NORTHEASTERN STORM BUSTER

SKYWARN

Fall, 2016 - VOL. 21, NO. 4

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FEATURES

DEPARTMENTS

Northeastern StormBuster is a quarterly publication of the National Weather Service Forecast Office in Albany, New York, serving the weather spotter, emergency manager, cooperative observer, ham radio, scientific and academic communities, and weather enthusiasts, all of whom have a special interest or expertise in the fields of meteorology, hydrology and/or climatology.

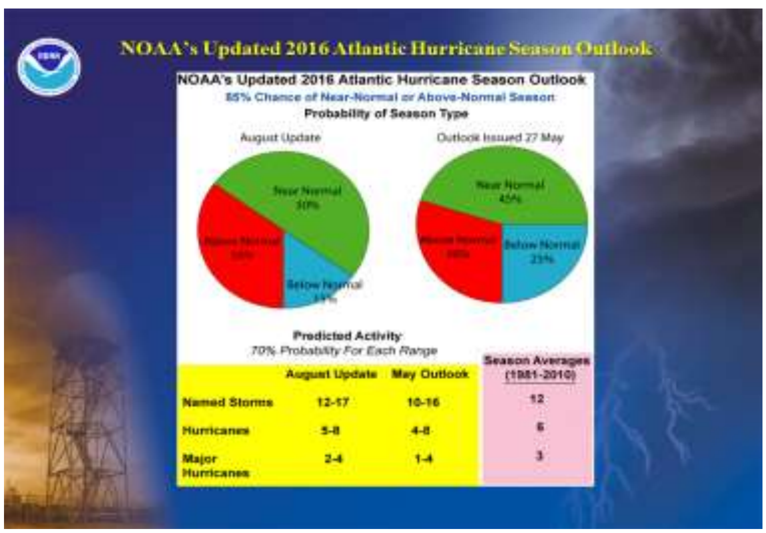
TROPICAL REVIEW THUS FAR

Brian Montgomery
Senior Meteorologist, NWS Albany

The 2016 hurricane season continues at the time of publication of this article, and we are just past the normal climatological peak. So let's take a preliminary look back at the season thus far, including a caparison with the Atlantic Hurricane Season Outlooks.

Before any outlooks were issued, we started this year's hurricane season back in January with the development of 'Alex'. Per the National Hurricane Center, this was the first tropical or subtropical storm to form in January since an unnamed system did so back in 1978, and it is only the fourth known to have formed in this month throughout the entire historical record that dates way back to 1851. Alex strengthened to 'hurricane' status on January 14th and was the first hurricane to form during the month of January since 1938, as well as the first to appear in this month since Alice in 1955 (formed in December, 1954).

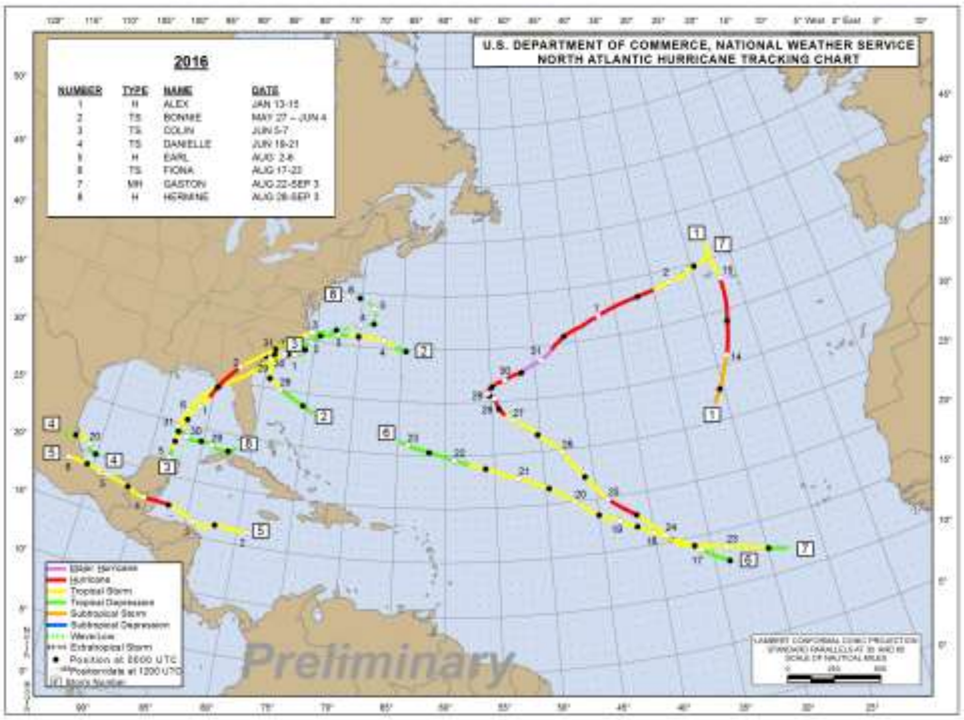
The next storm was developing when the first of two Hurricane Season Outlooks was issued, in May. The second, an update, was issued in August, as shown below, with comparison to the original May outlook.



Here are the tropical weather storm summaries through early September, followed by the tracking map showing each system:

Name	Dates	Maximum Wind (mph)
Hurricane Alex	13-15 January	85
Tropical Storm Bonnie	27 May-4 June	45
Tropical Storm Colin	5-7 June	50

Tropical Storm Danielle	19-21 June	45
Hurricane Earl	2-6 August	80
Tropical Storm Fiona	17-23 August	50
Major Hurricane Gaston	22 August-3 September	120
Tropical Storm Hermine	28 August-6 September	60



Since that map and summary were completed, three additional tropical storms had developed (*preliminary*):

Name	Dates	Maximum Wind (mph)
Tropical Storm Ian	12 September-16 September	60
Tropical Storm Julia	13 September-19 September	40
Tropical Storm Karl	14 September-	40

So here are the preliminary 2016 numbers when compared to the forecasts:

	August Update	May Outlook	Actual Count (Preliminary)
Named Storms	12-17	10-16	11
Hurricanes	5-8	4-8	3
Major Hurricanes	2-4	1-4	1

Hurricane season continues through November 30th. Keep www.hurricanes.gov and www.weather.gov in your weather bookmarks for all the latest tropical updates from your National Weather Service.

SUMMER 2016: SOMEWHAT WARM AND DROUGHTY

Evan L. Heller
Climatologist, NWS Albany

The first third of the Summer of 2016 was only slightly (just 1.0 degree) above normal (Table 1). There were no records for temperature established in Albany during June; the only ones established were two daily wind records (Table 3a). It was a somewhat unremarkable month, with no other records established. July was a little more significant. The average temperature of 74.0° was 2.2 degrees above normal (Table 1). This put the month in a 5-way tie for 55th-hottest month of all time in Albany. There were no other records for temperature. The hottest reading of the season…94°, occurred on the 22nd.

