SKYWARNEWS

National Weather Service State College, PA

Spring 2012

"Working Together To Save Lives"

The Winter that Wasn't

By John La Corte, Senior Forecaster

It was the end of October when an unusually strong coastal storm brought one of the worst early season snowfalls ever to hit the region. Because the leaves were still on trees, power outages were widespread and lasted several weeks in some of the hardest hit areas of New York and New England. The inevitable question arose as to what this meant for the remainder of the winter. Well the answer is in and it is… "nothing".

The meteorological winter is over (Dec-Feb) and we have had one of the warmest ones on record along with snowfall that was much below normal. A persistent moderate to strong La Nina pattern helped steer the jet stream far to the north which kept an almost uninterrupted supply of mild Pacific air flooding into the continental United States. This was coupled with a North Atlantic Oscillation (NAO) pattern which was positive virtually every day of the winter. When the NAO is positive, storms that affect the Northeastern US tend to be weaker than normal and move out to sea very quickly. The biggest snow storms in memory tend to be associated with a negative NAO. Without it this winter, we basked in near record setting warmth and were able to give the snowplows a much needed reprieve.

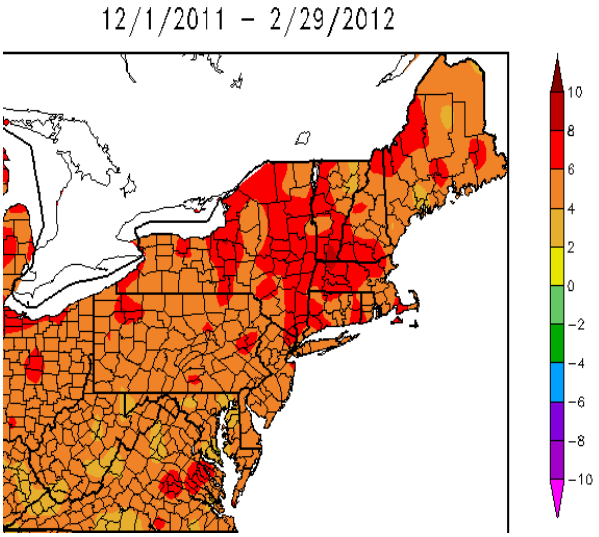

Figure 1 Temperature departures for the 2011-12 winter season (Dec-Feb)

Figure 1 shows the temperature departures for the winter months. Almost all of Pennsylvania averaged some 4 to 8 degrees above normal for the season. Just outside of our area parts of the Hudson Valley in New York saw the warmest winter ever!

Unfortunately for The Old Farmer's Almanac, their winter forecast of above normal warmth coupled with above normal snowfall was only half right. While precipitation was above normal over about a third of the state (Figure 2), snowfall was below normal over all the state

(Table 1). In fact a dearth of snow negatively affected numerous businesses that rely on winter-time outdoor activities for their livelihood from the Great Lakes through much of New York and New England. While most of us probably didn't mind the lack of shoveling or driving in snow, ski areas and those who rent snow mobiles represented just a couple of businesses that were not quite so happy with the lack of the white stuff. Another positive outcome from the mild winter was fewer potholes. The less extreme freeze thaw cycles over the last several months offered much less stress on regional road surfaces. Coupled with less salt being spread to combat snow and ice, and the pothole population remained below what we might expect during a typical winter. So it's not all bad.

As we ease out a mild winter, we always look ahead and wonder what the upcoming season has to hold. The latest CPC forecast (not shown) has about the southern 2/3 of the US (to include almost all of Pennsylvania) with an increased chance of a warmer than normal summer (June-August). As for precipitation, they display a forecast for "equal chances". This means they see nothing in our upcoming pattern that would show much skill in forecasting amounts near, above or below normal. We might recall that locally, last summer was bracketed by a very wet spring and fall and was very hot, with many areas seeing their first 100 degree temperatures in over 20 years. Annual rainfall was actually record setting at Harrisburg and Williamsport where the wettest years in history were experienced. So whether-the-weather ends up as a series of extremes and records, or bland and not very noteworthy, we will see you all here again in the fall to summarize it.

