2014 Weather Summary

Sue A. Pfeiffer

JANUARY started out cold and quite snowy. The first winter storm on the 2nd and 3rd delivered 15 inches of fluffy snow while the temperature dipped to -4°F, which turned out to be the coldest reading for the entire year. Temperatures rose thereafter, melting the snow within days. A front moved in on the 11th, bringing downpours and unseasonably warm temperatures in the 50s that lasted for three days—a welcome surprise. Temperatures remained above freezing over the following week; three additional storms passed through over this period but because of the warm temperatures all precipitation fell as rain. A small storm on the 21st and 22nd left 5 inches of snow on the ground which, despite the mostly cold temperatures, had melted away by the end of the month. Wind speeds reached 16 mph with gusts as high as 38 mph on the 25th; fortunately there was no significant damage to Arboretum plants. Overall, January was cooler than normal and total precipitation was slightly above average.

FEBRUARY began with sunny and warm conditions. A storm passed through on the 4th and 5th dropping a foot of snow, which remained on the ground until mid-March. A cold front arrived following the storm, bringing a week of cold tem-
temperatures with highs in the 20s and lows in the teens and single digits. Seasonal temperatures returned on the 13th, and in the following week an additional foot of snow fell. Frigid temperatures returned and we finished out the month with lows in the single digits once again. The cold trend continued and the average high for the month fell four degrees below the historical average.

**MARCH** brought a continuation of the cold pattern with lows in the single digits during the first week. The first signs of spring were evident on the 8th as temperatures warmed to the mid 50s, greatly melting the snow cover and reducing the icy, hard-crusted remnants of plowed snow. As the snow cover retreated, rabbit damage was visible on many shrubs. Precipitation during the month was scarce; we received two rainfall events on the 12th and 13th and on the 20th, amounting to less than an inch cumulatively. As temperatures warmed, the snow and ice continued to melt; by the 23rd, three days after the spring equinox, bare ground was visible as the snow cover had completely melted. A couple of cold and windy fronts moved in on the 22nd and 26th, both with average wind speeds of 16 mph and gusts reaching 36 mph, making it feel even colder. A storm arrived on the 29th bringing two days of consistent rain followed by a combination of rain, sleet, and hail as the storm lingered into the 31st. Over three inches of rain fell, making up for the lack of precipitation earlier in the month. It felt as if spring was right around the corner as spring ephemerals popped up from the warming soil. Despite rising temperatures, the month as a whole turned out to be colder than the historical average; both the average high and average low temperatures were 5°F colder.

**GROWING DEGREE DAYS (GDD)** measure heat accumulation and are calculated by subtracting a base temperature (50°F is the standard we use) from the day’s average temperature (maximum temperature + minimum temperature, divided by 2). For example, if the day’s high temperature was 70°F and the low was 50°F, the average temperature was 60°F, and subtracting the base (50°F) from the average results in 10 GDD. Growing degree days are cumulative (if a day’s average temperature is 50°F or below, no GDD accrue). Keeping track of GDD is an important tool for determining the expected emergence of insect pests (for example, gypsy moth eggs hatch when 90 to 100 GDD have accumulated), which allows for well-timed control efforts when needed.

**APRIL** saw seasonal temperatures with lower than average precipitation. We started the month with temperatures in the high 40s and 50s. A storm arrived and dropped half an inch of rain during the 4th and 5th. Temperatures continued to warm slowly to the high 50s and mid 60s as a second storm passed through on the 8th and 9th, delivering over an inch of rain. Rising temperatures associated with the storm lead to our first accumulation of growing degree days on the 8th. Temperatures continued to rise into the 70s as the third storm of the month arrived. As the storm passed over on the 14th and 15th, strong wind gusts were recorded; a 43.6 mph gust on the 15th proved to be the highest of the year. Rain was followed by sleet and a dusting of snow on the 16th, accumulating over an inch of precipitation. Despite the high winds, there was only minor storm damage to the collection. The latter half of the month saw typical temperature fluctuations and an additional six small storms, accumulating over 3/4 of an inch. The last frost
date was recorded on April 21st, marking the beginning of the growing season. The month ended with five days of below seasonal temperatures, with highs mostly in the 40s, resulting in frost damage to some early flowering magnolias.