Despite apparently sufficient rainfall, much of east central New York and adjacent western New England was declared to be in a mild to moderate drought after June rainfall amounted to about an inch and a half below normal (Table 1). July precipitation attempted to alleviate the shortfall - producing the most rainfall of any of the three summer months. The 6.44" total was more than 2 inches above normal, and placed it in a 3-way tie for 101st-wettest month in Albany (Table 3b). However, the degree and coverage of the drought had remained pretty much unchanged. The last day of July produced more than a third of the month's rainfall and was a daily record, though not by much. It was also the 43rd-heaviest calendar day rainfall amount ever recorded in Albany (Table 3b). Two more daily wind speed records were set in July, on the 2nd and 14th, the latter of which was a gust caused by a thunderstorm (Table 4b). There were 8 days in July with thunderstorms.

August was only 0.1 degree cooler than July in Albany, and thus placed in a 5-way tie for 61st-hottest month of all time. Only daily high minimum records were broken or tied for temperature…2 of them (Table 3c). A daily wind speed record more than doubling the previous record was set on the 12th thanks to a thunderstorm. This was it for the daily records. The 73.9° mean temperature for the month was nearly 4 degrees above normal (Table 1), and made it the 10th-warmest August since the beginning of records at Albany (Table 3c). The month's mean minimum value of 63.7° was off its norm by the same amount, and placed 7th on the Warmest Mean Minimum Augusts table. The monthly August total rainfall of 3.94" was nearly a half inch above normal (Table 1); however, the drought declaration continued. Thunderstorm days had backed off significantly in August, numbering only three.

Summing up, the season as a whole, with its mean temperature of 72.0°, was 2.3 degrees above normal, and the 12.69" precipitation total was 1.32" above normal (Table 1).

STATS

	JUN	JUL	AUG	SEASON
Average High Temperature/Departure from Normal	79.9°/+2.0°	84.9°/+2.6°	84.0°/+3.6°	82.9°/+2.7°
Average Low Temperature/Departure from Normal	56.5°/+/-0	63.1°/+1.7°	63.7°/+3.8°	61.1°/+1.8°
Mean Temperature/ Departure From Normal	68.2°/+1.0°	74.0°/+2.2°	73.9°/+3.8°	72.0°/+2.3°
High Daily Mean Temperature/Date	77.5°/20th & 26th	82.5°/22nd	83.0°/12th	
Low Daily Mean Temperature /Date	56.5°/11th	65.0°/2nd	64.0°/22nd	
Highest Temperature reading/Date	91°/19th & 20th	94°/22nd	93°/12th	
Lowest Temperature reading/Date	45°/11th	53°/20th	50°/23rd	
Lowest Maximum Temperature reading/Date	65°/8th & 9th	71°/31st	73°/22nd	
Highest Minimum Temperature reading/Date	68°/27th	73°/14th & 19th	73°/12th & 13th	
Total Precipitation/Departure from Normal	2.31"/-1.48"	6.44"/+2.32"	3.94"/+0.48"	12.69"/+1.32"
Total Snowfall/Departure from Normal	0.0"/-	0.0"/-	0.0"/-	0.0"/-
Maximum Precipitation/Date	1.29"/5th	2.55"/31st	1.13"/2nd	
Maximum Snowfall/Date	0.0"/-	0.0"/-	0.0"/-	

Table 1

NORMALS, OBSERVED DAYS & DATES

NORMALS & OBS. DAYS	JUN	JUL	AUG	SEASON
NORMALS				
High	77.9°	82.3°	80.4°	80.2°
Low	56.5°	61.4°	59.9°	59.3°
Mean	**67.2°**	**71.8°**	**70.1°**	**69.7°**
Precipitation	**3.79"**	**4.12"**	**3.46"**	**11.37"**
Snow	**0.0"**	**0.0"**	**0.0"**	**0.0"**
OBSERVED TEMPERATURE DAYS				
High 90° or above	3	7	4	14/92
Low 70° or above	0	4	5	9/92
High 32° or below	0	0	0	0/92
Low 32° or below	0	0	0	0/92
Low 0° or below	0	0	0	0/92
OBSERVED PRECIPITATION DAYS				
Days T+	12	18	13	43/92/47%
Days 0.01"+	6	14	11	31/92/34%
Days 0.10"+	4	7	7	18/92/20%
Days 0.25"+	3	6	5	14/92/15%
Days 0.50"+	1	5	2	8/92/9%
Days 1.00"+	1	2	2	5/92/5%

Table 2a

NOTABLE TEMP, PRECIP & SNOW DATES	JUN	JUL	AUG
1.50"+ Precipitation/Date	-	2.55"/31st	-
Wet Spell (At least 3 cons. days special min. measurable precip. criteria)	-	29th ->	<-2nd (5 days/4.55")
Heat Wave (3+ consecutive days of 90°+ high temperatures)	-	-	11th – 14th (4 days)

Table 2b

RECORDS

ELEMENT	JUNE	
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	42 mph/NW/7th	35 mph/W/1990
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	35 mph/W/13th	33 mph/NW/1991

Table 3a

ELEMENT	JULY	
Daily Maximum Precipitation Value/Date | Previous Record/Year	2.55"/31st	2.42"/2009
200 All-Time Hottest Months Value/Rank | Remarks	74.0°/#55	5-way tie
200 All-Time Wettest Months Value/Rank | Remarks	6.44"/#101	3-way tie
200 All-Time Wettest Dates Value/Date | Rank (Remarks)	2.55"/31st	#43
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	34 mph/W/2nd	31 mph/NW/1995
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	34 mph/ NW/14th	32 mph/NW/1989

Table 3b

ELEMENT	AUGUST	
Daily High Minimum Temperature Value/Date | Previous Record/Year	73°/12th	72°/1905
Daily High Minimum Temperature Value/Date | Previous Record/Year	73°/13th	73°/2005
Daily Maximum Wind Speed Value/Direction/Date | Previous Record/Direction/Year	52 mph/W/12th	25 mph/W/1992
Top 10 Warmest Mean August Temperatures Value/Rank | Remarks	73.9°/#7	Tie
Top 10 Warmest Mean Minimum August Temperatures Value/Rank | Remarks	63.7°/#10	-
200 All-Time Hottest Months Value/Rank | Remarks	73.9°/#61	5-way tie

Table 3c

ELEMENT	SUMMER	
none	none	none

Table 3d

MISCELLANEOUS

JUNE

Average Wind Speed/Departure from Normal	8.1 mph/+0.8 mph
Peak Wind/Direction/Date	42 mph/WNW/7th
Windiest Day Average Value/Date	16.8 mph/8th
Calmest Day Average Value/Date	1.8 mph/4th
# Clear Days	5
# Partly Cloudy Days	23
# Cloudy Days	2
Dense Fog Dates (code 2)	4th
Thunder Dates (code 3)	11th, 21st & 28th
Sleet Dates (code 4)	None
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	None

Table 4a

JULY

Average Wind Speed/Departure from Normal	6.7 mph/+-0 mph
Peak Wind/Direction/Date	39 mph/NW/15th
Windiest Day Average Value/Date	12.0 mph/2nd & 13th
Calmest Day Average Value/Date	3.1 mph/24th
# Clear Days	3
# Partly Cloudy Days	26
# Cloudy Days	2
Dense Fog Dates (code 2)	None
Thunder Dates (code 3)	1st, 7th, 9th, 14th, 17th, 18th, 23rd & 29th
Sleet Dates (code 4)	None
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	None

