



Weather of Appomattox Court House National Historical Park and Booker T. Washington National Monument

Mid-Atlantic Network Summary Report for 2012

Natural Resource Data Series NPS/MIDN/NRDS—2013/499



ON THE COVER

Appomattox Court House National Historical Park

Photograph by: Kelly Armentrout

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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List of Key Acronyms

APCO	Appomattox Court House National Historical Park
ASOS	Automated Surface Observation System
BOWA	Booker T. Washington National Monument
CASTNet	Clean Air Status and Trends Network
COOP	National Weather Service Cooperative Observer Program
CWOP	Citizen Weather Observer Program
FAA	Federal Aviation Administration
IFLOWS	Integrated Flood Observing and Warning System
MIDN	Mid-Atlantic Network
NADP	National Atmospheric Deposition Program
NARR	North American Regional Reanalysis
NCDC	National Climatic Data Center
NHP	National Historical Park
NM	National Monument
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PASC	Pennsylvania State Climatologist
PDSI	Palmer Drought Severity Index
POR	Period of Record
PRISM	Parameter-elevation Regressions on Independent Slopes Model
RAWS	Remote Automated Weather Stations
USDM	United States Drought Monitor
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

Introduction

Weather and climate are widely recognized as key drivers of terrestrial and aquatic ecosystems, affecting biotic as well as abiotic ecosystem characteristics and processes. Global and regional scale climatic patterns, trends, and variations are critical to the cycling of elements, nutrients, and minerals through ecosystems and can deliver pollutants from regional and even global sources (National Assessment Synthesis Team 2001). These variations and trends influence the fundamental properties of ecologic systems such as soil-water relationships and plant-soil processes and their disturbance rates and intensity. Information obtained from meteorological monitoring will be useful to interpreting and understanding changes in species composition, community structure, water and soil chemistry, and related landscape processes (Comiskey and Callahan 2008).

The purpose of this report is to provide a concise weather and climate summary for January 1 to December 31, 2012, and to place current patterns and trends in an appropriate historical, regional, and global context (Marshall et al. 2012). It is our intention that this report will satisfy an inherent interest in meteorological phenomena and meet the Mid-Atlantic Network (MIDN) Weather and Climate Monitoring objective:

- 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.

To accomplish this objective, a variety of atmospheric data streams were evaluated for their quality, longevity, and applicability to the MIDN parks. Since no single weather observing network contains all the pertinent measures of atmospheric phenomena to assess ecosystem health, an objective analysis of the data networks was developed and outlined in the Weather and Climate Monitoring Protocol for the Eastern Rivers and Mountains Network and Mid-Atlantic Network of the National Park Service (Marshall et al. 2012). Through this analysis, a select number of weather/climate observing stations were chosen as representative of each park; these are the primary data sources used in the profile of 2012's climate summary and trends.

In addition to a suite of summary tables, graphs, and narratives, we specifically identify a series of key weather indicators to report status and trends on an annual basis and periodically in separate and more thorough reports. These key indicators are further described in the protocol (Marshall et al. 2012) and summarized in this report.

Climate of the Western Piedmont Region of Virginia

Appomattox Court House National Historical Park (NHP) and Booker T. Washington National Monument (NHP) lie in Virginia Climate Division 3, known as the “Western Piedmont.” A climate division is a region that is reasonably homogenous with respect to climatic and hydrologic characteristics and is frequently used for compiling climate statistics (<http://www.esrl.noaa.gov/psd/data/usclimdivs/data/map.html>). Virginia is divided into six climate divisions. This division is generally considered to have a humid, continental type of climate, but the varied physiographic features have a marked effect on the weather and climate of the various parts of this region. The prevailing westerly winds carry most of the weather disturbances that affect the region from the interior of the continent through the Ohio Valley, so that the Atlantic Ocean has only some influence on the climate of the area (Davey et al. 2006, Gawtry and Stenger 2007). Coastal storms do, at times, affect the day-to-day weather, especially in the winter. Infrequently, storms of tropical origin can have a significant effect, causing severe floods in some instances.

Temperatures are moderately continental, with the tempering effects of the nearby mountains contributing to cloud production in the winter and mountain-valley circulation clouds reducing the heat at times during the summer. The lowest readings in the winter occur with polar air masses of Canadian origin settling over the region after a fresh snowfall. On average, Appomattox Court House NHP tends to have a greater number of sub-freezing days than Booker T. Washington NM (~92 to ~75). The highest readings of the summer happen when the sub-tropical fair weather system, the Bermuda high, pushes westward into the Carolinas; its clockwise circulation will direct hot, humid air from the Gulf region into the area. The humid southwest winds descending the crest of the Appalachians will raise the temperature several more degrees. The last freeze and first frost typically occur in mid-April and late October, respectively.

Precipitation is fairly evenly distributed throughout the year. Annual amounts generally range between 36–52 in (914–1,321 mm), while the majority of places receive 38–44 in (965–1,118 mm). Greatest amounts usually occur in the late spring and summer months, while February is the driest month, having about 2 in (51 mm) less than the wettest months. Precipitation is somewhat greater in the mountains. During the warm season, the uneven heating over the irregular terrain leads to thunderstorms which typically form over the mountains and dissipate as they reach the Piedmont.

Surface winds blow from the west and northwest in the cold season and from the southwest during the warm half of the year. Thunderstorms follow a frequency that matches the solar cycle, occurring between the equinoxes and reaching a peak near the solstice. Hail is relatively infrequent, but flash floods and damaging thunderstorm winds affect parts of the region each summer. On average, tornadoes pass through the area about once every three years. The direct effects of an Atlantic hurricane are uncommon, though remnant rains from hurricanes and tropical storms occur most years and some have contributed to the region’s worst floods. Ice storms, which can cause significant disruption, occur at irregular intervals but are primarily confined to the months between December and March (Kocin and Uccellini 2004).