Location	*Winter Snow*	*Departure*
Harrisburg	7.0	-17.4
Williamsport	11.2	-15.0
Erie	76.1	-32.0
Pittsburgh	29.3	-1.1
Philadelphia	3.7	-15.0
Bradford	37.9	-14.6
Altoona	14.2	-7.2

Table 1 Winter snowfalls and departures

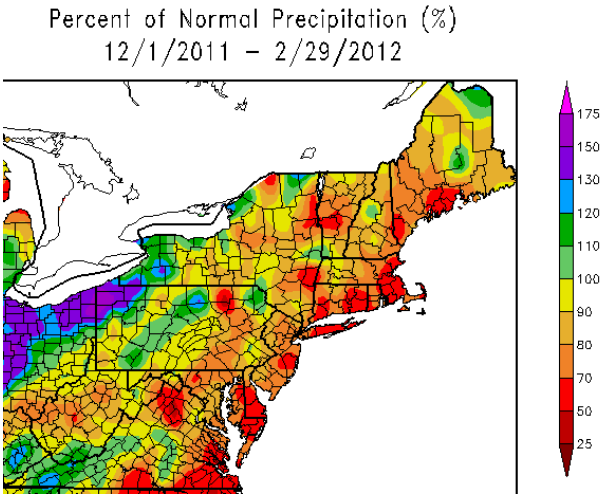

Figure 2 Precipitation departures for the 2011-12 winter season (Dec-Feb)

For some further reading about how the warmer than normal temperatures may be affecting Mother Nature, check out the following links.

http://www.poconorecord.com/apps/pbcs.dll/article?AID=/20120212/OUTDOORS/202120321/-1/NEWSMAP

http://www.climatewatch.noaa.gov/image/2011/warmer-climate-may-repaint-fall-colors-in-eastern-u-s

Deepwater Horizon…Two Years After

By John La Corte, Senior Forecaster

April 20th will mark the two year anniversary of the explosion at the Deepwater Horizon oil platform that killed 11 men and spewed crude oil into the Gulf of Mexico for three months. An estimated 4.9 million barrels of oil (205,800,000 gallons) were released into the ocean causing the death of an untold number of marine and other wildlife and fouling hundreds of miles of coastline from Louisiana to the panhandle of Florida. Some twenty times larger than the Exxon Valdez (off the coast of Alaska) in 1989, it became the largest oil spill ever to originate in US controlled waters. It also eclipsed the 1979 Ixtoc blowout (southern Gulf of Mexico) as the largest ever spill in the Gulf of Mexico. Tourism for vast stretches of Gulf beaches virtually disappeared overnight along with the livelihoods of countless fishermen who rely on the seafood of the Gulf or tourists for their livelihood.

While there is much debate about what happened to the majority of the oil, what is clear is that even two years later the effects are far from over. In late 2011 a NOAA report stated that whales and dolphins continue to die at twice the normal rate. It is estimated that as much as 75% of the oil spilled remains unaccounted for, possibly dispersed beneath the surface of the ocean continuing to pollute the water and endanger ocean dwelling organisms.

In early 2012 the town of Grand Isle, Louisiana was described as a ghost town in a BBC report. A once thriving fishing village, no one is fishing and no one who supports the fishing industry is working. Restaurants, bars, gas stations and even the people who provide ice for the shrimp boats all sit idle, victims of the continuing effects of the Deepwater oil spill.

Figure 1 A pelican is covered in oil after the Deepwater Horizon spill

While tourism begins to show signs of recovering and the oil companies make progress in settling law suits and paying fines, the fishing communities directly affected by the spill are far from back to normal. After the next biggest oil spill in US waters, the Exxon Valdez, it took four more seasons for the effects to fully be felt. Some scientists say it may take ten years for the effects to dissipate in the Gulf. In the meantime long time fishermen who used to make a living harvesting seafood continue to suffer. They know that when they bring up a net full of shrimp that have no eyes, their problems are far from over.