Table 4b

AUGUST

Average Wind Speed/Departure from Normal	6.3 mph/+0.2 mph
Peak Wind/Direction/Date	52 mph/W/12th
Windiest Day Average Value/Date	11.1 mph/17th
Calmest Day Average Value/Date	1.6 mph/27th
# Clear Days	9
# Partly Cloudy Days	18
# Cloudy Days	4
Dense Fog Dates (code 2)	3rd
Thunder Dates (code 3)	2nd, 12th & 13th
Sleet Dates (code 4)	None
Hail Dates (code 5)	None
Freezing Rain Dates (code 6)	None

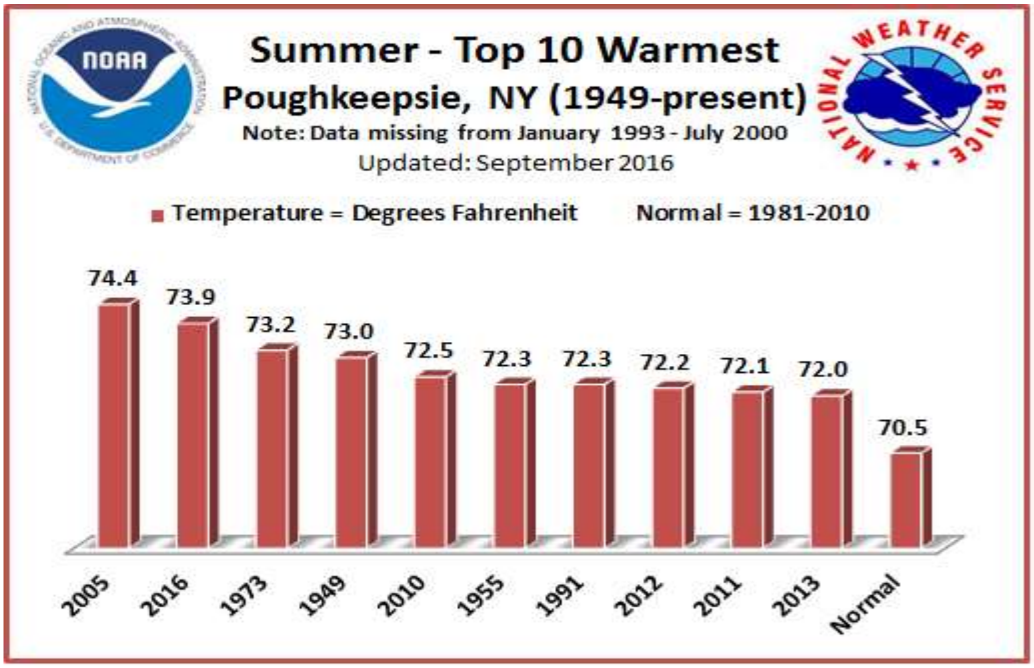
Table 4c

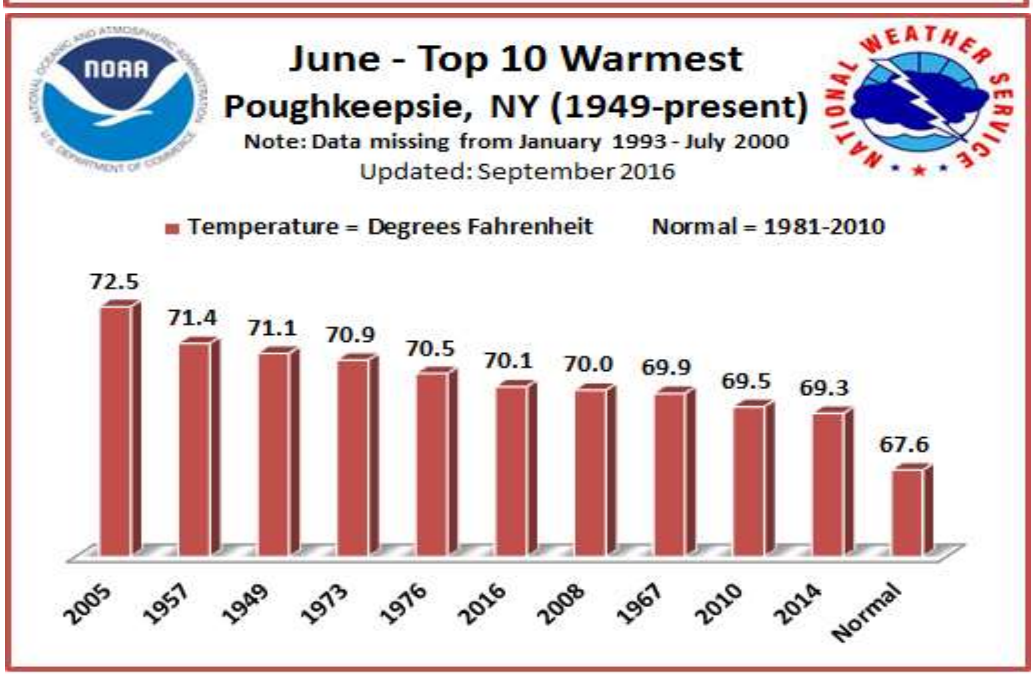
For more climate data and records, please visit our climate page at: www.weather.gov/albany/Climate.