Observing Stations

A total of five weather observing stations comprising two weather observing networks were selected around Appomattox Court House NHP and Booker T. Washington NM. Representative stations within a 100-km range of each park were chosen based on several criteria, which include proximity to the park, the representativeness of the station to the park elevation profile, the type and frequency of observations, the period of record of the data, and data availability (Marshall et al. 2012). Moreover, the percentage of time a station reports a particular parameter (e.g., temperature) can influence data inclusion. A total of five stations were ultimately used for this 2012 report: Lynchburg, Roanoke, Rocky Mt., Appomattox, and Huddleston (Figure 1, Table 1).

The average value of a climate element over 30 years is defined as a climatological normal, which is calculated and established by NOAA's National Climatic Data Center (NCDC). Every ten years, NCDC computes new thirty-year climate normals for selected temperature and precipitation elements for a large number of U.S. climate and weather stations. The current (as of 2011) normals cover the period 1981–2010. In this report, the 30-year normals established by NCDC are used as the baseline for comparisons (e.g., departures from normal). In cases where data for the 30-year normal period are not available, we use alternative comparisons such as the new pseudo-normal from NCDC or a recent 10-year period. In some cases, sufficient data may simply not be available to calculate normals. For metrics that NCDC may not routinely calculate a normal, such as the number of days with more than 2 in (55 mm) of rain or liquid equivalent, normals are calculated using the same time period (e.g., 1981–2010) as the current NCDC standard. Throughout the report, descriptions of a station's values as compared to the normals are described as a difference from the "average", "mean", "typical", "long-term value", as well as "normal", to improve the readability of the document. However, all of these terms are comparing a value from one year at that station to that station's normal, whether it be the 30-year normal or the pseudo-normal calculated on a shorter time frame.

Of the five stations, four have a Period of Record (POR) sufficiently long for a 30-year normal (1981–2010); however, Huddleston lacks temperature data. The normal for Rocky Mt. is based on a POR from 1994–2011. Monthly averages and deviations from normal are presented for all five stations for precipitation, and for all except Huddleston and much of Appomattox for temperature.

In addition to the summary information available in this report, a near real-time data stream has been made available to the MIDN through a Web interface for the weather observing stations, along with monthly, seasonal, and annual summaries. The Web interface is accessible through the following link: http://climate.met.psu.edu/gmaps/NPS_DEVELOPMENT/interface.php.

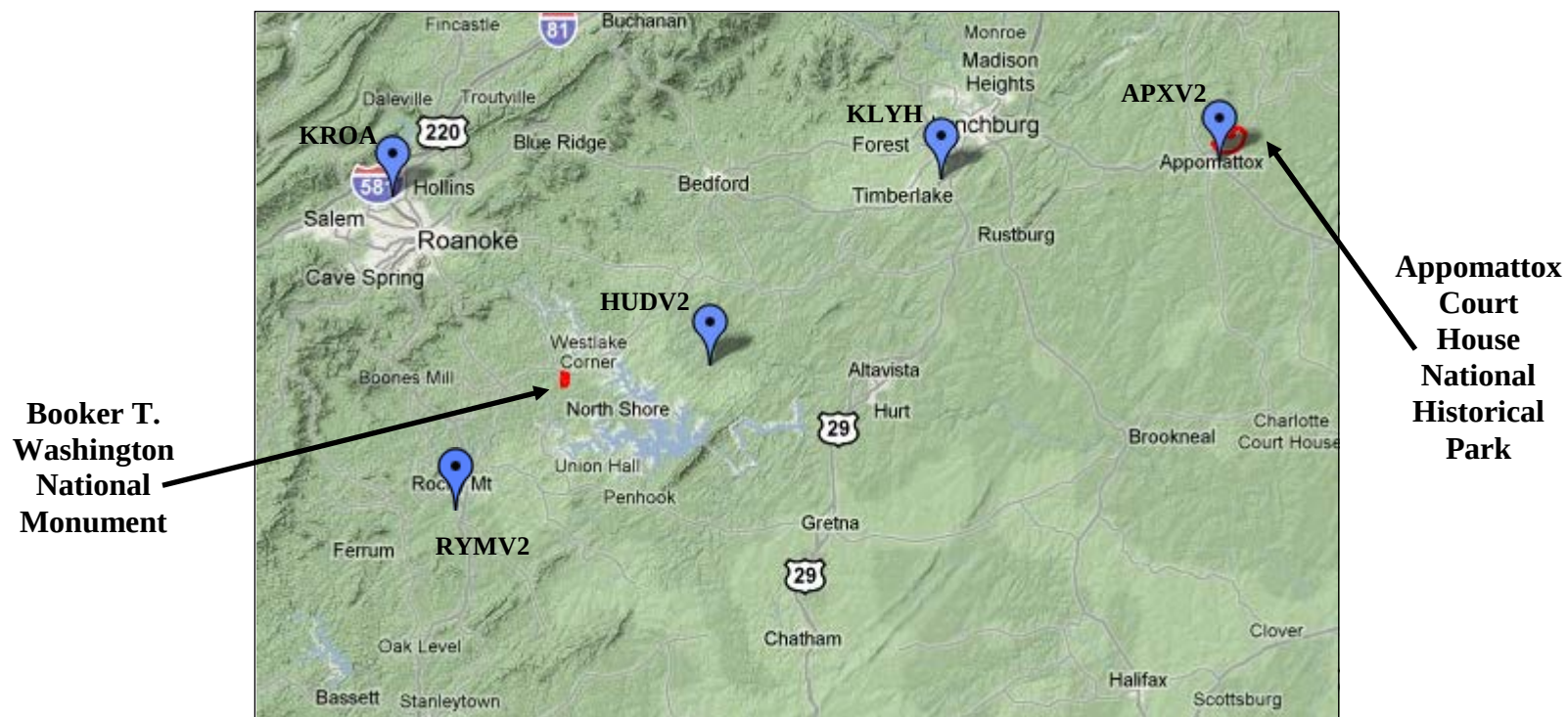


Figure 1. Location of weather observing stations around Appomattox Court House National Historical Park and Booker T. Washington National Monument selected as most representative of the parks in 2012. See Table 1 for station names.