The Japan Earthquake and Tsunami

By John La Corte, Senior Forecaster

By the time this newsletter is published, a year will have passed since an earthquake and tsunami devastated large portions of northern Japan. On March 11, 2011 at 2:46 PM Japan time, a massive 9.0 “mega thrust” earthquake

occurred about 40 miles east of Oshika Peninsula of Tohoku (Figure 1). Occurring at a depth of about 20 miles, it became the most powerful earthquake ever to hit Japan, and one of the five strongest ever worldwide since records began being kept in 1900.

The resulting tsunami was awe inspiring as cameras recorded the unimaginable damage occurring live for modern day TV viewers. Some of the tsunami waves were as high as 133 feet and traveled as far as ten miles inland inundating an area covering more than 500 square miles. The combination of the earthquake and ensuing tsunami killed more than 15,000 people. More than 3000 people remain missing today.

As a result of the temblor, some sections of the Japanese coastline sunk as much as 3 feet because of the displacement in the Earth's undersea crust. Some parts of northeastern Japan shifted by as much as 8 feet closer to North America and entire coastal towns and villages were destroyed or wiped out to sea. A report by the Japan Agency for Marine-Earth Science and Technology (December 2011) concluded that the seabed in the area between the epicenter and the Japan Trench moved 160 feet east-southeast and rose about 23 feet as a result of the quake. The Earth's axis of rotation was even affected, shifting by as much as 10 inches.

The energy released from the earthquake was immense. If it could be harnessed, it is estimated that the energy could power a city the size of Los Angelis for an entire year. Another measure placed the energy equivalent to 9,320 gigatons of TNT, or approximately 600 million times the energy of the Hiroshima bomb.

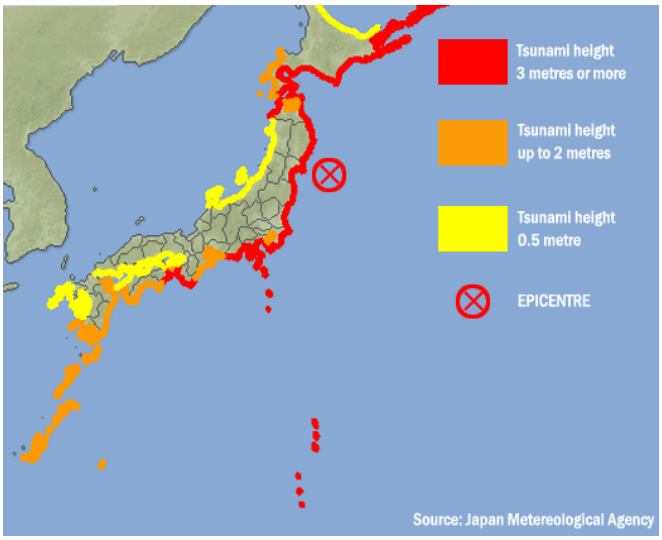

Figure 1 Epicenter of the Japan earthquake

Perhaps the worst and longest lasting effects of the earthquake-tsunami were the numerous nuclear accidents that occurred, including 3 full nuclear meltdowns in the reactors at the Fukushima Daiichi Nuclear Power Plant complex. This caused an evacuation of several hundred thousand people in the area surrounding the plant out as far as 12 miles and the area directly around the power plant will be contaminated with radioactivity for many years.

The tsunami didn't just affect Japan. The tsunami waves spread out across the entire pacific basin. (http://en.wikipedia.org/wiki/File:20110311Houshu.ogg) Click the link and you can view an animation of the way the wave propagated across the ocean basin.

More than $3 million in damage was reported in Hawaii where the tsunami was as high as 7 feet in places. Along the western coast of North America waves of 3 to 8 feet caused damage from Alaska to California. Damage was even reported along the coasts of Chile and Peru in South America where waves were as high as 5 to 10 feet. Damage was reported in the

Philippines, Indonesia, New Guinea, Tonga and New Zealand. The tsunami wave even maintained enough energy to break icebergs off the Sulzberger Ice Shelf in Antarctica, more than 8000 miles away! The largest iceberg that broke off was approximately the size of Long Island and some 260 feet thick.