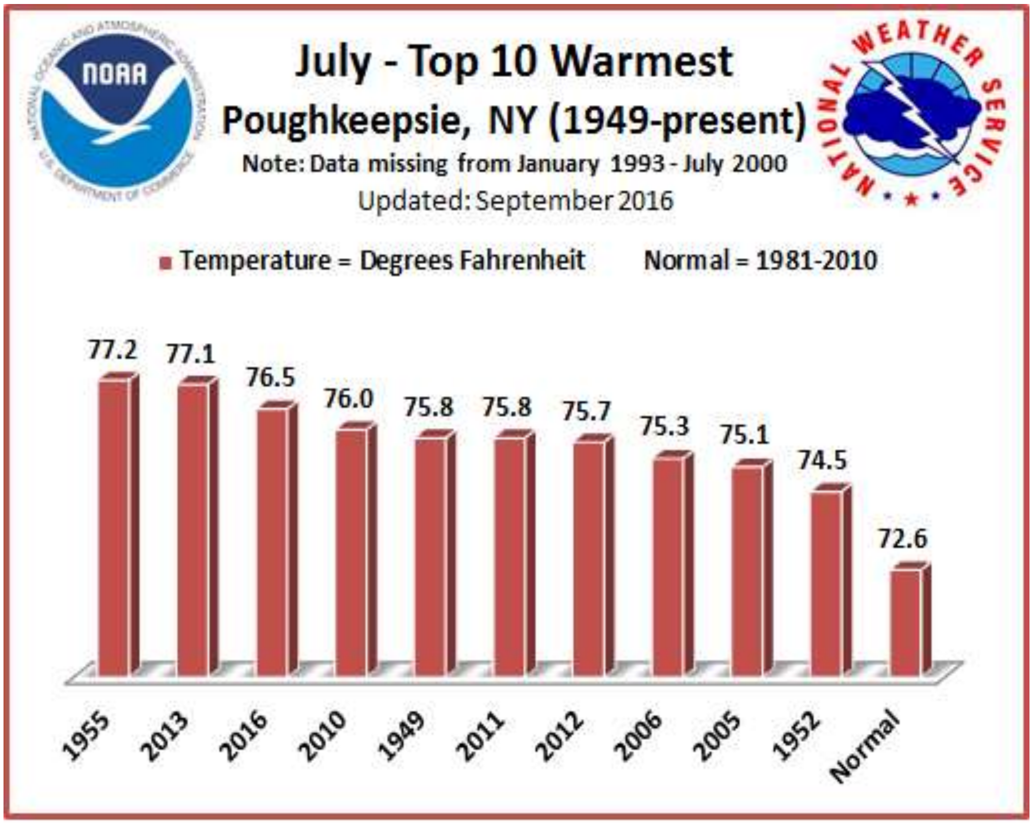
REGIONAL CLIMATE TABLES FOR SUMMER

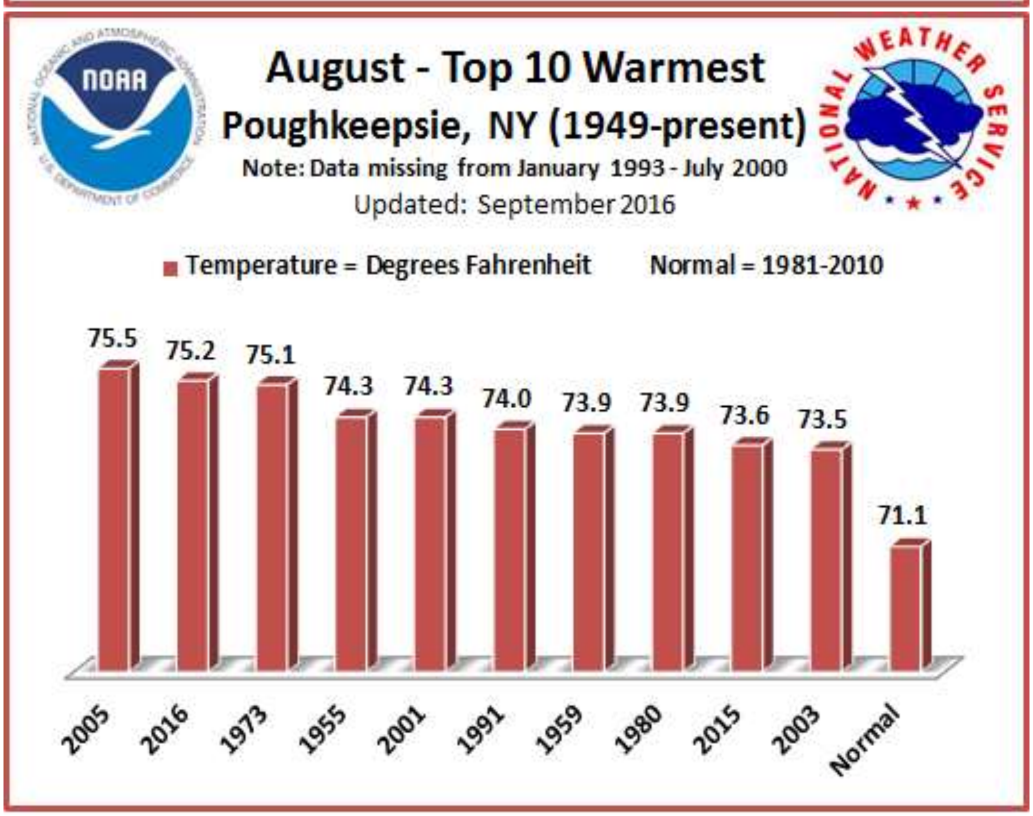
Ingrid Amberger
Senior Meteorologist, NWS Albany

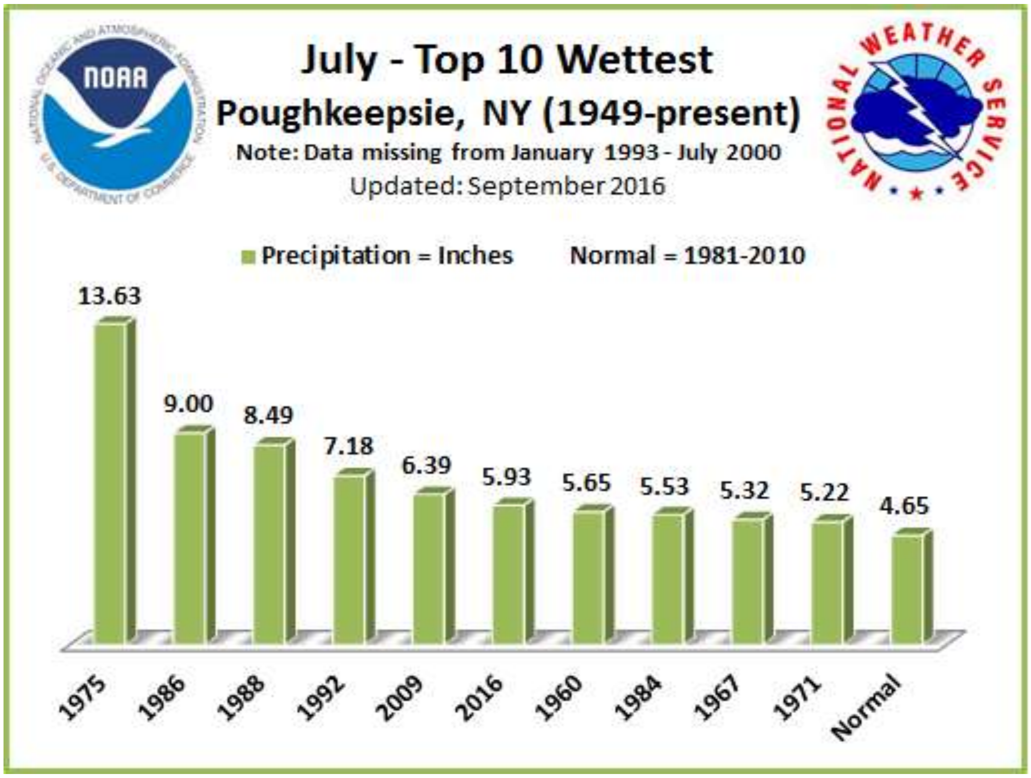
The following are summary and Top 10 regional climate tables of note covering this past summer season. The cities covered are Poughkeepsie, Glens Falls and Albany:

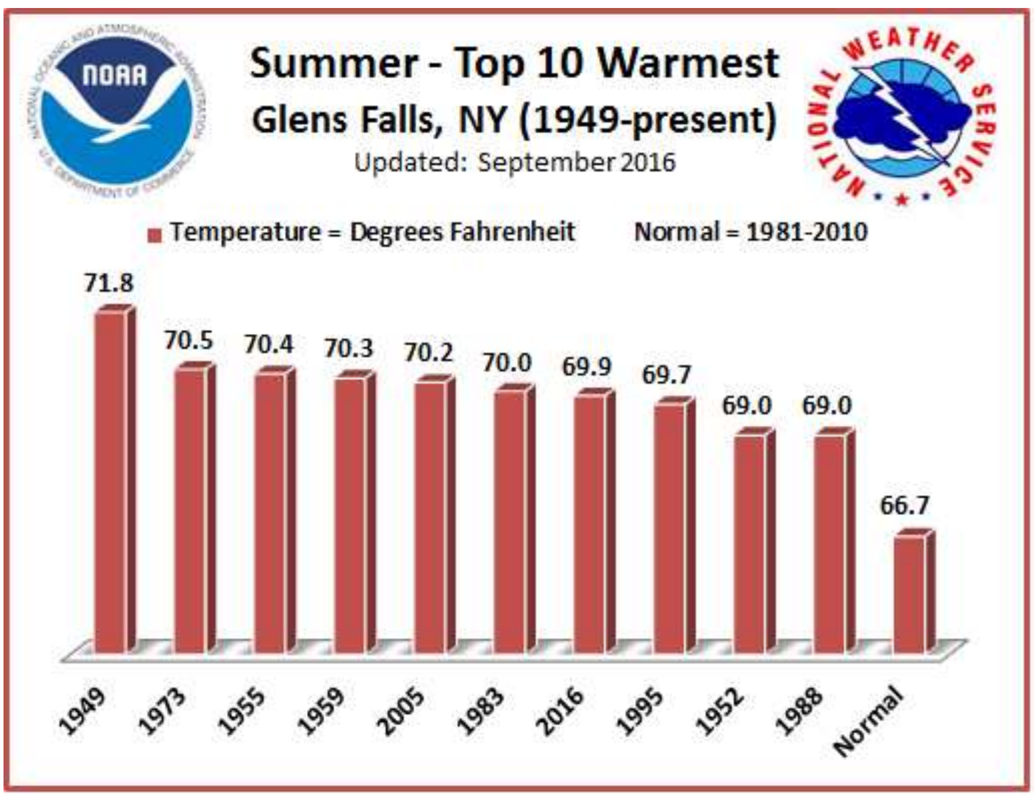


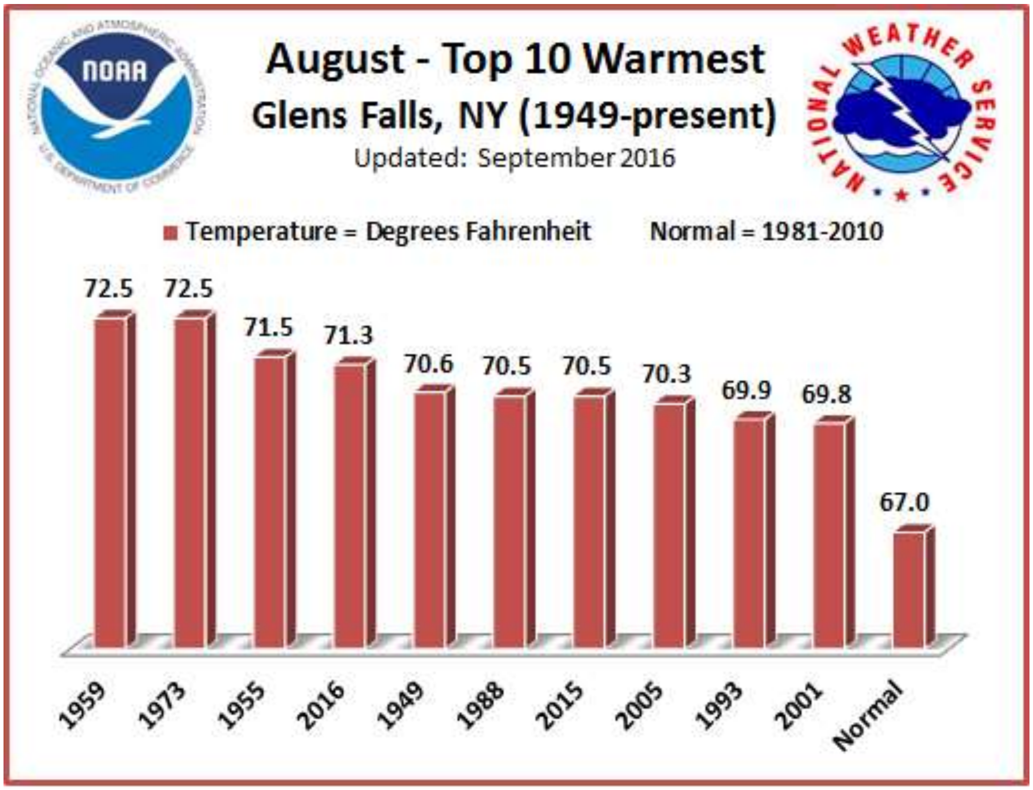


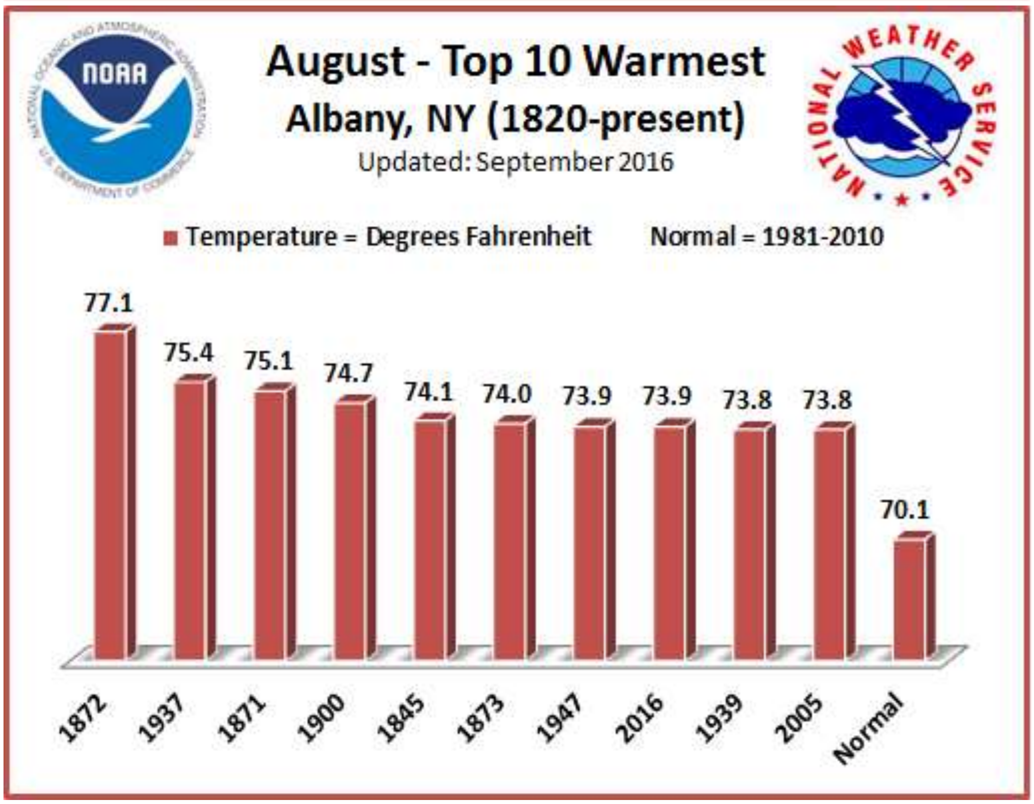

July - Top 10 Warmest
Poughkeepsie, NY (1949-present)
Note: Data missing from January 1993 - July 2000
Updated: September 2016
Temperature = Degrees Fahrenheit
Normal = 1981-2010
77.2
77.1
76.5
76.0
75.8
75.8
75.7
75.3
75.1
74.5
72.6
1955
2013
2016
2010
1949
2011
2012
2006
2005
1952
Normal