Table 1. List of weather observing stations around Appomattox Court House National Historical Park and Booker T. Washington National Monument selected as most representative of the parks in 2012.

Station	Observing Network ¹	Station Name	Period of Record (POR)	Percentage of Time Reporting Temperature for 2012	Percentage of Time Reporting Precipitation for 2012	Percentage of Time Reporting Temperature for entire POR	Percentage of Time Reporting Precipitation for entire POR
KLYH	ASOS	Lynchburg Regional Airport/Preston Glenn Field	02/01/1948 Present	100.0	100.0	96.1	96.1
KROA	ASOS	Roanoke Regional Airport/Woodrum Field	02/01/1948 Present	100.0	100.0	95.8	95.8
RYMV2	COOP	Rocky Mt.	01/01/1951 Present	97.0	100.0	94.4	94.3
APXV2	COOP	Appomattox	11/01/1937 Present	44.9	84.1	94.4 ²	95.9
HUDV2	COOP	Huddleston 4 SW	01/01/1960 Present	-	100.0	-	99.2

¹ Observing networks are: ASOS — Automated Surface Observation System, COOP — National Weather Service Cooperative Observer Program.

² Percentage of time reporting temperature for Appomattox Court House NHP is based upon a Period of Record beginning on 11/01/1961. The station did not report temperature prior to this date.

Temperature Summary

Average annual temperatures in 2012 were significantly above the 30-year normal for the area around Appomattox Court House NHP and Booker T. Washington NM (Table 2) despite a cool June and a chilly November (Tables 3 and 4). Average monthly temperatures were continuously above normal from January through May (Figures 2 and 3)¹.

January was milder than average, with mean temperatures ranging from +2.9 to +4.8°F (+1.6 to +2.7°C) from the long-term values (Tables 3 and 4). The lowest readings of the year occurred on January 3rd- 4th with values as low as 13.0°F (-10.6°C), much higher than the typical annual minimums (Table 2). February was just as mild with mean temperatures varying from 42.0°F (5.6°C) at Rocky Mt. to 44.3°F (6.9°C) at Roanoke (Table 3). There was a surge of record high temperatures in March, leading to a winter that ranked the 6th warmest in 118 years for the Western Piedmont (Table 5; 59 is the mid-point). There were also below-normal number of cold days during the winter (Table 2).

Spring stayed milder than normal, as the first two months noted significant positive anomalies at each of the representative weather stations (Table 4). April had the largest positive departures from normal, with Lynchburg registering 5.6°F (3.1°C) above normal (Table 4). Much of the warmth was due to very mild nights, particularly during May (Figure 3), but June turned cooler than average. Overall, this spring season was near normal and ranked as the 49th warmest on record for the Western Piedmont (Table 5).

The summer months featured much warmer-than-average weather in July and then near normal readings from August through much of September. In fact, the positive anomalies ranged from +3.5 to +4.1°F (2.0 to 2.3°C) during July (Table 4). The number of hot days was above normal. Between 30 and 34 days reached or exceeded 90°F (32.2°C) compared with normal numbers around 25 days (Table 2). Accordingly, the highest readings of 2012 exceeded the normal values of around 96°F (36.5°C), topping out at 104°F (40.0°C) (Table 2). However, the summer of 2012 ranked as the 59th warmest in the last 118 years for the Western Piedmont, which is virtually normal (Table 5).

A chilly November was spliced between two autumn months that had mainly positive departures from normal. The number of sub-freezing days were noticeably fewer than normal (Table 2). December's departure from normal varied from +4.2°F (2.3°C) at Rocky Mt. to +5.5°F (3.1°C) at Lynchburg (Table 4). The autumn ranked as the 51st warmest in 118 years for the Western Piedmont (Table 5). The length of the growing season was between ten and thirty days longer when compared to the 1981–2010 average and first freeze of the autumn occurred on November 3rd, very close to the average date (Table 2).

¹ The maps in Figures 2 and 3 were created using estimates from the Parameter-elevation Regressions on Independent Slopes Model (PRISM). PRISM uses an interpolation scheme for temperature between actual observations and corrects these estimates for changes in topography across the region (Daly et al. 2002). More information can be found at <http://www.prism.oregonstate.edu/>.

Table 2. Status of 2012 temperature indicators compared to the 30-year normal (1981–2010) at the Lynchburg Airport (KLYH), Roanoke Airport (KROA), and Appomattox (APXV2) weather observing stations.