Truly a global phenomenon, the World Bank estimates the economic cost of the disaster at $235 billion, making it the most expensive natural disaster in world history. It will be many years before Japan recovers from this incredible natural disaster.

2011 The Year of the Tornado

By John La Corte, Senior Forecaster

Anyone who pays even the smallest bit of attention to the weather knows that 2012 was an unusually active year for tornadoes, especially deadly ones.

The season started early with the first death occurring on February 28th when a tornado destroyed a mobile home near Beech Tennessee killing one of the occupants, and it only got increasingly deadly from there.

April 15th was the first "big" day when 10 people were killed in an outbreak that stretched from Illinois to Georgia. Most of the deaths and injuries occurred in Louisiana, Alabama and Arkansas. These southern states, not normally within the area we refer to as "tornado alley" would bear the brunt of the fatalities over the next couple of months as system after system seemed destined to just continue the deadly tornado production.

The big outbreak occurred from April 26th-28th when 344 tornadoes were confirmed and 321 people died. Not since the "Super Outbreak of April 3-4, 1974" have there been so many deadly tornadoes associated with a single storm system over such a wide area. The system was so noteworthy; it was labeled "Super Outbreak 2011" by The Weather Channel's tornado expert Dr. Greg Forbes. The deadliest day of the outbreak was April 27 when Tuscaloosa, Birmingham, Phil Campbell and Hackleburg Alabama were all hit by devastating storms.

Figure 1 Aerial photo shows a huge area of devastation following the Joplin tornado

The tornado that hit Tuscaloosa and Birmingham was an EF4 (on a scale from 1-5 where an EF5 causes unimaginable destruction). This storm was on the ground for 80 miles and caused 64 fatalities. The other storm that affected Phil Campbell and Hackleburg was an EF5 that was on the ground for over 106 miles and killed 72. This sort of death toll was thought to be not possible given today's high tech communications and increased forecasting skill and severe weather warning lead times. However the storms hit populated areas and completely destroyed entire neighborhoods,

(Figure 1) offering residents little or no opportunity to escape.

The Joplin Missouri tornado followed less than a month later on May 22 and became the single deadliest tornado since 1947 when 181 people were killed in Woodward Oklahoma. The EF5 storm killed 159 people on its 22 mile long path that saw the tornado funnel grow to more than a mile wide at times! Damaging or destroying as much as 75% of the city of Joplin, more than 7000 homes were flattened or completely blown away. The devastation was incomprehensible. When adjusted for inflation and compared to previous damaging tornadoes, it became he costliest storm in history causing approximately 2.8 billion dollars in damage.

From there the season thankfully began to grow quieter. There were still deadly days, May 24th for instance saw 17 people die in tornadoes in Kansas, Oklahoma and Arkansas. Three people died in a rare strong EF3 tornado that hit in the Westfield-Springfield-Sturbridge areas of west-central Massachusetts on June 1st and 5 died later in the year when tornadoes raked across the Carolinas on November 16.

What will 2012 hold in store? Well the season has already gotten off to a fast and furious start with nearly 200 tornadoes confirmed through mid-March and even the first February tornado ever to be sighted in Nebraska. Fourteen people died in an outbreak that stretched from Kansas to Tennessee on Feb 28th and 29th. And already we have had one monster day when 132 tornadoes killed 38 on March 2nd. Hopefully this is not a sign of things yet to come this spring and summer.

2011 An Active Year for PA Tornadoes

By Peter Jung, Warning Coordination Meteorologist

The severe weather season for 2011 was certainly an active one across the Commonwealth last year, with 32 confirmed tornadoes. While tornadoes are certainly not uncommon in Pennsylvania, last year's count of 32 was certainly well above the long term average of 16. In fact, 2011 tied with 1996 for third place for most tornadoes ever across Pennsylvania in a given year. Only 1985 (with 53 tornadoes) and 1998 (with 62 tornadoes) were higher.