August - Top 10 Warmest
Poughkeepsie, NY (1949-present)
Note: Data missing from January 1993 - July 2000
Updated: September 2016
Temperature = Degrees Fahrenheit
Normal = 1981-2010
75.5
75.2
75.1
74.3
74.3
74.0
73.9
73.9
73.6
73.5
71.1
2005
2016
1973
1955
2001
1991
1959
1980
2015
2003
Normal


July - Top 10 Wettest
Poughkeepsie, NY (1949-present)
Note: Data missing from January 1993 - July 2000
Updated: September 2016
Precipitation = Inches
Normal = 1981-2010
13.63
9.00
8.49
7.18
6.39
5.93
5.65
5.53
5.32
5.22
4.65
1975
1986
1988
1992
2009
2016
1960
1984
1967
1971
Normal


Summer - Top 10 Warmest
Glens Falls, NY (1949-present)
Updated: September 2016
Temperature = Degrees Fahrenheit
Normal = 1981-2010
71.8
70.5
70.4
70.3
70.2
70.0
69.9
69.7
69.0
69.0
66.7
1949
1973
1955
1959
2005
1983
2016
1995
1952
1988
Normal


August - Top 10 Warmest
Glens Falls, NY (1949-present)
Updated: September 2016
Temperature = Degrees Fahrenheit
Normal = 1981-2010
72.5
72.5
71.5
71.3
70.6
70.5
70.5
70.3
69.9
69.8
67.0
1959
1973
1955
2016
1949
1988
2015
2005
1993
2001
Normal


August - Top 10 Warmest
Albany, NY (1820-present)
Updated: September 2016
Temperature = Degrees Fahrenheit
Normal = 1981-2010
77.1
75.4
75.1
74.7
74.1
74.0
73.9
73.9
73.8
73.8
70.1
1872
1937
1871
1900
1845
1873
1947
2016
1939
2005
Normal

Climate Summary – June 2016

Location	Average Temperature (departure)	Record Warmest & Coldest	Precipitation in inches (departure)	Record Wettest & Driest
Albany, NY	68.2 (+1.0)	75.0 1870/1858 62.1 1958	2.31 (-1.48)	8.74 2006 0.65 1964
Glens Falls, NY	66.7 (+2.4)	70.9 1949 60.3 1958	3.11 (-0.44)	8.20 1998 0.37 1949
Poughkeepsie, NY	70.1 (+2.5) 6th warmest	72.5 2005 62.5 1985	2.03 (-2.40)	9.82 2013 0.30 1988

Temperature records for Albany date back to 1820 and Precipitation records back to 1826
Temperature/Precipitation records for Glens Falls data back to 1949
Temperature/Precipitation records for Poughkeepsie date back to 1949; however data from January 1993 to July 2000 is missing

Location	Average Temperature (departure)	Precipitation (departure)
Bennington, VT	64.3 (+0.6)	1.74 (-2.39)
Pittsfield, MA	63.6 (+0.1)	2.50 (-1.90)

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Climate Summary – July 2016

Location	Average Temperature (departure)	Record Warmest & Coldest	Precipitation in inches (departure)	Record Wettest & Driest
Albany, NY	74.0 (+2.2)	79.7 1868 67.6 1992	6.44 (+2.23)	9.91 2009 0.49 1968
Glens Falls, NY	71.7 (+2.9)	73.9 1995 65.2 1992	3.73 (-0.36)	8.31 1994 0.84 1993
Poughkeepsie, NY	76.5 (+3.9) 3rd warmest	77.2 1955 69.0 2009	5.93 (+1.28) 6th wettest	13.63 1975 0.72 1968

Temperature records for Albany date back to 1820 and Precipitation records back to 1826
Temperature/Precipitation records for Glens Falls data back to 1949
Temperature/Precipitation records for Poughkeepsie date back to 1949; however data from January 1993 to July 2000 is missing

Location	Average Temperature (departure)	Precipitation (departure)
Bennington, VT	69.8 (+1.6)	2.39 (-1.95)
Pittsfield, MA	69.5 (+2.0)	4.15 (-0.10)

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Climate Summary – August 2016

Location	Average Temperature (departure)	Record Warmest & Coldest	Precipitation in inches (departure)	Record Wettest & Driest
Albany, NY	73.9 (+3.8) 8th warmest	77.1 1872 64.6 1836	3.94 (+0.48)	10.59 1871 0.53 1876
Glens Falls, NY	71.3 (+4.3) 4th warmest	72.5 1973/1959 63.5 1964	2.70 (-0.98)	9.03 2011 0.75 1957
Poughkeepsie, NY	75.2 (+4.1) 2nd warmest	75.5 2005 66.7 1987	2.20 (-2.00)	13.23 2011 0.64 1981

Temperature records for Albany date back to 1820 and Precipitation records back to 1826
Temperature/Precipitation records for Glens Falls data back to 1949
Temperature/Precipitation records for Poughkeepsie date back to 1949; however data from January 1993 to July 2000 is missing

Location	Average Temperature (departure)	Precipitation (departure)
Bennington, VT	69.9 (+3.5)	4.13 (+0.13)
Pittsfield, MA	69.0 (+2.5)	2.62 (-1.47)

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Climate Summary: Summer 2016

June-July-August

Location	Average Temperature (departure)	Record Warmest & Coldest	Precipitation in inches (departure)	Record Wettest & Driest
Albany, NY	72.0 (+2.3)	76.4 1872 66.2 1982	12.69 (+1.32)	27.21 1870 4.29 1929
Glens Falls, NY	69.9 (+3.2) 7th warmest	71.8 1949 64.8 1992	9.54 (-1.78)	17.17 1994 5.36 1964
Poughkeepsie, NY	73.9 (+3.4) 2nd warmest	73.0 1949 67.2 1985	10.16 (-3.12)	20.77 1975 2.87 1966

Temperature records for Albany date back to 1820 and Precipitation records back to 1826
Temperature/Precipitation records for Glens Falls data back to 1949
Temperature/Precipitation records for Poughkeepsie date back to 1949; however data from January 1993 to July 2000 is missing

Location	Average Temperature (departure)	Precipitation (departure)
Bennington, VT	68.0 (+1.9)	8.26 (-4.21)
Pittsfield, MA	67.3 (+1.5)	9.27 (-3.47)

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WE NEED YOU TO JOIN CoCoRaHS

John S. Quinlan
Senior Meteorologist, NWS Albany

The Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) needs your support. CoCoRaHS uses low-cost methods to collect information about rain, hail and snow. Data is collected on a daily basis and sent to a national center where it is then archived and displayed on a national map. The data is very important and is utilized by a wide variety of users, including: the National Weather Service; other meteorologists; hydrologists; emergency managers; city utilities (water supply, water conservation, storm water); insurance adjusters; USDA; engineers; mosquito control; ranchers and farmers; outdoor & recreation interests; teachers; students, and; neighbors in the community. These are just some examples of those who visit the web site and use the CoCoRaHS data.