Temperature Indicator	Lynchburg Airport 2012	Lynchburg Airport 1981–2000	Roanoke Airport 2012	Roanoke Airport 1981–2010	Appomattox 2012	Appomattox 1981–2010
Average Annual Temperature	58.0°F 14.4°C	55.6°F 13.1°C	59.5°F 15.3°C	57.0°F 13.9°C	M°F M°C	56.0°F 13.3°C
Average Annual Maximum Temperature	69.7°F 20.9C	67.1°F 19.5°C	69.9°F 21.1°C	67.3°F 19.6°C	M°F M°C	67.4°F 19.7°C
Maximum Temperature	103°F 39.4°C	95.9°F 35.5°C	104°F 40.0°C	96.7°F 35.9°C	M°F M°C	96.0°F 35.6°C
Hot Days (days with Tmax≥90°F/32°C)	34	22	30	25	M	23
Average Annual Minimum Temperature	46.3°F 8.0°C	44.1°F 6.7°C	49.1°F 9.4°C	46.6°F 8.1°C	M°F M°C	44.5°F 6.9°C
Minimum Temperature	13.0°F -10.6°C	3.7°F -15.7°C	19.0°F -7.2°C	6.0°F -14.4°C	14.0°F -10.0°C	4.4°F -15.3°C
Cold Days (days with Tmax≤32°F/0°F)	1	6	1	7	1	6
Sub-freezing Days (days with Tmin≤32°F/0°C)	90	99	57	78	68	95
Sub-zero Days (days with Tmin≤0°F/-18°C)	0	0	0	0	0	1
Growing Season Length (days between last spring Tmin 32°F/0°C and first fall Tmin 32°F/0°C)	192	201	239	208	209	199

M = missing data (Monthly statistics are reported as 'M' if more than 4 days of data are missing).

Table 3. Summary of 2012 monthly average temperatures for selected stations.

Station name	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lynchburg Airport	KLYH	39.1°F	41.6°F	56.3°F	56.0°F	67.8°F	70.8°F	79.4°F	74.9°F	67.1°F	56.3°F	43.1°F	43.1°F	58.0°F
		3.9°C	5.3°C	13.5°C	13.3°C	19.9°C	21.6°C	26.3°C	23.8°C	19.5°C	13.5°C	6.2°C	6.2°C	14.4°C
Roanoke Airport	KROA	41.4°F	44.3°F	57.4°F	58.1°F	68.9°F	72.7°F	80.8°F	75.2°F	68.2°F	57.1°F	44.9°F	44.6°F	59.5°F
		5.2°C	6.9°C	14.1°C	14.5°C	20.5°C	22.6°C	27.1°C	24.0°C	20.1°C	13.9°C	7.2°C	7.0°C	15.3°C
Rocky Mt	RYMV2	38.5°F	42.0°F	54.7°F	56.4°F	67.6°F	69.9°F	78.4°F	73.9°F	67.2°F	55.8°F	42.9°F	42.1°F	57.5°F
		3.6°C	5.6°C	12.6°C	13.6°C	19.8°C	21.1°C	25.8°C	23.3°C	19.6°C	13.2°C	6.0°C	5.6°C	14.2°C
Appomattox	APXV2	38.8°F	41.9°F	55.0°F	58.5°F	M°F	M°F	M°F	M°F	M°F	M°F	42.6°F	42.7°F	M°F
		3.8°C	5.5°C	12.8°C	14.7°C	M°C	M°C	M°C	M°C	M°C	M°C	5.9°C	5.9°C	M°C

M = missing data (Monthly statistics are reported as 'M' if more than 4 days of data are missing).

Table 4. Summary of 2012 departure from normal temperature based on the 30-year normal (1981–2010) for selected stations.

Station name	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lynchburg Airport	KLYH	4.0°F	3.4°F	10.4°F	0.6°F	4.7°F	-0.8°F	4.1°F	0.8°F	0.1°F	0.1°F	-3.7°F	5.5°F	2.4°F
		2.2°C	1.9°C	5.8°C	0.3°C	2.6°C	-0.4°C	2.3°C	0.4°C	0.1°C	0.1°C	-2.1°C	3.1°C	1.4°C
Roanoke Airport	KROA	4.8°F	4.7°F	10.1°F	1.4°F	4.3°F	-0.2°F	4.1°F	-0.2°F	0.1°F	-0.6°F	-3.2°F	5.6°F	2.6°F
		2.7°C	2.6°C	5.6°C	0.8°C	2.4°C	-0.1°C	2.3°C	-0.1°C	0.1°C	-0.3°C	-1.8°C	3.1°C	1.4°C
Rocky Mt ¹	RYMV2	2.9°F	3.7°F	9.3°F	1.7°F	5.0°F	-1.2°F	3.5°F	0.4°F	0.8°F	-0.1°F	-3.7°F	4.2°F	2.2°F
		1.6°C	2.1°C	5.2°C	0.9°C	2.8°C	-0.7°C	2.0°C	0.2°C	0.4°C	-0.1°C	-2.1°C	2.3°C	1.2°C
Appomattox	APXV2	3.7°F	3.3°F	9.3°F	3.1°F	M°F	M°F	M°F	M°F	M°F	M°F	-4.6°F	4.4°F	M°F
		2.1°C	1.8°C	5.2°C	1.7°C	M°C	M°C	M°C	M°C	M°C	M°C	-2.5°C	2.4°C	M°C

¹Indicates a station's Period of Record does not cover the period of 1981-2010 but is five or more years. In these cases the departure from normal values were calculated with normals derived from data spanning the length of the station's Period of Record.

M = missing data (Monthly statistics are reported as 'M' if more than 4 days of data are missing).

Table 5. Seasonal and annual temperature and precipitation rankings for 2012 over 118 years for the Western Piedmont (NOAA 2012).

	Climate Division 3 Rankings — Western Piedmont				
	Jan–Feb–Mar WINTER	Apr–May–Jun SPRING	Jul–Aug–Sep SUMMER	Oct–Nov–Dec AUTUMN	Jan–Dec YEAR
Temperature-2012	6	T-49	T-59	T-51	14
Precipitation-2012	75	81	67	94	104

1 = warmest/wettest year and 118 = coldest/driest year. T = Tie between two years.

