts to the traveling public and costly disruptions to commercial interests/interstate commerce can result from the instantaneous loss of visibility and traction and resultant multi-vehicle pileups associated with these snow squalls.

Pennsylvania has a long history of tragic and deadly pileup accidents associated with snow squalls. Although snow accumulations are typically an inch or less, the combination of zero

visibility, gusty winds and falling temperatures causes extremely dangerous driving conditions to develop rapidly for motorists. Minor accidents quickly snowball into fiery multiple vehicle pileups as motorists are unable to see and safely stop their vehicles from becoming part of the mass of twisted metal. Annual highway fatalities from these events can even exceed fatalities from tornadoes.

Up until now, the NWS has issued locally-specific Special Weather Statements (SPS) for snow squalls, as no formal warning had been implemented for these events. However, these statements had limited reach, and did not convey the threat to life and property that a formal warning does. We are pleased to announce that starting in January 2018, the NWS will implement operational Snow Squall Warnings (SQW). The warning will be short-fused and polygon-based, similar to severe local storm warnings (Severe Thunderstorm or Flash Flood), and will greatly facilitate distribution and promote/provide more efficient decision support services.

Adding this new product does not diminish the agency's commitment to overall hazard simplification and associated reduction in the number (consolidation) of Watch, Warning and Advisory (WWA) products. As NWS continues to move forward with simplifying our suite of products, the Snow Squall Warning will be considered for consolidation into the Winter Weather product suite. We are excited to add this new capability to save lives now and address the needs expressed by our forecasters and partners.



Near Earth Objects and Meteor Showers for 2017-18 and Beyond

By Barry C. Lambert – Senior Meteorologist

1) Near Earth Objects (NEO):

Near Earth Objects (NEOs) have been around as long as the Earth has (no pun intended).

If you think Climate Change is a significant regional and global issue now, how about a record air temperature that likely occurred on Earth about 38 million years ago? -- 2370 degrees C (4298 degrees F)! This extremely hot regional temperature was hypothesized to be the result of a meteorite that struck the earth and formed the 28km wide Mistastin Lake located in Labrador, Canada.

<https://cneos.jpl.nasa.gov/ca/>

This link is a table of all known and tracked close approaches to Earth by NEOs. Pertinent information within this table are 1) the close approach date, 2) the distance from Earth measured in Nominal and Minimum “Lunar” and “Solar” distances (LD and au), and 3) the size or estimated diameter of the NEO. For the next several months, the closest approach by any tracked object will be on December 20, 2017 by the space rock called – (2006 XY). This 42-92 meter wide NEO will pass by Earth at anywhere from about twice the distance of the moon to 6 times the distance. Looking out a little further in time, another, relatively smaller (6-14 meter wide) and very recently discovered NEO (2016 JQ5) will pass earth within 1-6 Lunar Distances on May 8, 2018. A similarly small NEO (called 2015 HG182 and measuring 4-10 meters wide) is expected to race by our planet at roughly the same distance on October 11, 2018.

When we change the Nominal Distance of the object’s passage from 0.05 Solar Distance (au) to Less than 1 Lunar Distance (LD), in order to emphasize the rare, but nonetheless potential Earth impacts, we see that the first such occurrence in Earth’s future comes on September 1, 2020 by NEO (2011 ES4). This unwelcome visitor about 20-40 meters in size will pass within about 1/5 the earth-moon distance (the moon is about 238,900 miles away).

The greatest threat (but still quite a remote chance) of a collision by a large NEO within at least the next 100 years appears to be by the well-documented and more easily tracked 99942 Apophis (2004 MN4). This approximately one-third of mile wide, oblong asteroid will make an extremely close approach to Earth of about one-tenth the distance to the moon (as it trails our orbit around the sun and closes in) on Friday the 13th of April, 2029. Another apparently less threatening pass by the Earth occurs on Sunday the 13th of April, 2036!



Figure 1. Simulated image of Apophis on April 2, 2007

Here are a few brief articles about the 2036 close approach of Apophis:



<https://www.space.com/19221-asteroid-apophis-earth-safe-2036.html>

<http://www.skyandtelescope.com/astronomy-news/asteroid-apophis-takes-a-pass-in-2036/>

A collision by a NEO this size would be catastrophic on a large regional, if not continental scale. Here are a few fantastic video presentations that show the difficulty detecting elusive asteroids and an explanation of Apophis.

<https://www.youtube.com/watch?v=LmVpx8P4GHM>

<https://www.youtube.com/watch?v=1NyG4q4HK08>

By comparison, the Tunguska event (Krasnoyarsk Krai, Russia) on the morning of June 30, 1908 flattened 2000 square kilometers (770 square miles) of forest, but caused just 2 “unofficial” deaths in the very sparsely populated Eastern Siberian Taiga. The explosion was an “Air Burst” of a meteoroid (either a dense Asteroid or Comet measuring 60 to 190 meters in diameter respectively) at an altitude of 5 to 10 Kilometers above ground (3-6 miles), rather than a direct earth impact. This is the largest Earth impact event to occur in recorded history. Modern supercomputer estimates are that the energy released by this air burst was 3 to 5 megatons of TNT, roughly equal to the United States’ Castle Bravo ground-based nuclear thermonuclear detonation on March 1, 1954.



Figure 2. Trees flattened by the Tunguska Air Burst

There are a few additional, much closer, but much later passages by smaller NEOs, namely 2012 HG2 (that measures 11-24 meters wide and passes within a minimal Lunar Distance of just 0.0002 or just 48 miles above the earth’s surface) on February 13, 2047, and the 6-14 meter wide, 2010 RF12 that could come within 1600 miles of earth. Both of these NEO

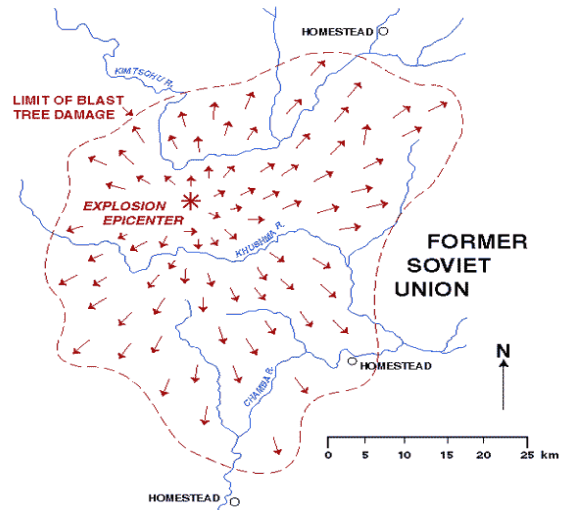


Figure 3. Extent of the Tree Damage from the Tunguska Event

passages are well within the orbit of our Geostationary Satellites (22,300 miles)! Even the much larger Apophis asteroid moves by Earth at a minimal distance equal to just twice the height of our Geostationary Satellites. We have 12 long years to track this space rock, calculate if it’s more of a threat than just a close passage, and if so, devise a plan to divert its course just slightly (while it’s still fairly far out in space) in order to have it miss Earth.

2). Meteor Showers:

What is a meteor shower? Meteor showers take place when typically very small space rocks, also known as meteoroids, enter the Earth’s atmosphere. When there are numerous rocks at the same time, this is known as a meteor shower. Meteoroids are often so small

(the size of a grain of sand) that they burn up quickly in the earth's atmosphere, so there is little chance of a collision. Meteor showers are named after the constellation where the rocks appear to be coming from. The streaks of light you can see are actually caused by tiny bits of dust and rock called meteoroids entering the Earth's atmosphere and burning up. As a rock falls towards earth, resistance of the air on the meteor makes it hot and air around it glows – which has led to them being known as shooting stars. They often appear with a streak of light behind them, caused by the remains of the super-heated rock burning up as the meteoroid falls to Earth.

Light pollution, specifically that from a bright moon, greatly affects your ability to see and enjoy the spectacle of one of the primary meteor showers each year. Prior to setting aside precious time to view a meteor shower, it's good to know what kind of moonlight you'll be competing with that night.

Here are the lunar calendars for 2017 - <https://www.timeanddate.com/moon/phases/> and 2018 - <https://www.calendar-365.com/moon/moon-phases.html> before the event, if the moon is too bright during its full or gibbous phase, it may obscure the view.

Meteor showers 2018		
Jan 01 - 05, 2018	Quadrantids 2018	World
Jan 03, 2018	Peak of Quadrantid meteor shower 2018	World
Jul 17 - Aug 24, 2018	Perseids 2018	World
Aug 12, 2018	Peak of Perseid meteor shower 2018	World
Nov 14 - 21, 2018	Leonids 2018	World
Nov 17, 2018	Peak of Leonid meteor shower 2018	World

Figure 4. Major Meteor Showers for 2017

Meteor shower	Dates / Peak Night	Moon Phase	Meteors per Hour	Constellation	Radiant (Right ascension/ Declination)	Associated Comet
Quadrantids	Jan 1-6 Jan 3-4	30%	120	Bootes	15h 28m +49.5°	2003 EH1 (asteroid)
Lyrids	Apr 19-25 April 22-23	17%	20	Lyra	18h 08m +32°	C/1861 G1 Thatcher
Eta Aquarids	Apr 19 - May 28 May 6-7	85%	45	Aquarius	22h 32m -1°	1P/Halley
Delta Aquarids	Jul 12 - Aug 23 Jul 29-30	33%	20	Aquarius	22h 40m -16.4°	Unknown, 96P Machholz suspected
Perseids	Jul 13 - Aug 26 Aug 12-13	72%	100	Perseus	03h 04m +58°	109P/Swift-Tuttle
Orionids	Oct 4 - Nov 14 Oct 21-22	4%	20	Orion	06h 20m +15.5°	1P/Halley
Leonids	Nov 5-30 Nov 17-18	1%	15	Leo	10h 08m +21.6°	55P/Tempel-Tuttle
Geminids	Dec 4-16 Dec 13-14	16%	120	Gemini	07h 28m +32.2°	3200 Phaethon

Figure 5 Major Meteor Showers for 2018

Here is a fantastic site (the International Meteor Organization) that describes in detail each major meteor shower in 2018 (along with some of the less famous events), and provides a sky chart that shows the surrounding constellations and radiant for each day of the meteor shower.

<https://www.imo.net/files/meteor-shower/cal2018.pdf>

Similar with all meteor showers, dry, clear skies are key, so people are advised to check with the nearest National Weather Service Office for the latest weather reports with the goal of finding out the best viewing times.

When trying to observe the showers, always look towards the radiant (where the meteor originates), and a constellation chart can help

determine this. The shower is usually named after the radiant constellation. Most meteors can be seen with the naked eye, so don't worry if you don't have expensive equipment, but binoculars and



telescopes can help you get a closer look if you wish.

Bolide meteors or “Fireballs” typically range in size from a rock you can hold to a large boulder weighing several tons. Here is a great video compilation of a fireball seen over various parts of the northern hemisphere in March 2017 –

<https://www.youtube.com/watch?v=APep3sgwEz4>

If you happen to be lucky enough to catch a few to several second glimpse of a bolide meteor, the American Meteor Society (founded in 1911) website <https://www.amsmeteors.org/> serves as the primary site to report a bolide meteor - under their Fireball Tab. Please take a few minutes to record your sighting of a Bolide Meteor.

Happy viewing of the numerous meteor showers during the upcoming year, and any other celestial objects that may come your way!

Spotter Information

Please help us to keep your contact information up to date. While we hope to get a report from you when severe weather occurs, from time to time we call or email spotters to investigate significant storms. Thus, it is important to keep your contact information current. If any of your contact information (name, phone number/s, addresses, etc) has changed recently, please let us know. Send an email or ‘snail mail’ note to us at one of the addresses below.

email: william.gartner@noaa.gov

U.S. mail:

William Gartner/Skywarn Spotter Update

NWS/WFO State College

328 Innovation Blvd, Rm #330

State College, PA 16803

If you are not sure that we have the most up to date information on file, go ahead and send us an email or note with your current information anyway 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 else 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 SkywarnNews email notification, or communicate important program changes.

Please report the following:*

Snow:

- When snow accumulation reaches 3 inches
- When snow accumulation reaches 6 inches
- Storm total after the snow ends (also water equivalent if possible)
- If snow is falling at the rate of 1 inch or more per hour

Ice:

- Any occurrence of or accumulation of freezing rain or freezing drizzle
- Accumulation of ice of ¼ inch or more on trees or wires

Other:

- When forecast winter precipitation differs significantly from observed (i.e. snowing with no snow in forecast, sleet...when only snow is forecast...)
- Any other significant weather



occurrence/oddity (i.e. flooding due to snow melt/ice jam, damage from strong winds not associated with a thunderstorm)

And, remember thunderstorms that produce wind damage and flooding rains are still possible even in winter.

*This list of reporting criteria is available on our web page:

<http://www.weather.gov/ctp/reportSevere>



Do You Enjoy This Newsletter?

We have been publishing this newsletter twice a year since the mid-1990s. We'd like to get a feel for how many people read it or even look forward to it each Spring and Fall.

If you enjoy our bi-annual publication, or even if you have suggestions on how to make it better, please take a moment to drop us a line at ctp.stormreports@noaa.gov

We will not use your email address for any kind of solicitation.

