

CLIMATE

INTRODUCTION

The climate of Hawthorne is typical of the Mid-Atlantic region and specifically the New Jersey Piedmont region. Winters are cold with sub-freezing weather, and summers are hot with temperatures in the eighties and nineties (Seglin 1975). The difference between winter and summer averages 40°F, but differences between low and high temperatures can be almost 100°F (Godfrey 1980). Precipitation, in some form, is received throughout the year.

As a result of geography, there are some meteorological occurrences that are unique to Hawthorne. The First Watchung Ridge (called Orange Mountain by geologists) plays a key role in Hawthorne's climate, especially in winter. With an elevation difference of over two hundred feet between the mountain and the valley there is a marked difference in the texture of winter precipitation when the temperature is near freezing, with snow accumulating on the mountain but melting in the valley during winter storms. The First Watchung also alters the local weather by creating thermal inversions. During nor'Easters (northeastern storms), it is common for warmer air from the ocean to be brought in by easterly winds. This warm air overrides cold air at the surface and turns snow into rain, sleet, and freezing rain. The First Watchung has the capacity to help trap cold air in the valley and extend the duration of an inversion, resulting in slightly more sleet or freezing rain for those in the valley than in the surrounding areas.

According to the NJ State Climatologist, there is growing evidence that our global climate is changing as a result of human activities. The NJ State Climatologist evaluated data from 19 stations for the NJ Climate Report Card in order to begin to document and understand climate within NJ. While statistical trends were not developed for this study, over 600 time-series graphs were created that chart weather variables over the past century (e.g. min. and max. temperature, precipitation). The weather station nearest to Hawthorne that was evaluated for this climate study was Charlotteburg Reservoir, which has been monitored since 1893 (Robinson, 2010; Hartman, 2002). The Charlotteburg Reservoir weather monitoring station is located about 16 miles west of Hawthorne, in West Milford Township, Passaic County near Route 23.

According to the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC), the temperature trend (annual average) in New Jersey is +0.2 °F per decade, and the precipitation trend is +0.41 inches per decade (for the period of record 1895 to 2012) (NOAA, June 13, 2013).

In addition, the NCDC calculates state *normals* (three-decade averages) of climatological variables, including temperature and precipitation. The normal maximum temperature for NJ has increased between 0.5 to 0.7°F for 1981-2010 compared to the 1971-2000 period. Normal minimum temperature for the state has increased 0.3 to 0.5°F (NOAA, May 16, 2011)

TEMPERATURE AND PRECIPITATION

As the prevailing westerlies shift north and south and vary in strength, they bring wet, dry, hot, and cold airstreams. These influence the weather throughout New Jersey, resulting in highly variable daily weather. The Office of the New Jersey State Climatologist (ONJSC) divides New Jersey into five distinct climate regions. Hawthorne is included in the Northern Zone, which mainly encompasses the Appalachian Highlands portion of the state (ONJSC, No Date).

This region has higher elevations and is more northern than the rest of the state; therefore, it experiences colder temperatures – on average 10°F colder than the Coastal Zone in the winter. The Northern Zone receives an average of 40 to 50 inches of snow, compared with an average of 10 to 15 inches in the south. This region is cloudier and wetter, as well. As moist air comes in from the west or off the ocean, it rises when it encounters the mountains, generating clouds and precipitation. During the warm season, thunderstorms are responsible for most of the rainfall, often developing in the evening. About twice as many thunderstorms occur here as in the Coastal Zone, where the Atlantic Ocean helps stabilize the atmosphere (ONJSC, No Date).

The ONJSC's New Jersey Weather and Climate Network maintains weather stations which transmit real-time data and weather forecasts on the Internet. Of these stations, the Charlotteburg Reservoir station is nearest to Hawthorne.

Table 5 displays monthly average highs and lows and mean temperature, average monthly precipitation, and record highs and lows (and the year it occurred in parentheses).

Measurable precipitation falls in this area on approximately 120 days per year. At the Charlotteburg Reservoir station, annual precipitation has averaged 50.23 inches (for the period 1893-2021), which is at the high end of the range of 40 to 51 inches in New Jersey (see **Table 5**) (ONJSC, No Date; ONJSC, December 2021).

Table 5. Temperature & Precipitation at Charlotteburg Reservoir, NJ.