Appomattox Court House National Historical Park
and Booker T. Washington National Monument
Departure from Average Monthly Maximum Temperature
2012 vs. 1981–2010

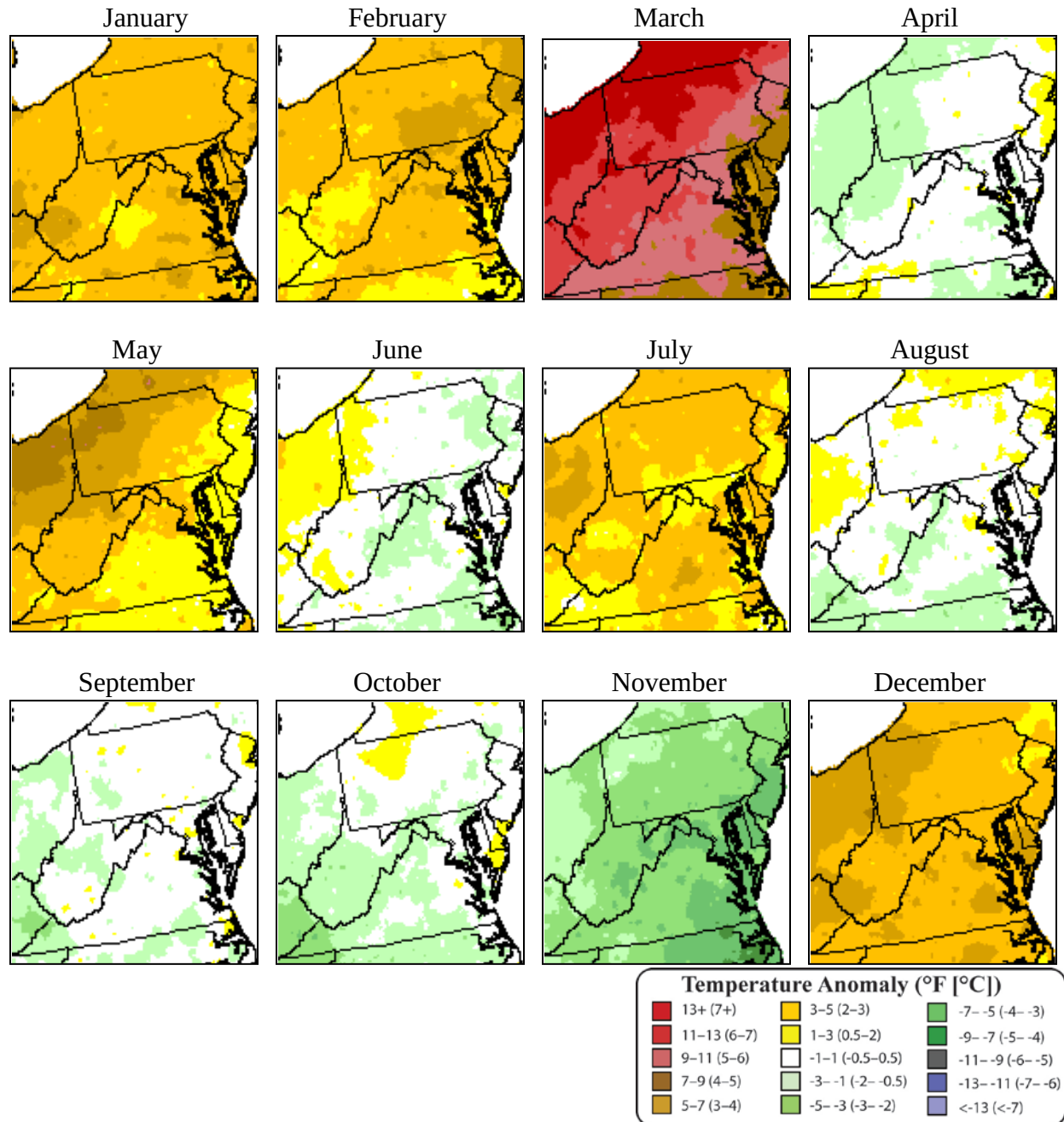


Figure 2. Maps showing departure from average monthly maximum temperature compared to the 30-year normal (1981–2010).

Appomattox Court House National Historical Park
and Booker T. Washington National Monument
Departure from Average Monthly Minimum Temperature
2012 vs. 1981–2010