Top Ten Pennsylvania Tornado Years	
Year	**Tornadoes**
1998	62
1985	53
2011	32
1996	32
1992	31
2004	26
1976	24
1954	22
1991	22
1994	22

Table 1. Top PA Tornado Years

The tornadoes were classified into a range of strengths, with 7 being rated as EF0 (winds 65 to 85 mph), 21 rated as EF1 (winds 86 to 110 mph) and 4 being rated as EF2 (winds 111 to 135 mph). Tornadoes are rated based either on measured wind speeds (rare) or by examining damage indicators and assigning a wind speed. These assigned wind speeds are then classified into categories on the Enhanced Fujita (or EF) scale. The scale is listed below:

The Enhanced Fujita (EF) Tornado Scale	
EF Number	**Wind Speed**
0	65 to 85 mph
1	86 to 110 mph
2	111 to 135 mph
3	136 to 165 mph
4	166 to 200 mph
5	Over 200 mph

Table 2. Enhanced Fujita (EF) Scale

The 32 confirmed tornadoes occurred all across the Commonwealth. Southwest Pennsylvania saw an EF2 near Pittsburgh, while southeast Pennsylvania saw an EF0 in the suburbs of Philadelphia. There was one tornado in far northwest Pennsylvania (Crawford County) and two in the far Northeast part of the state in Wayne County. The bulk of the tornadoes, however, occurred in the central part of the state. A map of all the 2012 Pennsylvania Tornadoes can be seen in Figure 1.

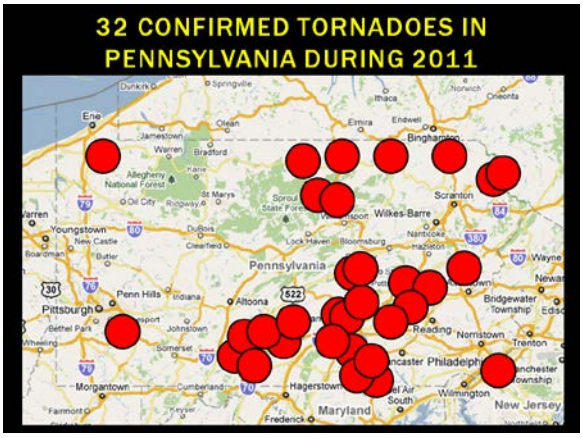

Figure 1. 2011 PA Tornado Plot

What will 2012 bring? Only time will tell. In the meantime, the best advice is to be prepared for severe weather and tornadoes whenever and wherever they may strike. Always have access to the latest warnings issued by the National Weather Service – a battery backed-up NOAA Weather Radio All Hazards is highly recommended.

Here are some general tornado safety tips:

Inside a home:

- Head into the basement
- If no basement is available, seek a sturdy inside room on the lower floor
- Stay away from windows
- Cover yourself with a mattress or heavy blankets
- Seek shelter under a staircase if possible
- Lay low to the floor and protect your head

Public Building such as School or Hospital:

- Know the emergency evacuation and shelter areas
- Avoid windows
- Seek an interior room or hallway on the lowest floor
- Avoid larger open rooms like gyms and auditoriums
- Do not use the elevator

Mobile Home:

- Get out! Even if your home is tied down, you are probably safer outside
- If your community has a tornado shelter, go there fast.
- Seek a sturdy building close by
- Otherwise, lie flat on low ground away from your home. If possible, use open ground away from trees and cars, which can be blown onto you.

In a vehicle:

- If the tornado is visible and far enough away, and the traffic is light, you may be able to drive out of its path
- Otherwise, park the car as quickly and safely as possible and seek shelter in a sturdy building.
- If no building or shelter is available, run to low ground away from cars (which may roll over on you) and lie flat and face-down
- Avoid seeking shelter under bridges

In general, BE PREPARED!

Update Your Spotter Contact Information

By Bill Gartner, General Forecaster

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, or communicate important program changes.

GO GREEN…SAVE A TREE!

In our continuing efforts to save natural resources (by using less paper) and conserve government resources (by reducing printing and mailing costs), we provide spotters the option of being notified by email when a new issue of SKYWARNEWS is available. Instead of getting SKYWARNEWS in the mail, you can read it online or download and print it if you choose.

