

# **2016 WEATHER SUMMARY**

## **West Henrico Co. - Glen Allen, VA**

### **MOST UNUSUAL RECORDS**

#### **The Greatest Snowstorm Since 2000**

The snowstorm of January 22-23 gave the Richmond International Airport 11.4 inches of snow and the January total was 12.1 inches the 12th greatest monthly snowfall total for January since snowfall records were started in 1898. Glen Allen had 15.1 inches with 6.0 inches of snow falling on the 22<sup>nd</sup> and 9.1 inches of snow on the 23<sup>rd</sup>, greatest snowstorm ever recorded at the Glen Allen station. The total water content was 2.26 inches. Of this total, approximately 0.80 inches fell as sleet from 1730 on the 22<sup>nd</sup> to 0300 on the 23<sup>rd</sup> during a 9.5-hour period. The snow during the storm equaled approximately 1.46 inches of liquid. The maximum wind gust during the storm was 33 mph at 0821 on the 23<sup>rd</sup> but several afternoon gusts were 30 mph. The snow started again by 0630 on the 23<sup>rd</sup> and by 1445 Glen Allen had 10.4 inches of snow and 1.80 inches of liquid precipitation. Glen Allen and western Henrico got more snow because of snow bands moving around the low just off the coast so the total snowfall was 15.1 inches by 2200 on the 23<sup>rd</sup>. The snow to water ratio before any sleet was 11.4 inches to one inch. Some thought the models were off the mark but it was the sleet that gave this illusion. If all the precipitation had been snow the 1.81 inches of liquid precipitation would have given 20.6 inches even more than the forecasted amount. So, shoveling these 15.1 inches was like shoveling the weight of a 20.6 inches of snow.

#### **Heavy Thunderstorm**

On Thursday June 16, 2016 Glen Allen had the worst thunderstorm since June 25, 2012 between 2130 and midnight. The storm had tops to 52,000 feet and wind to 42 mph here. The Richmond International Airport had a gust to 60 mph and Ashland Airport had winds to 58 mph. Our neighborhood lost 2 trees and not far to our north they had 1.25-inch diameter hail. The lightning was also very frequent. One couldn't get to sleep until about midnight because of the thunder. One bolt was about 3 or 4 miles away but was so strong it shook the house! My son lost a section of his fence and five shingles from his roof. He brought all their food over to our refrigerator and his power was restored Saturday afternoon of the 18<sup>th</sup>. At one point 200,000 people were without power in central VA and 160,000 customers in the Richmond area were without power, according to Dominion Virginia Power. By Saturday afternoon there were still 53,000 in Henrico without power. I spent about 3 hours clearing up the yard's broken limbs and leaves which were all over. Two homes had shutters that were torn off

and one neighbor lost two sections of his fence. But we were lucky in our neighborhood as it was worse in many areas. There were still about 8,500 people without power on Monday June 20th or 4 days later.

## Tornadoes

The lowest pressure was 29.32 inches on the 24th which was also the 2nd lowest pressure ever recorded in February at the Glen Allen station. The low pressure was associated with a tornado outbreak in Virginia with 8 confirmed tornadoes. The maximum dew point on the 24th was a new record for February at 1350 before the tornado outbreak. Tappahannock was particularly hard hit with a F3 tornado which was estimated to have maximum wind speed of 140 mph, and a maximum path width of 400 to 500 yards. They were four people killed Two men and a 2-year-old boy were killed when a tornado tore through Waverly and destroyed their mobile home and the violent weather that claimed the life of an Appomattox County man and inflicted injuries and damage in the Tappahannock area. Two of the tornadoes were F3s and one of the F3s had a 30-mile path over NE VA.

## Thunderstorms

Thunder was heard on 33 days in 2016 at Glen Allen. The average is 38.9 days per year. 2013 set the record low number of 31 thunderstorms. July had 7 thunder days which was the greatest for one month in 2016 and most weren't that strong. Most were weak as 20 of the 33 were rated as category one the weakest.

20 (Cat. 1),    7 (Cat. 2),    3 (Cat. 3),    2 (Cat. 4),    1 (Cat. 5)

## Temperature

**YEAR-** The mean temperature for 2016 at Glen Allen was 60.1°F which was positive departure of 1.1°F. This was the warmest year at Glen Allen since 2012 with an average of 60.5°F which is the Glen Allen record. The Richmond International Airport had a mean of 59.3°F which made 2016 the 23<sup>rd</sup> warmest year in the past 136 years. Glen Allen had 53 days that the maximum temperature was  $\geq 90^\circ\text{F}$  which was 11 days above the normal. The maximum temperature at Glen Allen was  $\leq 32^\circ\text{F}$  for the high temperature nine times. Glen Allen had 74 days when the low temperature was  $\leq 32^\circ\text{F}$ . Glen Allen's lowest record was 63 days with the minimum temperature of  $\leq 32^\circ\text{F}$  days in 2012. The Airport had 74 days that the low temperature was  $\leq 32^\circ\text{F}$  which was 0.5 days more than their 30-year average. The lowest minimum temperature of 2016 at Glen Allen was 8.2°F on February 14<sup>th</sup>.

**MONTH-** The coldest month for 2016 was January with a mean temperature of 36.2°F. January also had the greatest number of days (23) with the minimum temperature  $\leq 32^\circ\text{F}$ . May had the greatest negative departure from normal  $-3.9^\circ\text{F}$ . December had the second greatest negative departure of  $-1.6^\circ\text{F}$ . March had the greatest positive departure from average of  $+6.8^\circ\text{F}$ .

July had 22 days with the maximum temperature  $\geq 90^\circ\text{F}$  which was the greatest number for any month. August had 22 nights that the temperature was  $70^\circ\text{F}$  or more. The warmest minimum temperature for the year was  $79^\circ\text{F}$  on August 13<sup>th</sup>. The number of days that the minimum temperature was  $\geq 70^\circ\text{F}$  in 2016 was 55 days and the average is 46.5 at Glen Allen. Only 2010 had more with a total of 66. November's maximum of  $84^\circ\text{F}$  set a new monthly high temperature for the month at Glen Allen.

**DAY-** The hottest temperature of 2016 in Glen Allen occurred on July 24<sup>th</sup> with a maximum temperature of  $99^\circ\text{F}$ . The average highest annual high temperature for Glen Allen is  $99.7^\circ\text{F}$ . The hottest day was August 14<sup>th</sup> with a daily mean of  $88.1^\circ\text{F}$  and the coldest day of the year occurred on January 19<sup>th</sup> with the daily mean temperature of  $19.9^\circ\text{F}$ . The lowest minimum temperature at Glen Allen was  $8^\circ\text{F}$  recorded on February 14, 2016.

**RANGE-** The greatest temperature range for the year at Glen Allen was  $43.5^\circ\text{F}$ , which occurred on April 18, 2016 with a high temperature of  $87.0^\circ\text{F}$  and a low temperature of  $43.5^\circ\text{F}$ .

The smallest temperature range for the year at Glen Allen was  $2.9^\circ\text{F}$ , which occurred on September 21, 2016 with a high temperature of  $74.0^\circ\text{F}$  and a low temperature of  $71.1^\circ\text{F}$  during a day with rain.

## **PRECIPITATION**

**YEAR-** The total number of days this year with measurable precipitation at Glen Allen was 129 days and the total precipitation for 2016 at Glen Allen was 47.73 inches. The average annual precipitation for Glen Allen is 45.86 inches or a positive departure of 1.87 inches. The total precipitation for 2016 for the Airport was 52.75 inches. The average annual precipitation for the Richmond Airport is 43.60 inches or a positive departure of 9.15 inches.

**MONTH-** May had 17 days with measurable precipitation, which was the most of any of the months of 2016 and the most on record for the Glen Allen Station. There were 81 days with a daily precipitation amount  $\leq 0.10$  inches. There were 15 days with daily precipitation amount  $\geq 1.00$  inch and 2 days with more than 2.00 inches. May was the wettest month with 8.55 inches and set a new record for the wettest May with a +4.57 inch departure. March was the driest month of 2016 with only 1.10 inches and set the record for the driest March with a -3.06 inch departure.

**CALENDAR-** The most precipitation recorded in a day occurred on October 8, 2016 with 2.81 inches and set a new record for the month of October. The daily record for Glen Allen is 3.75 inches, which occurred on August 27, 2011 during Hurricane Irene.

**24-HOUR PERIOD-** The maximum precipitation in a 24-hour period for 2016 was 3.43 inches on October 08 - 09, 2016. The record for Glen Allen is 3.83 inches that occurred on August 27-28, 2011 during Hurricane Irene

**HOURLY-** The greatest one-hour rainfall intensity during 2016 was 1.26 inches on June 16<sup>th</sup>. The record one-hour precipitation intensity for the Glen Allen Station is 2.13 inches on June 3, 2009. The maximum precipitation of 0.64 inches on February 03 set a new one hour record for the month of February.

**FIVE-MINUTES-** The greatest five-minute precipitation rate for 2016 was 0.40 inches, which fell on June 16<sup>th</sup> 2016 during a thunderstorm. The record for the most intense five-minute precipitation at Glen Allen was 0.67 inches, which occurred on August 10<sup>th</sup> 2013.

**DROUGHT-** The longest dry period of 2016 was October 10<sup>th</sup> to October 20<sup>th</sup> with no measurable precipitation in 11 days. Another long period with only 0.10 inches occurred from October 10<sup>th</sup> to Nov. 2 or 24 days. Six months of the year were below average but they were not consecutive months like 2014 when Glen Allen had seven consecutive months with below average precipitation.

## **WIND**

**YEAR-** The highest wind gust for the year was 42 mph from the NNW that occurred on June 16, 2016 at 2130 hours during a thunderstorm. This was the highest wind at Glen Allen since 2-21-2014 when a gust to 45 mph occurred.

**MONTH-** The windiest month was March with a wind run of 2,628.8 miles. This was the 4<sup>th</sup> windiest month ever recorded at the Glen Allen station.

**DAY-** The windiest day for 2016 was on January 23<sup>rd</sup> with a wind run of 227 miles. This was also the highest daily wind run recorded at Glen Allen since January 27, 2012 when 247 miles was recorded. The second windiest day was October 9, 2016 when a wind run of 206.8 miles was recorded. The record wind run for Glen Allen during a calendar day was 284.1 miles set during Hurricane Irene on August 27<sup>th</sup> 2011.

## **SNOW**

**YEAR-** The 2016 Glen Allen total snowfall for the winter (2015 - 2016) was 18.0 inches and the total snow for 2016 was 19.9 inches. There were 9 days during 2016 that Glen Allen had measurable snowfall and most were very light except one snow on January 22-23<sup>rd</sup> of 2016 when a record snow of 15.1 inches occurred. There were 9 days (average is 10.4 days) in 2016 with more than a trace of snow on the ground at sunset, eight of these occurring in January. The maximum snow on the ground at sunset during 2016 was 13 inches on January 23<sup>rd</sup>. The Airport recorded 15.1 inches of snow for the year which was a departure of +4.8 inches.

**MONTH-** The greatest monthly snowfall total for Glen Allen in 2016 was 16.4 inches in the month of January which averages 4.7 inches.

**STORM-** The most snow to fall in any one storm was 15.1 inches that occurred on January 22<sup>nd</sup> and 23<sup>rd</sup>. The greatest snow in a calendar day in 2016 was 9.1 inches on January 23<sup>rd</sup>.

## BAROMETRIC PRESSURE

**YEAR-** The highest barometric pressure recorded for the year was 30.70 inches of mercury on December 19, 2016, the highest barometer since December 5, 2015 when the pressure was 30.74 inches. The lowest barometric pressure for the year was 29.32 inches of mercury which was recorded on February 24<sup>th</sup> which was the lowest pressure since March 2014 when the pressure was 29.13 inches.

**MONTH-** December had the highest average barometric pressure of any month in 2016 which was 30.20 inches the highest since November 2015. June had the lowest average barometer reading of any month at 29.97 inches the lowest since July 2015.

## RELATIVE HUMIDITY

**YEAR-** April's average relative humidity of 61.9% was the lowest for any month of 2016. The highest relative humidity was recorded in September with an average relative humidity of 78.4%. The lowest daily relative humidity for the year was 11% recorded on Jan. 18, 2016. May, Sep, and Dec all set a new record high relative humidity for the month. The winter of 2015-2016 had the highest average relative humidity on record of 70.1%.

## SKY COVER

The cloudiness average value is based on (0 as clear), (1 as partly cloudy), and (2 as cloudy).

**MONTH-** May with (1.48) was not only the cloudiest month of 2016 but is now the cloudiest month on record at this station. September was also very cloudy and averaged 1.42 and set a new record for September. Oct with (0.73) was the clearest month of 2016 and set a new record for the clearest October on record. The cloudiest season was the spring of 2016 with the average of the three months being 1.19.

## SEASON RECORDS

### Glen Allen Winter – Dec. 2015 to February 2016

The winter was +3.6°F warmer than average and 1.23 inches wetter than normal. December 2015 was the warmest on record with a +9.8 °F departure. January had only a -0.5 departure and February had a +1.8 °F departure. January had 16.4 inches of snow and February had 1.6 inches of snow of the 18.0 inch total for the winter season.

#### Richmond International Airport Winter Records:

December was the warmest on record with a 52.1 °F mean temperature. (Records since 1880)

The Airport had 12.1 inches of snow for Jan. the most since Jan 2000 and the 12<sup>th</sup> greatest monthly total on record.

8 Tornadoes were reported by Wakefield in the Richmond area on February 24<sup>th</sup>.

### Glen Allen Spring – March to May 2016

Spring was only +0.4°F warmer than average and March was the second warmest on record with a +6.8 °F departure. But May was the coolest May on record and April was a little cooler than average.

The first 90° day didn't come until May 26<sup>th</sup>. Spring 2016 was also the third wettest on record with 12.10 inches of precipitation. The warm March was the driest March on record and the coolest May was the wettest on record. The spring season had 1.9 inches of snow in March which was 2.0 inches below the average. May was not only the cloudiest May on record but the cloudiest month on record at Glen Allen. With all the extremes in the spring it was a very difficult season for gardeners.

#### Richmond International Airport Spring Records:

March was the 3<sup>rd</sup> driest in 129 years.

March was the 10<sup>th</sup> warmest in 119 years.

April 10<sup>th</sup> had a hard freeze of 27°F the coldest in April since 1992 after a very warm March that killed many plants and even injured some shrubs.

May with 9.79 inches of rain made it the wettest in 143 years

### Glen Allen Summer – June to August 2016

Summer was +1.3° warmer than average and 0.32 inches drier than average. June and August rainfall was below average but July was +1.63 above average. The summer had 48 of the year's fifty-three 90° days and had 11 more than the season average of 37 days. This was the third most humid summer. This summer's average relative humidity had a +2.1% departure from average. On June 16<sup>th</sup> a strong thunderstorm left 160,000 in the Richmond area without power and some areas had hail of 1 to 1.25 inches in diameter.

#### Richmond International Airport Summer Records:

August was the 3<sup>rd</sup> driest in 143 years.

August was the 6<sup>th</sup> hottest in 119 years.

## Glen Allen AUTUMN – SEPTEMBER to NOVEMBER 2016

The fall was +2.4 ° above average mean temperature and departure of +0.39 inches in precipitation. September was the wettest on record and not only the cloudiest September but also the 2<sup>nd</sup> cloudiest month on record. September also had 13 precipitation days which was a new record. November had a maximum temperature of 84 °F on November 3<sup>rd</sup> the first 80°F day in November. The 2.81 inches on the 8<sup>th</sup> was the 5<sup>th</sup> greatest rain in a calendar day for all the months.

Tropical Storm Matthew on October 8<sup>th</sup> and 9<sup>th</sup> gave 3.43 inches of rain but only 0.10 inches for the rest of the month. October ended up the clearest October on record for 2016.

### Richmond International Airport Autumn Records:

September was the second wettest on record in the past 143 years with 11.19 inches of precipitation.

Tropical Storm Matthew gave 3.31 inches of rain in a calendar day the 6<sup>th</sup> greatest rain on record for October.

November the 19<sup>th</sup> driest in the past 119 years

## Annual Records

2016 was the fourth wettest year on record at Glen Allen with a total of 47.73 inches, a +1.54 inch departure. The Richmond International Airport had 52.75 inches and was much wetter than Glen Allen with a +9.15 inch departure based on the 30 year average of 43.60 inches and the wettest year since 2013 when 53.68 inches was recorded.

Glen Allen's 2016 annual temperature average was 60.1°F which was a +1.1°F departure from the eight-year average and the warmest year since 2012. The Richmond International Airport's 2016 annual temperature average was 59.3°F with a +0.4°F departure based on the 30-year average of 58.9°F.

In 2016 Glen Allen had the third greatest snowfall on record with 19.9 inches. The eight year average is 16.7 inches or a departure of +3.2 inches. The most on record is 36.7 inches in 2010 and the least is 1.8 inches in 2011. There was one day with pea size hail observed on April 7<sup>th</sup>. The Richmond International Airport had 15.1 inches of snow in 2016 and its 30-year average is 10.3 inches for a departure of +4.8 inches.

2016 at Glen Allen with a wind run of 20,336.2 miles was the fifth windiest year in the past eight years. The average annual wind run is 19,093.2 miles.

During the Year 2016 at Glen Allen there were a total of:

3 Days with Glaze

4 Days with Sleet

15 Days with Snow

1 Day with Hail

24 Days with Fog

33 Days with Thunder

164 Days with Dew

57 Days with Frost