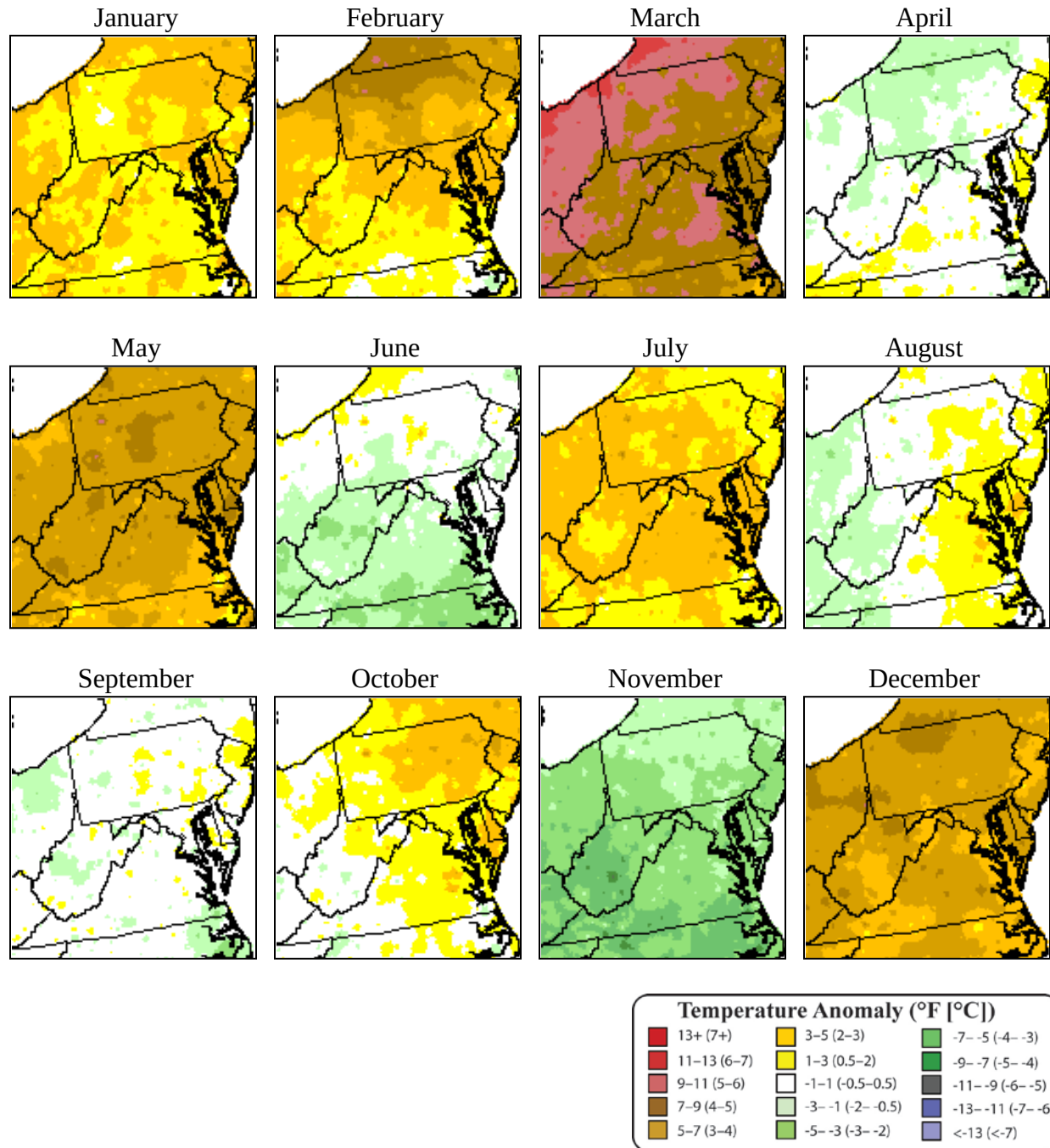


Figure 3. Maps showing departure from average monthly minimum temperature compared to the 30-year normal (1981–2010).

Precipitation Summary

The year began with two dry months at Appomattox Court House NHP and Booker T. Washington NM. Unlike previous years, all of the seasons were drier than average, resulting in the 15th driest year on record (Table 5). Annual precipitation ranged from 8.4 in (214 mm) below normal precipitation, or about ten weeks of rain and snow at Roanoke, to 11.8 in (300 mm) below normal at Lynchburg (Table 6). The number of heavy precipitation days was about half the long-term average at three of the four stations (Table 6).

January was noted by light precipitation: a total of 1.70 in (43 mm) fell the entire month at Roanoke (Tables 7 and 8). It was dry also in February with no measurable precipitation during February 7-19, followed by a wetter March (Figure 4). Precipitation in February was measured at 43-89 percent of normal (Tables 8 and 9). March brought closer to average precipitation, as 5.8 in (147 mm) was tallied at Lynchburg and 5.6 in (142 mm) was measured at Huddleston. (Table 7). Overall, the winter months (January, February and March) were the 44th driest in the Western Piedmont since 1895 (Table 5).

The spring months of April, May and June were even drier, aided by an anomalously dry June, with only 1.7 in (43 mm) in Lynchburg, 47 percent of normal precipitation for the month (Tables 7 and 8). Two long dry spells were noted from April 6-17 and June 18-July 8 during which no measurable precipitation was reported (Table 9). Overall, the spring in the Western Piedmont ranked as the 38th driest in 118 years of records (Table 5).

Summer rainfall varied across the region, as evidenced by the range of precipitation during August. This month brought only 2.4 in (61 mm) at Huddleston to 4.9 in (124 mm) at Appomattox (Table 7). There were no effects from hurricanes or tropical storms this season. Overall, this season averaged the wettest of the year, and ranked as the 67th wettest in 118 years for the Western Piedmont (Table 5). One of the five notably wet days occurred during this season with 2.96 in (75 mm) on August 26 (Table 7).

The last quarter of the year was notably the driest. Only one station reported near normal precipitation during this three month period. October had relatively low precipitation totals ranging from 45 to 79 percent of normal (Table 8). November was increasingly drier at all of weather stations (Table 8) with as little as 17 percent of average at Appomattox. The autumn precipitation totals were around 60 percent of the 1981–2010 normal amounts (Table 6). Snowfall was well below normal, with most stations measuring less than 8 in (20 cm), compared with long-term averages of 12 in (30 cm) (Table 6). Much of the snow for 2012 fell in December and the number of snowy days at Lynchburg was a quarter of the normal (Table 6).