If you currently get the printed version and would like instead to be notified by email, send an email to william.gartner@noaa.gov and include 'SKYWARNEWS via email' or something similar in the subject line. Please be sure to include your name, spotter ID # and the county in which you live in the body of the email.

Warm season reporting criteria:

For your convenience, a list of reporting criteria is available on our web page, www.weather.gov/statecollege. Click on "Send Us Reports" in the left-hand column. It is the fourth selection under the Current Hazards header.

- Tornadoes or funnel clouds (be very wary of look-alikes; watch for rotation)
- Wall clouds, especially if they are rotating

- Hail of any size (Please be specific with regard to size when you call)
    - Quarter-Size (1") and larger is severe!

Other sizes/descriptions to use for hail:

* Pea 0.25 - .375 inch
* Small marble 0.50 inch
* Penny 0.75 inch
* Nickel 0.88 inch
* Quarter 1.00 inch (15/16")
* Half dollar 1.25 inch
* Walnut/Ping Pong 1.50 inch
* Golf ball 1.75 inch
* Lime 2.00 inches
* Tennis Ball 2.50 inches
* Baseball 2.75 inches
* Large Apple 3.00 inches
* Softball 4.00 inches
* Grapefruit 4.50 inches
* Computer CD/DVD 4.75 - 5.00 inches

- Wind Gusts (40 mph or greater; specify whether estimated or recorded)
    - large branches downed (specify diameter of branch)
    - Trees/power lines downed
    - Structural damage to buildings (roof, windows, etc.)
- Rainfall
    - 1 inch or greater in an hour (NOT a 1"/hr. rate for 10 minutes)
    - 2 inches or greater storm total
- Flooding
    - Streams/Rivers -- also, when nearing bankfull
    - Street (when more than the usual poor drainage puddles)

Meteor Gazing 2012

By Barry Lambert, Senior Forecaster

In the wake of one of the mildest and least snowy winters on record across the region, we can look forward to warmer nights and the opportunity to glance up at the heavens and see if we can catch a glimpse of a fleeting nighttime occurrence – a meteor shower.

Figure 1. A brilliant Geminid fireball over the Mojave Desert

Most months during the remainder of this year contain one or more meteor showers, which occur as a result of the earth passing through the debris trail left behind by comets. Some comets (such as 1P/Halley – whose location is now at the orbital distance of and opposite to Neptune) have taken a path through the solar system that leads to the Earth intersecting its debris trail twice a year.

The meteor showers derive their names from the constellation where most of the fleeting and faint flashes of light are seen. Occasionally, a slightly larger piece of debris (ice or dust particles) can lead to a more pronounced "fireball" leaving a thin, glowing trail across a long arc in the sky. Meteors begin to burn up and glow as they encounter the outer layer of our atmosphere, roughly 40 to 60 miles above the Earth's surface.

Meteor activity picks up in April and May, though of the two shower maxima in late April,

only the Lyrids have a short, Moon-free observing window.

The May through December period contains some of the more “brilliant” and “reliable” meteor showers of the year. Below is a list of the more significant upcoming events.

First is the Lyrid meteor shower on April 21-22. This is usually somewhat of an average event, with the tiny meteors falling at a rate of about 20 per hour. However, with no moon present to illuminate the sky, this may be a particularly good show this year. Lyrid meteors can be seen anywhere from April 16-25.

Arriving in to your local sky on Saturday-Sunday May 5-6th is the ETA Aquarius, from the debris of comet 1P/Halley. The peak time to view this shower will be the early morning of Sunday May 6th. However, viewing this shower will be possible during any early morning from May 4-7. There will be a rather low frequency of meteors, and we’ll be lucky to see about 10 ETAs in an hour. Unfortunately, the moon is near the low radiant of this meteor shower this year which will greatly obstruct viewing the fleeting grains sand or pebble-size objects. The key is to watch during the last hour or so before twilight gets really bright.