Month	<i>Based on data from 1893-2021</i>					
	Temperature (°F)					Mean Precipitation
	Avg. High	Avg. Low	Mean	Record High	Record Low	
January	38.8	15.5	27.1	71 (1950)	-26 (1912)	3.69 in.
February	35.9	15.9	27.6	76 (1985)	-25 (1943)	3.38 in.
March	48.1	26.3	36.4	85 (1945)	-10 (1943)	4.23 in.
April	53.7	41.4	47.3	92 (1976)	6 (1923)	4.19 in.
May	63.9	48.7	57.8	96 (1936)	23 (1922)	4.21 in.
June	72.8	60.2	66.0	99 (1934)	29 (1957)	4.32 in.
July	76.1	65.6	70.7	105 (1936)	36 (1912)	4.63 in.
August	74.0	63.5	68.9	100 (1933)	32 (1940)	4.58 in.
September	68.9	56.1	62.3	100 (1953)	23 (1904)	4.51 in.
October	59.7	44.9	51.6	90 (1941)	10 (1936)	4.09 in.
November	49.4	35.3	41.3	81 (1950)	-1 (1938)	4.13 in.
December	49.3	18.9	30.9	73 (1998)	-15 (1917)	4.17 in.
Average Annual Precipitation:						50.23 in.

Rainfall is distributed fairly evenly throughout the year, with February being the driest month. On average, July, August and September have the most precipitation, but appear drier because evapotranspiration exceeds precipitation (ONJSC, December 2021). Record rainfalls are more likely to occur in August and September, due to tropical storms.

An average of 30 to 40" of snow falls annually in the lower elevations and 40 to 60" falls annually in the northern region (about 10" of snow equals 1" of rain). Each winter, about 11 to 12 days receive snowfall greater than or equal to 0.5" in Hawthorne. Days with snowfall greater than 4" occur only about 2.1 to 2.5 times per winter in this area (ONJSC, 1971-2000). Measured at Charlotteburg, the earliest snow on record was on October 10 (in 1979, with 1.5"), and the latest was April 29 (in 1909, with 2.0") (ONJSC, 1893-2010).

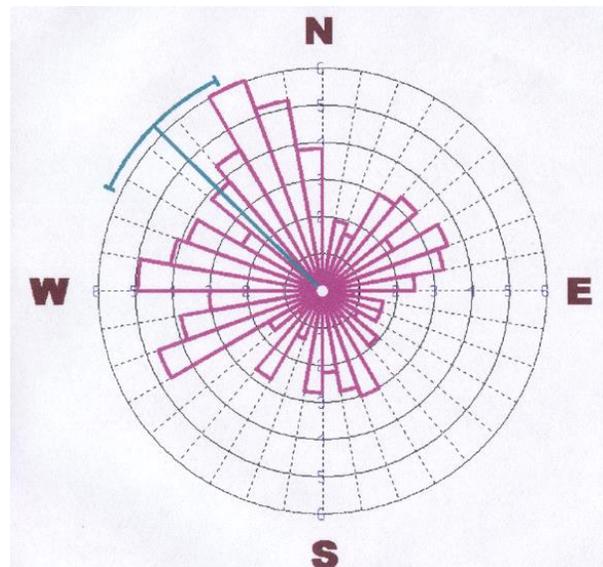
According to NOAA, Charlotteburg Reservoir has an average of 151 frost-free days. The average date for the last spring frost (32°F) is May 5th (although there is a 10% probability that the last freeze may be May 18th or later). The first frost in fall is usually around October 3rd (although there is a 10% probability that the first frost may be September 19th or earlier). The exact dates vary from place to place as well as from one year to another (NOAA, February 26, 2005).

During the winter, temperatures are not generally cold enough to keep the soil frozen for the whole winter. Winter rains are frequently warm enough to thaw the soil. Heavy rain on partly thawed soils is very erosive.

WIND

Wind plays an important role on the climate experienced in Hawthorne. The "Westerlies" are the dominant wind force experienced in Hawthorne, and are prime elements directing this region's climate. In this region, the "Westerlies" are the winds that influence the weather patterns, moving from west to east. The "Westerlies" vary in strength, bringing moist warm air masses from the south in summer and cool dry air from the north in winter. The prevailing winds blow from the northwest (**Fig. 8**).

Fig. 8. The circular graph plots wind direction against percent frequency. The concentric circles within the larger circle denote percents (0-6%). The petals flow outward from the center towards the compass point of the origin of the wind. North represents 0 degrees. The single line in the chart indicates the mean wind direction, also pointing to the direction of wind origin. The lines teeing off indicate the standard error (1.37%). Graph generated from data obtained from Newark Airport



STORM EVENTS

Hawthorne has been subjected to almost all types of severe weather, including blizzards, hurricanes, tornadoes, floods, nor'Easters, and violent thunderstorms. All of these severe weather occurrences have occurred in Hawthorne at one time or another.

A low-pressure center moving into the area is usually carries moisture-laden air from the Atlantic Ocean and is indicative of rain. Wind blowing from the east, if sustained, will almost always bring rain. Although precipitation bearing weather fronts do move east to Hawthorne from the Great Lakes, it is coastal storms originating in the tropics that lead to the greater precipitation and wind events (Dunlap 1978).

Tornadoes are rare in New Jersey; Hawthorne was struck by the famous Paterson tornado of July 1903. A fully developed funnel created a swath of destruction from Lambert Castle into Hawthorne, damaging 206 buildings and leaving four dead in its wake (Ludlum 1983).

Hurricane Sandy, which made landfall near Atlantic City on October 29, 2012, was notable not for rain totals, but for sustained wind and wind gusts (48 mph at Charlotteburg, 56 mph at Hawthorne; many sites even higher) and devastating damage to homes, trees and infrastructure (Robinson, November 7, 2012).

FLASH FLOODS IN HAWTHORNE

On July 8, 2021, a predecessor rainfall event resulted in flash flooding across portions of the area as moisture streaming northward ahead of Tropical Storm Elsa encountered a stationary boundary draped across the area. Rainfall amounts ranged 1.5-4 inches, with the ASOS at Teterboro Airport reporting 2.37 inches of rain from this event. (NOAA, 2011- 2021, Storm Events Database)

On August 22, 2021, rainfall from Tropical Storm Henri resulted in widespread flash flooding across portions of northeast New Jersey With a tropical airmass in place (precipitable water values greater than 2 inches), rainfall totals generally ranged from 2-4 inches, with this rain coming in addition to the 1-3 inches that fell during the predecessor rainfall event the night before. This resulted in widespread rainfall amounts of 3-7 inches in many locations over a 24-36 hour period. The ASOS at Newark Airport recorded a total of 4.67 inches across the two days, while the COOP observer in Harrison reported a two-day total of 8.02 inches. (NOAA, 2011- 2021, Storm Events Database).

On August 22, 2021, Hawthorne announced that multiple areas of the borough are at flood risk. The borough listed a number of flooded areas in Hawthorne and warned residents not to travel, but to stay at home. Those who must travel need to avoid the affected areas.

- Lafayette Avenue between Warburton Avenue and Central Avenue
- Rea Avenue from Goffle Road to First Avenue
- Wagaraw Road from May Street to Goffle Road
- Grand Avenue
- Goffle Road and North 8th Street

(*TAP Into Hawthorne*, August 22,2021)

On Wednesday September 1, 2021, Tropical Storm IDA brought 6.28 inches of rain to the Borough of Hawthorne (William Westhoven, NorthJersey.com - Sep 3, 2021). The Borough of Hawthorne sent out several Nixle alerts to all residents to strongly urge people to stay off the roadways due to severe flooding, except for emergencies. Tropical Storm IDA brought severe flooding to Hawthorne neighborhoods. Many parts of Goffle Brook overflowed the bridges and pathways throughout Goffle Brook Park as police and firetruck sirens filled the air.

The Hawthorne Fire Department responded to nearly 50 calls for service and rescued over 20 people from their vehicles after being trapped in flood waters. Excellent job by all our dedicated members who responded throughout the night. Thank you to the Hawthorne PD, EMS, DPW, and North Haledon and Wyckoff FD's for their assistance during the storm. (Hawthorne Fire Department, 2021)

On September 7, 2021, Passaic counties were included in FEMA's Major Disaster Declaration. The declaration allowed individuals in the approved counties to register at www.disasterassistance.gov for direct federal assistance for Ida-related recovery, which may include home repairs, temporary housing, low-cost loans, and other programs to help recover from the effects of the tropical storm.