Appomattox Court House National Historical Park
and Booker T. Washington National Monument
Percent of Average Monthly Precipitation
2012 vs. 1981–2010

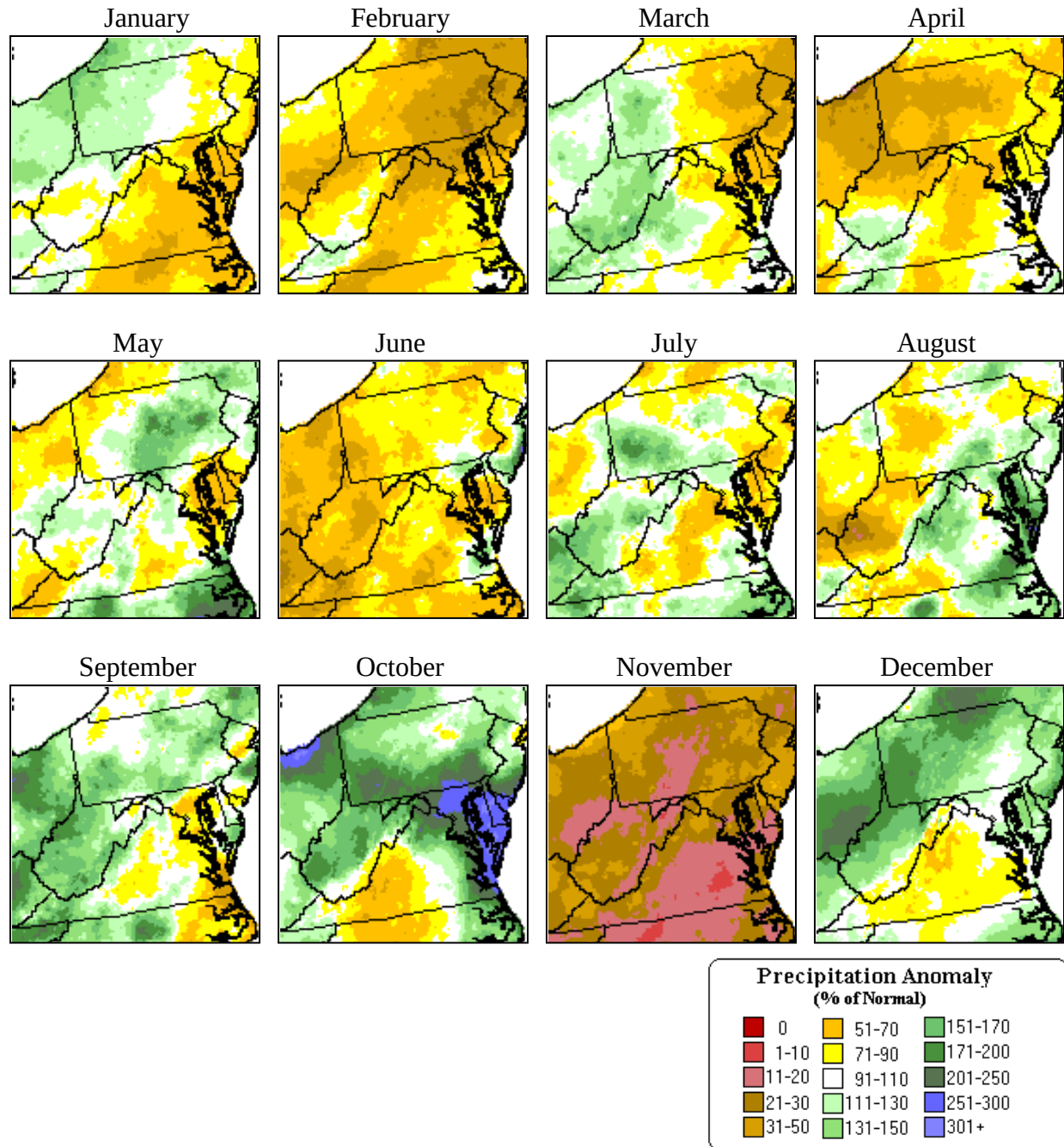


Figure 4. Maps showing percent of average monthly precipitation compared to the 30-year normal (1981–2010).

Table 6. Status of 2012 precipitation indicators compared to the 30-year normal (1981–2010) at the Lynchburg Airport (KLYH), Roanoke Airport (KROA), Appomattox (APXV2), and Huddleston 4 SW (HUDV2) weather observing stations.

Precipitation Indicator	Lynchburg Airport 2012	Lynchburg Airport 1981–2010	Roanoke Airport 2012	Roanoke Airport 1981–2010	Appomattox 2012	Appomattox 1981–2010	Huddleston 4 SW 2012	Huddleston 4 SW 1981–2010
Annual Precipitation	29.8 in 757 mm	41.6 in 1,057 mm	32.9 in 836 mm	41.3 in 1,049 mm	M in M mm	46.6 in 1,184 mm	33.3 in 847 mm	42.5 in 1,080 mm
Autumn (Oct, Nov, Dec) Precipitation	5.0 in 127 mm	9.8 in 249 mm	4.5 in 114 mm	9.2 in 234 mm	6.0 in 153 mm	11.2 in 284 mm	6.0 in 152 mm	10.3 in 262 mm
Heavy Precipitation Days (days with ≥ 1.0 in (25 mm) rain)	6	10	7	10	5	13	4	11
Extreme Precipitation Days (days with ≥ 2.0 in (51 mm) rain)	1	1	0	2	2	1	1	2
Micro-drought (strings of 7+ days without rain)	8	7	7	5	10	11	8	10
Annual Snowfall	8.5 in 21.6 cm	16.2 in 16.3 cm	6.4 in 8.1 cm	18.5 in 47.0 cm	5.9 in 15.0 cm	8.5 in 21.6 cm	5.5 in 14.0 cm	2.0 in 5.1 cm
Measurable Snow Days (days with ≥ 0.1 in (0.3 cm) snow)	2	8	4	9	2	3	1	1
Moderate Snow Days (days with ≥ 3.0 in (7.6 cm) snow)	1	2	1	2	1	1	1	0
Heavy Snow Days (days with ≥ 5.0 in (12.7 cm) snow)	1	1	1	1	1	1	1	0

M = missing data (statistics are reported as 'M' if more than 4 days of data are missing in a given month).