The low radiant elevation means that the earliest ETAs you catch a glimpse of will be "Earth-grazers" – which are long, relatively slow-moving ones that often trace paths along the horizon. Bright Earth-grazers are spectacular. Unfortunately, because of their greater distance from the observer, Earth-grazers tend to be faint. As the radiant gets a bit higher, the ETAs take on more of a typical appearance: fast meteors, bright on average and often leaving a glowing trail. You'll only catch a few of them, though, because dawn is approaching.

The meteor shower will be found looking east and fairly low on the horizon within the constellation Aquarius, and just east of Pegasus.

The late July “Southern Delta Aquarids” can also be found emanating from this constellation. There will be up to 30 meteors per hour this year, and with just the first quarter of the moon setting just after midnight, the stage could be set for quite a good show.

Coming in mid-June will be a second round of the Lyrids during the period of June 15-16. About 15 faint meteors per hour may be viewed during this year’s event. There will be little in the way of moonlight to obscure this show of normally faint, blue and white meteors. Look again to the constellation Lyra.

The peak of this mid-Summer (July 29th – 30th) meteor shower, the Capricornids are known for their often yellow color, slow movement and occasionally producing bright “fireballs”.

The Perseid Meteor shower has a very long duration from about July 15 to August 25, with its peak August 11-13 just before dawn each day. The Perseids are probably the most widely viewed annual meteor shower. The meteors may fall at a rate of up 100 per hour, and an occasional longer lasting “fireball” is also seen. You can view this display the entire night as the radiant is above the horizon all night at latitudes above 32 deg N. The best of the show occurs during the predawn hours when the moon is low and the radiant relatively high in the mid-summer sky. The moon will be in its waning crescent phase.

The Orionids (peak on October 21-22) is an interesting but sometime erratic meteor show.

It will display a medium rate of around 20 shooting stars per hour, but it is known for producing meteors that are a unique yellow and green color. It often produces large meteors described as fireballs. Although it is spread out over a period of time, the best viewing usually takes place from Oct 17-25.

The Leonids (November 17-18) is a prolific meteor producer. It tends to peak around November 17, but some are spread through several days on either side. The specific peak date varies from year to year.

On occasion, this event has produced a "meteor storm", with counts exceeding 1000 meteors per hour. Compare this to the annual background of just 1 to 2 meteors per hour, and you'll realize just how amazing this one could turn out to be.

Look skyward into the constellation Leo the Lion for the radiant of this celestial event. Seen from our latitude, Leo rises over the eastern horizon around 1 a.m. That is why you'll see more meteors after midnight. After rising, Leo then continues upward and westward throughout the predawn hours. It climbs to its highest point in the southern sky around 6 a.m.

We see the most Leonid meteors in the hour before dawn because that's when Leo the Lion is found highest in the sky. The crescent moon will set early in the evening this year, leaving dark skies for what should be an excellent show.

The final and perhaps the most significant meteor shower of this year will be the Geminids on Dec 13-14. Many stargazers claim this to be the best meteor shower in the heavens. The Geminids are known for producing up to 60 multicolored meteors per hour at their peak.

The peak of the shower usually occurs around December 13 & 14, although some meteors should be visible during the nearly 2 week period from December 6 - 19. The radiant point for this shower is in constellation Gemini. The best news comes from the fact that this year the new moon will guarantee a dark sky for what should be an awesome show. Let's hope for a large high pressure area to settle over Pennsylvania with clear skies and light wind.

The link below is a highly useful one for locating the radiant of the meteor showers, along with helping you become familiar with the many constellations.

http://www.astro.wisc.edu/~dolan/constellations/constellationjavalist.html

Following are a host of other links to further explore the fascinating world of meteors, and check out some of the more interesting astronomical dates. Some of the links contain a comprehensive listing of all meteor shower occurrences during 2012, along with where in the sky to locate them.

http://skytour.homestead.com/met2012.html

http://www.amsmeteors.org/

http://www.amsmeteors.org/showers.html#2012

http://www.theskyscrapers.org/meteors/

http://stardate.org/nightsky/meteors/

http://www.moonconnection.com/moon_phases_calendar.html

http://www.seasky.org/astronomy/astronomy_calendar_2012.html

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National Weather Service

328 Innovation Blvd

Suite #330

State College, PA 16803

TO: