



Mid-Atlantic Network

Weather & Climate Resource Brief



Shenandoah National Park 2011 Status & Trends

In 2011, nine weather observing stations were selected to report the weather of Shenandoah National Park which is located in the Western Piedmont, Northern, and Central Mountain climate divisions.

2011 was characterised by:

- *significantly above average temperatures;*
- *the growing season was about one week longer than the 30-year average;*
- *higher than normal rainfall restored drought conditions to normal.*

Temperature: In 2011, temperatures were well above the 30-year normal despite a cold January and a chilly October. Temperatures were continuously above normal from February through September, resulting in the 7th warmest year in the 117 year record for the Northern

climate division.

January was cold, but the remaining winter months were warmer, resulting in the 64th warmest winter on record in the Western Piedmont. The spring was much warmer than normal due to very mild nights, particularly in May and June. Overall, this season ranked as the 6th warmest since 1895 for the Central Mountain division. Summer featured consistently warmer-than-average weather, especially July, becoming the 8th warmest on record in Northern Virginia. There were more hot days than normal and the highest reading of the year was 99.0°F (37.2.4°C) in Luray compared to the long-term mean of 97.4°F (36.3°C). After a cool October, the next two months were warmer than average to produce the 13th warmest fall in Northern Virginia. The number of sub-freezing days was well below normal, 80 days compared to the long-term average of 111 days in Luray. The growing season

Objectives

1. *Document current status and long-term trends in air temperature and precipitation at multiple temporal scales (e.g., daily, monthly, seasonal, annual, and decadal) and spatial scales (e.g., individual stations and aggregated stations such as climate divisions) utilizing existing weather and climate monitoring programs and datasets.*

was 36 days longer at Staunton compared to the 1981–2010 average.

Precipitation: The dry winter was offset by wet spring, summer and fall. Annual precipitation ranged from 4.3 in (107 mm) to 6.4 in (163 mm) above normal in Luray and Staunton respectively. The number of heavy precipitation days was slightly above the long-term average at Staunton.

January and February were noted by little precipitation, followed by a wetter



Importance

Climate is a dominant factor driving physical and ecological processes, and is responsible for short- and long-term changes that have profound effects on park ecosystems. Individual storm events do occasionally alter the structure of plant and animal communities. Future climate changes will likely cause migrations of plant and animal communities both northward and to higher

elevations. Superimposed on these trends is a long history of human use in the region, with its associated landscape fragmentation that will influence the ability of the plant and animal communities of the MIDN's parks to adapt to climate changes. Because of its influence on the ecology of the park units and the surrounding areas, climate was identified as a high-priority vital sign.

Management Applications

- Illustrate the effects of local climate change.
- Document how 2011 weather compares to long-term average.
- Help interpret natural resource observations in relation to 2011 weather.
- Provide a baseline for future comparisons.

Long-term Monitoring

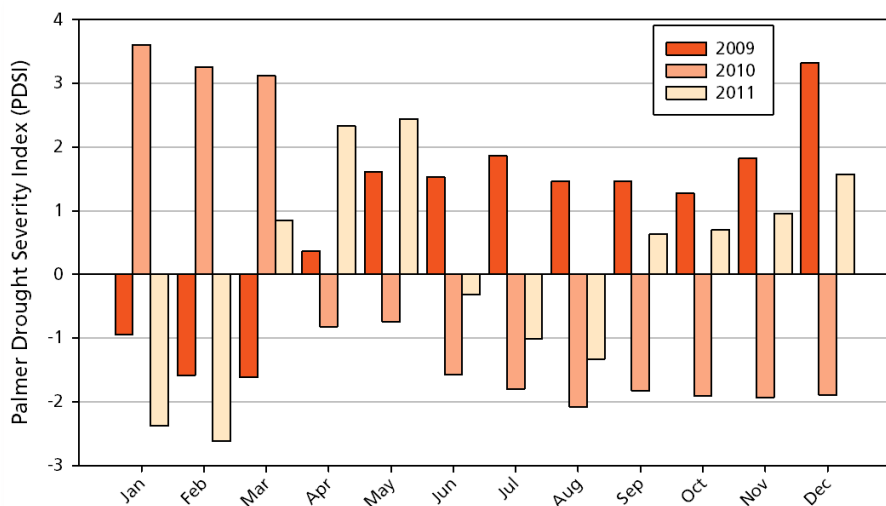
A total of 32 weather observing stations were selected across the network based on their proximity to the network parks, the representativeness of the station to each park's elevation profile, the type and frequency of observations, the period of record of the data, data availability, and the percentage of time a station reports a particular parameter. Some of the stations with a longer period of record are used for comparison to a

30-year normal, while others are used to illustrate monthly averages. Two drought indices are used to estimate the severity of drought in an area. The Palmer Drought Severity Index (PDSI) is based on soil moisture, while the United States Drought Monitor (DM) – Drought Intensity Index is a synthesis of multiple indices (including the PDSI) and impacts which represents a consensus of federal and academic scientists.

2011 Status & Trends...

March, resulting in the 28th to 43rd driest winter for the three climate divisions since 1895. Spring was much wetter,

particularly April, to produce the 4th wettest on record for the Central Mountain division. Summer rainfall varied across the region but was generally wet, ranging from the 40th to 50th wettest



Palmer Drought Severity Index (PDSI) for the Central Mountains, 2009–2011. Scale values are: 0 to ± 2 = near normal; ± 2 to ± 3 = moderate drought/moist; ± 3 to ± 4 = severe drought/very moist; ± 4 and above = extreme drought/moist.

across the three regions, partly due to the indirect effects of Hurricane Irene in late August. The autumn was relatively wet, with up to 130 percent more rainfall than normal. Snowfall was well below normal, with 4.5 in (11.4 cm) at Luray, compared with long-term average of 17.9 in (45.5 cm). Much of the snow for 2011 fell in January and the number of snowy days was half the normal.

Drought: 2011 started under moderate drought conditions for the Central Mountains division. Spring rainfall improved the drought status, with the additional late summer rainfall bringing the drought severity index to positive numbers for the fall months. The full report can be found at: <http://science.nature.nps.gov/im/units/midn/Protocol-WeatherandClimate.cfm>

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Photos by James Comiskey (front) and Kristina Callahan (below).

A Final Note

The Weather and Climate Monitoring Protocol is led by Paul Knight, Pennsylvania State Climatologist, and his team including Kyle Imhoff, Chad Bahrmann, and Sonya Miller at the Pennsylvania State Climate Office. In addition to the summary information available in technical reports, a near real-time data stream is available for the selected weather observing stations, along with monthly, seasonal, and annual summaries at: http://climate.met.psu.edu/gmaps/NPS_DEVELOPMENT/interface.php. This project is a collaborative effort with the Eastern Rivers and Mountains Network.



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Parks monitored: Appomattox Court House NHP • Booker T. Washington NM • Colonial NHP • Eisenhower NHS • Fredericksburg & Spotsylvania NMP • Gettysburg NMP • George Washington Birthplace NM • Hopewell Furnace NHS • Petersburg NB • Richmond NBP • Thomas Stone NHS • Valley Forge NHP

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