**MAY** was an average month for both precipitation and temperature. The first storm on May 1st dropped over an inch of rain and was followed by a week of temperatures in the 60s; spring had finally arrived. These temperatures were welcome and necessary for plant development; the effects of the harsh winter were becoming more evident as we waited for buds to break and leaves to emerge. We experienced summer-like conditions over Mother’s Day weekend when temperatures soared into the high 80s. Despite these warm conditions, only the early lilacs had started to bloom by Lilac Sunday (May 11th), while the common lilacs were still in bud. Half way through the month, some plants had yet to break bud despite the recent favorable conditions. A second storm passed through on the 16th and 17th, providing nearly an inch of rain. The remainder of the month saw cooler temperatures and typical spring weather fluctuations along with regular precipitation—rain fell on 10 out of the 15 days. A storm on the 27th brought torrential downpours in the evening, depositing 0.41 inches of rain within half an hour. We finished the month with cooler temperatures—May 28th and 29th were so cold that we did not accumulate any growing degree days.

**JUNE** was somewhat cooler and drier than average. The month started with temperatures in the 80s before a couple of storms passed through on the 4th and 5th, delivering close to an inch of rain combined as temperatures dropped into the 60s. Temperatures warmed again into the 80s until the next storm passed through on the evening of the 10th, again dropping temperatures into the 60s for three days. Warm weather returned through the end of the month with only an additional 2/3 inch of rain. Warm, sunny conditions prevailed through much of the month. The extent of fire blight infection became evident as damage became visible throughout the collection.
**Ups and Downs**

Significant temperature fluctuations can affect many natural processes, and we saw several examples in May 2014. This was an explosive year for fire blight (*Erwinia amylovora*), a bacterial disease that affects apples (*Malus*), pears (*Pyrus*), and a number of other rose family genera including mountain ash (*Sorbus*), hawthorn (*Crataegus*), firethorn (*Pyracantha*), and flowering quince (*Chaenomeles*). The warmer temperatures experienced early in the month followed by cooler conditions with regular rain provided ideal conditions for fire blight bacteria to spread throughout the collection. We also witnessed a substantial fish kill in Dawson Pond (the largest of our three ponds) over the Memorial Day weekend. This common natural event, observed across the region, was attributed to low oxygen levels in the water caused by temperature fluctuations.

**JULY** was characterized by heat, humidity, and torrential downpours. We experienced several consecutive days of hot and humid weather, with the hottest day of the year (94°F) on the 3rd. Summer had arrived! This heat was quelled by a downpour on the 3rd that resulted in a few downed tree limbs. Hurricane Arthur arrived on the 4th, delivering a day filled with blowing rain (a total of 2.6 inches fell) and consistent wind. Fortunately there was minimal damage to the collection. A windy system passed through overnight on the 7th, leaving behind some fallen limbs. Temperatures remained seasonal for the remainder of the month. A couple of storms arrived on the 14th and 16th bringing soaking rains; rainfall rates of approximately half an inch of rain over 30-minute periods were recorded during each storm. Thunderstorms returned on the 27th and 28th, the latter pummeling Goldsmith Brook overflowed its banks and flooded the north end of Willow Path during heavy downpours on July 28th.
the earth with over an inch of rain in a 20-minute period and leaving gravel and
dirt roads completely washed out and mulch rivers emanating from planting beds.
By the end of the month, despite four torrential downpours, two windstorms, and
Hurricane Arthur, the Arboretum collection was relatively unscathed, a testa-
ment to the resilience of the well-maintained collection.

**AUGUST** was dry and 2 degrees cooler than average. The first 12 days of the
month were quite comfortable with temperatures mostly in the 80s. A system
moved through on the 13th, bringing an all-day rain that soaked the ground with
1.35 inches of rain. Temperatures cooled and remained comfortably in the 70s
until the 25th. Heat returned for several days as we reached highs in the 90s on
the 26th and 27th. Rain continued to be sparse throughout the month and the soil
was only moderately moist. A second rainfall was recorded on the 31st, dropping
1/3 inch of rain and adding much-needed moisture to the landscape where plants
had begun showing signs of water stress.