Joining CoCoRaHS is easy and anyone can help - young, old, and in-between. The only requirements are an enthusiasm for watching and reporting weather conditions, and a desire to learn more about how weather can affect and impact our lives.

The tools needed to participate in the network are a rain gage, a snow board and a snow measuring stick graduated in tenths of an inch. Each time a rain, hail or snow storm crosses your area, volunteers take measurements of precipitation from many locations. These precipitation reports are then recorded on the CoCoRaHS website www.cocorahs.org. The data are then displayed and organized for many of our end users to analyze and apply to daily situations, in ways as varied as water resource analysis, the issuing of severe storm warnings, and neighbors comparing how much rain fell in their backyards.

One of the neat things about participating in this network is coming away with the feeling that you have made an important contribution that helps others. By providing your daily observation, you help to fill in a piece of the weather puzzle that affects many across your area in one way or another. You also will have the chance to make some new friends as you do something important and learn some new things along the way. In some areas, activities are organized for network participants, including: training sessions; field trips; special speakers; picnics; pot-luck dinners, and; photography contests…just to name a few.

To sign up for CoCoRaHS, please go to http://www.cocorahs.org/Application.aspx.

CLOUD TYPES

Ever look up at the sky, see clouds, and wonder what the names are for these clouds? Well, cloud names actually originate back to the early 1800's, when British naturalist Luke Howard devised a classification system for cloud types, the basis of which is still used today. He named clouds based on their general appearance, giving them special Latin names. The three main types based on general appearance include fibrous-looking clouds called cirrus, layered clouds known as stratus, and puffy or heaped-looking clouds called cumulus. Furthermore, the latter two of these cloud types are also classified into three categories based on the height of their bases above ground level – high (the 'cirro' group), middle (the 'alto' group), and low (the 'unlabeled' group), which also includes some clouds of more significant vertical extent. This overall classification scheme results in 10 basic cloud types, which are described next.

High clouds generally have bases higher than 23,000 feet above ground level. Their names include the prefix 'cirro', from the Latin term "a curl of hair". Clouds at this level are generally composed of ice crystals because temperatures at these altitudes are typically well below freezing. There are three basic cloud types in the 'high' category: <u>cirrus</u> clouds are wispy, silky-looking strands which are frequently referred to as 'mares' tails', and can be dense or bright white in appearance; <u>cirrostratus</u> clouds combine the stratus appearance with that of cirrus, and are typically a milky-appearing sheet of clouds, often thin, that usually, but not always, allow the sun or moon to shine through. These clouds also may be accompanied by a halo surrounding the sun or moon that is due to the interaction of light rays with the ice crystals that these clouds are composed of; <u>cirrocumulus</u> adds a puffy look to the cirrus, tending to be white, rounded patches of clouds that may be arranged in a wavelike or uniform pattern that is sometimes referred to as a "mackerel sky"; this is because they bear a resemblance to fish scales.

Middle clouds typically have bases between 6,500 and 23,000 feet above ground level. These clouds tend to consist of a mixture of water droplets and ice crystals, but can also be either/or. Although in Latin, the term 'alto' means 'high', because these cloud bases occur lower than the cirriform clouds, they are actually classified as mid-level clouds. There are four basic types: <u>altostratus</u> clouds typically are bluish-gray or white sheet-like clouds that tend to cover most or all of the sky. They are usually fairly thick, and may only allow the sun or moon to be dimly visible through them. Their appearance resembles the sun or moon as seen through a frosted layer of glass; <u>altocumulus</u> clouds, on the other hand, are more well-defined and occur as patches of clouds that may be rounded in appearance, and also may occur in bands, rolls or waves across the sky; <u>nimbostratus</u> clouds are a thicker version of altostratus clouds, and almost always do not allow the sun or moon to shine through. As the Latin term 'nimbo-' implies, these clouds are frequently associated with precipitation. By sight, they tend to be ill-defined, having a dark and fuzzy appearance. Precipitation always falls from these clouds, but it doesn't necessarily have to reach the ground. This is actually a special-case cloud whose bases can extend down into the low levels, and it can occur in multiple layers.

Low clouds have bases which occur below 6,500 feet above ground level. Since these clouds are much lower in the atmosphere, they occur at warmer temperatures and tend to be composed mainly of water droplets, even at sub-freezing temperatures, especially the first two of the three basic types, which have typically little vertical extent; stratus clouds generally appear as an ill-defined uniform gray layer. When a stratus cloud intersects the ground, it is known as fog. Drizzle or tiny snow grains can fall from stratus clouds. Stratocumulus clouds tend to occur in large, thick patches, rolls or flat puffs that often are separated by patches of clear sky. Sometimes very light precipitation in the form of small droplet rain showers or very small snowflakes falls from these clouds.

The third basic type of low clouds are those with vertical extent, and are divided into two classifications: cumulus, and; cumulonimbus. Cumulus clouds have minor vertical extent, appearing as white, puffy clouds with darker bases that float by on a fair weather day (hence the occasional reference of "fair weather cumulus"). The bases of these clouds tend to be within 6,500 feet of the ground, but these are another special-case cloud when it comes to height as they can extend into the lower portion of the mid-level, especially over hot, dry terrain. These "fair weather" cumulus clouds also consist mainly of water vapor. But cumulus clouds can grow to greater vertical extent, resembling towers or giant heaps. These are referred to as "towering cumulus" or "cumulus congestus" clouds, and although their bases usually remain within the low cloud level, the tops of these clouds may extend well into the middle level. They still tend to consist mainly of water droplets. These clouds can grow even further, into the "king" of cloud types, cumulonimbus, which have very deep vertical extent, and bases in the low category (except sometimes higher over hot, dry terrain) yet with tops in the high range. In fact, the tops of these clouds often extend to over 40,000 feet above ground level! With such deep vertical extent, these clouds consist of a mixture of water vapor and ice crystals, with mostly ice crystals at the tops of these clouds. As you may have guessed, these clouds are indeed special – they are associated with thunderstorms, and contain strong channels of vertical motion within them – both updrafts and downdrafts. Oftentimes with the bigger cumulonimbus clouds, a flat-looking anvil top will form which resembles thick cirrostratus. In addition to lightning, these clouds produce heavy bursts of precipitation, which often includes hail of various sizes.

Although we have described the basic cloud types, there are many additional varieties, including two special, rare and very high cloud types called 'nacreous' and 'noctilucent'. You can explore the various types on the National Weather Service's Cloud Chart at the NWS Jetstream online course located HERE. In future *Weather Essentials*, we will discuss in more detail how clouds form, and some of the more intricate physical properties associated with them.

WEATHER WORD FIND

by Tom Wasula

Each word will be found in any one of 8 directions (vertical, horizontal or diagonals/forwards or backwards)

The solution to this puzzle will be provided in the winter issue.

ATMOSPHERIC OPTICS

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S Z W H B T F X L J N V L C E T N W R B
M U H O I C E C R Y S T A L S U Y O J E
R Y N Q B N O I T C E L F E R S Y X K I
Z L C P N N U E A N O R O C T G T I C E
C O F A I N I T Q F O S O E B T D B M C
B P Z I O L T A V I W J L I K R T S K P
P Y E K Y E L X R O N P V Y Q A C G Y Y
J H N U R L T A D N O Z S R W Y Y O Q J
R K P I P S L A R R H D P M N A P D T B
K M N Z S P H U D S R U L D B N A N K O
J G R E F S Q R F R E S M E T V L U M H
D X B Z Z B E A F J F S R J Q C K S D X
T B S I C T E F U X R C K R L N N R P P
P R B O A E G F I U A G L O R I E S J A
O I M W L B V X H I C G E B R R C W P O
L G N G H A P C G A T J B W E K L U I X
Y E L K B I H R A D I V E X S P I S B Y
X Y A L S U L J I S O J V N P N P H M A
O F U Z I K I L I R N L A A I P S M H E
N Q D Q F Q Y G K V Y U M X F V E E Q W
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CORONA
ECLIPSE
GLORIES
HALOS
ICECRYSTALS
PINKSKY
RAINBOW
REFLECTION
REFRACTION
ROYGBIV
SCATTERING
SHADOWS
SUNDOGS
SUNPILLARS
WATERDROPLETS

Summer Issue Solution

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+ W R + + + + W S + S E G A M A D L + + + + + + +
+ A A + + + + A + H + U + + + + I + + + + + + + +
+ R D + + + + L + T E + B + + G + + + + + + + + +
+ N A + + + S L + + H L + M H + + + + + + + + + +
E I R + + + U C + + D U F T I + R + + + + + + + +
N N + + + + T L + + + O N C + N + U + + + + + + +
O G + + + + A D + + + I O D L + O + O + + + + + +
L + + + + + M U + + N D + L E O + L + P + + + + +
C + + + + + M D + G A + + + F R U + U + N + + + +
Y + + + + + A W I N D + + + + + + D T M + W + + +
C + + + + + M + R + + + + + + + + S + + U + O + +
O D E R E C H D + + + + + + + + R + + + + C + D +
S + + + + + T + + + + + + + + U + + + + + + + + +
E + + + E T I L L E T A S + B + + + + + + + + + +
M + + + + + + + + + + + + O + + + + + + + + + + +
+ + + + + + + + + + + + R + + + + + + + + + + + +
+ + + + + + + + + + + C + + + + + + + + + + + + +
+ + + + + + + + + + I + + + + + + + + + + L + + +
+ + + + + + + + + M + + + + + + + + + + I + + + +
+ + + + + + + + + + + + + + + S + + + A + + + + +
+ + + + + + + + + + + + + + Q + + + H + + + + + +
+ + + + + + + + + + + + + U + + + + + + + + + + +
+ + + + + + + + + + + + A + + + + + + + + + + + +
+ + + + + + + + + + + L + + + + + + + + + + + + +
W A T E R S P O U T L + + + + + + + + + + + + + +
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(Over,Down,Direction)
CUMULONIMBUS(22,12,NW)
DAMAGE(17,1,W)
DERECHO(2,12,E)
DOWNPOUR(24,12,NW)
FLOOD(15,9,NW)
HAIL(19,21,NE)
LIGHTNING(18,1,SW)
MAMMATUS(7,11,N)
MESOCYCLONE(1,15,N)
MICROBURST(10,19,NE)
RADAR(3,5,N)
SATELLITE(13,14,W)
SHELFCLOUD(9,1,SE)
SQUALL(16,20,SW)
THUNDER(10,3,SE)
TORNADO(7,13,NE)
WALLCLOUD(8,1,S)
WARNING(2,1,S)
WATERSPOUT(1,25,E)
WIND(8,10,E)

From the Editor's Desk

It's the first full day of fall as I write this. A dry cold front passed through from the north several hours ago and dropped our temperature here in Albany all the way down into the mid 50s as of early this evening, giving us our first taste of fall right on cue. Our opening article details the Atlantic tropical season to this point. The summer was warmer than normal, and portions of east central New York and Western New England were declared to be in a mild or moderate drought. Two climate articles recap the season, the first being our usual article covering Albany in detail, and the second utilizing Top 10 graphs and summary tables to summarize the more significant climate aspects for Poughkeepsie, Glens Falls and Albany. Our fourth article invites our readers to join CoCoRaHS and be part of a large precipitation-gathering and reporting network in our community. From our departments, W*eather Essentials* provides interesting detailed information about the types of clouds you often see in our sky, and our *Weather Word Find* topic of Atmospheric Optics offers up some fun. Will our abnormally warm summer translate into a very cold winter? Only time will tell if this belief on the part of some pans out. In the meantime, enjoy the readings and have a pleasant holiday and election season!

WCM Words

Steve DiRienzo
Warning Coordination Meteorologist, NWS Albany

With the warm, dry summer we just experienced, drought has become a concern across much of the northeastern United States.

Many government agencies and university scientists work together to monitor drought and its effects. The United States Drought Monitor, which is updated weekly, is a collaborative effort to depict where drought and its impacts are occurring across the country. The U.S. Drought Monitor is available to the public and can be a useful tool for anyone involved with water resources planning.

The U.S. Drought Monitor can be found at: http://droughtmonitor.unl.edu/

Information incorporated into the Drought Monitor includes, but is not limited to: rainfall from weekly to yearly timescales; ground water levels and river flows; soil moisture and estimated soil moisture; reports from water supply managers on reservoir levels, and; reports from farmers on crop conditions. In addition, recommendations from state climatologists and NWS personnel, as well as media reports, concerning drought impacts are used in the final determination of drought level for each week.

An updated Drought Monitor is released every Thursday at 8 AM ET.

With vegetation beginning to go dormant, water usage will decrease through the next few months. The Water Year runs from October 1 to September 30, as there is normally an excess of precipitation from fall into spring beginning in October, and a recharge of water systems. Hopefully, the Northeast will see enough rainfall to make up the water deficits soon.

Here at the National Weather Service, we strive to be the source of unbiased, reliable and consistent weather information. We're here to answer your weather and water questions 24 hours a day, 7 days a week. If you have concerns, please call us. If you have comments on Northeastern StormBuster, or any of the operations of the National Weather Service, please let me know at Stephen.Dirienzo@noaa.gov.