**SEPTEMBER** continued as August ended, the feeling of fall was in the air and
rain was nowhere to be found. The month started out very warm as temperatures
hit the 90s on three occasions over the first five days before returning to seasonal
levels. We received small amounts of precipitation on four occasions throughout
the month, none totaling more than 0.15 inches. The weather was perfect for
vacations but the plants were suffering from lack of moisture. Additional irriga-
tion was provided throughout the entire month; we had received only 0.39 inches

High-volume irrigators were used in the collections during what turned out to be the driest
September on record.
of rain, officially making it the driest September since climate records began. These drought conditions, combined with the low rainfall amounts during late August, translated to accumulations of only 0.83 inches over a six-week period. The effects of this drought were apparent throughout the landscape; soils were extremely dry and the air was very dusty. Two of the Arboretum ponds almost dried up completely. Most plants showed some signs of drought stress and severe stress was obvious on many plants. Leaves were flagging, some turning brown; many plants had already formed their winter buds and appeared to go dormant early. Because of these continued dry conditions, fall planting was postponed until the following spring. Despite all this, fall leaf color on maples (Acer), cork trees (Phellodendron), and birches (Betula) was exceptional throughout the landscape.

**OCTOBER** was a warm and wet month. We started out with some much-needed precipitation from a storm that passed through on the 1st and 2nd, delivering well over an inch of rain. Sunny skies were prevalent as temperatures remained above average. A warm front moved through mid-month and we hit a high in the 80s on the 15th before temperatures returned to seasonal averages. The first nor’easter of the season arrived on the morning of the 22nd, bringing with it a welcome rain. As the storm intensified overnight, torrential downpours and high winds prevailed; recorded gusts peaked at 41 mph. A microburst [a small but intense downdraft of air] in the Centre Street Gate vicinity resulted in the complete loss of two accessions—a black hickory (Carya texana, accession 12892-A) along with a centenarian pin oak (Quercus palustris, accession 22896-E) were completely uprooted and broken below the base. Rain continued to fall until the 24th, delivering over three inches of precipitation. Other than the loss of the two large trees and damage to several nearby plants, the impact on the collection was minor with just some smaller branches down. Rain accumulation for the month was more than double that of the months of August and September combined!

**NOVEMBER** began with a nor’easter on the 1st and 2nd; wind gusts reached 35 mph and we recorded an additional 3/4 of an inch of precipitation equivalence which included a few hours of snow flurries on the 2nd. The snow created a beautiful juxtaposition in the landscape, but this did not last long as temperatures quickly warmed into the 60s. The growing season came to an end on November 10th when the first frost was recorded, ending the growing season at 202 days, the
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Average Maximum Temperature ........... 59.1°F
Average Minimum Temperature ............ 40.9°F
Average Temperature ............... 50.0°F
Total Precipitation ............. 46.39 inches
Total Snowfall in 2014 ............. 45.5 inches
Snowfall During Winter 2013–2014 ....... 57.0 inches
Warmest Temperature ............. 93.5°F on July 3
Coldest Temperature ............. -4.0°F on January 4
Strongest Wind Gust .............. 43.6 mph on April 15
Last Frost Date .................. 32.0°F on April 21
First Frost Date ................ 32.0°F on November 10
Growing Season .................... 202 days
Growing Degree Days ................ 2815.0 days
longest we have seen in over 7 years. Mid-November saw overnight temperatures dip well below freezing; this combined with rain and wind resulted in many trees dropping the remainder of their leaves, bringing an end to fall color. Another significant rainfall was recorded on the 17th, bringing over an inch and a half of rain. The last week of the month was very moist; we received 3 rain/snow events accounting for almost 2 inches of precipitation equivalence. Overall, November was a wet and cool month; average temperatures were 2 degrees below normal and accumulated precipitation exceeded five inches.

**DECEMBER** was a very wet and warm month; temperatures were 4 degrees above average and rainfall was abundant for the third month in a row. High temperatures during the first week fluctuated between the mid 30s and lower 60s with three storms depositing a total of almost two inches of rain. The next storm hit on the 9th, bringing wind gusts of over 40 mph and sustained winds at 18 mph—the highest recorded for the year. An additional three inches of rain fell, bringing the 10-day total to more than 5 inches. All of this rain left eroded gullies in gravel pathways and mulch washouts from planting beds, especially those in the lilacs. The rain subsided temporarily and temperatures remained above seasonal averages, allowing the grounds crew to accomplish much pruning and mulching. We recorded four additional rain events before we hit a high in the 60s on the 25th. These temperatures would not last as we ended the year with highs just below freezing. Little did we know what lay in store for the rest of the winter as we moved into 2015.

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