Table 7. Summary of 2012 monthly total precipitation for selected stations.

Station name	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lynchburg Airport	KLYH	2.2 in	2.6 in	5.8 in	2.4 in	2.4 in	1.7 in	2.7 in	2.7 in	2.4 in	1.7 in	0.6 in	2.7 in	29.8 in
		56 mm	66 mm	147 mm	61 mm	61 mm	43 mm	69 mm	69 mm	61 mm	43 mm	15 mm	69 mm	757 mm
Roanoke Airport	KROA	1.7 in	2.2 in	3.5 in	3.0 in	4.0 in	3.3 in	3.1 in	3.9 in	3.6 in	1.3 in	0.6 in	2.6 in	32.8 in
		43 mm	56 mm	89 mm	76 mm	102 mm	84 mm	79 mm	99 mm	91 mm	33 mm	15 mm	66 mm	836 mm
Rocky Mt	RYMV2	2.2 in	1.7 in	3.4 in	3.2 in	4.4 in	3.3 in	4.3 in	3.2 in	4.0 in	2.5 in	0.8 in	3.5 in	36.0 in
		56 mm	43 mm	86 mm	81 mm	111 mm	84 mm	109 mm	81 mm	102 mm	64 mm	20 mm	89 mm	930 mm
Appomattox	APXV2	2.0 in	1.3 in	5.8 in	M in	M in	M in	3.5 in	4.9 in	2.9 in	2.4 in	0.7 in	2.9 in	M in
		51 mm	33 mm	147 mm	M mm	M mm	M mm	89 mm	124 mm	74 mm	61 mm	18 mm	74 mm	M mm
Huddleston 4 SW	HUDV2	1.9 in	1.6 in	5.6 in	2.2 in	4.8 in	2.1 in	4.1 in	2.4 in	2.6 in	2.0 in	0.9 in	3.1 in	33.1 in
		48 mm	41 mm	142 mm	56 mm	122 mm	53 mm	104 mm	61 mm	66 mm	50 mm	23 mm	79 mm	847 mm

M = missing data (Monthly statistics are reported as 'M' if more than 4 days of data are missing).

Table 8. Summary of 2012 percent of normal precipitation based on the 30-year normal (1981–2010) for selected stations.

Station name	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lynchburg Airport	KLYH	71	89	161	74	63	47	63	83	61	54	18	82	72
Roanoke Airport	KROA	58	76	102	90	99	85	78	111	93	45	18	88	80
Rocky Mt ¹	RYMV2	66	44	79	85	109	73	88	74	86	79	24	101	78
Appomattox	APXV2	64	43	146	M	M	M	72	122	68	63	17	86	M
Huddleston 4 SW	HUDV2	57	55	152	66	130	60	102	68	63	58	25	95	78

¹Indicates a station's Period of Record does not cover the period of 1981-2010 but is five years or more. In these cases the departure from normal values were calculated with normals derived from data spanning the length of the station's Period of Record.

M = missing data (Monthly statistics are reported as 'M' if more than 4 days of data are missing).

Table 9. Top five wettest days and top five dry spells (consecutive days with a trace or less of liquid precipitation) during 2012 from weather observing stations at Lynchburg (KLYH), Roanoke (KROA), Rocky Mt (RYMV2), Appomattox (APXV2) and Huddleston (HUDV2).

Wettest Days in 2012	Dry Spells in 2012
Mar 24-25: 3.48 in (88 mm)	Jun. 18-Jul. 8
Mar. 3: 3.03 in (77 mm)	Nov. 14-26
Aug. 26: 2.96 in (75 mm)	Feb. 7-19
Mar. 25: 2.74 in (70 mm)	Apr. 6-17
May 15: 2.07 in (53 mm)	Oct. 16-26

Drought Status

There are a number of drought indices used to estimate the severity of drought in an area using algorithms that incorporate recent temperatures, rainfall, soil moisture, and other information (<http://www.drought.gov>). The main indices we report are the Palmer Drought Severity Index (PDSI) and the United States Drought Monitor (DM) – Drought Intensity Index. While both indices provide excellent summary information on broad-scale conditions, local conditions (such as at the park scale) may vary.

The PDSI is a soil moisture algorithm calibrated for relatively homogeneous regions and is calculated on a monthly basis using precipitation and temperature data, as well as the water content of the soil. The values vary between extremely moist (>4.0) and extreme drought (<-4.0) with “normal” values ranging between -1.9 and 1.9. The long-term average is “zero”. Monthly PDSI values for the Western Piedmont in 2012 are shown in Figure 5.

The DM – Drought Intensity Index is a synthesis of multiple indices (including the PDSI) and impacts, which represents a consensus of federal and academic scientists (NIDIS 2012). The DM produces a summary map of drought intensity for the nation and all states each week. It is on a scale ranging from abnormally dry (D0) to exceptional drought (D4). Mid-month (i.e., the second or third week) values for Virginia (Figure 6) and the Southeast (Figure 7) are shown for 2012.

According to the PDSI, 2012 in the Western Piedmont started with near normal to moderate drought conditions that stayed the same during spring. Drier weather returned in the late summer and persisted until December (Figure 5). As a result of the persistent dry conditions, the PDSI remained at negative values throughout the year. Compared with the previous two years, 2012 was much drier than 2010 during the winter and notably drier than 2011 during the autumn.

The DM – Drought Severity Index for Virginia (Figure 6) and the Southeast (Figure 7) shows a pattern similar to the PDSI for the growing season (May through October); abnormally dry (D0) to moderate drought (D1) in all sections during the warm season in the Western Piedmont.

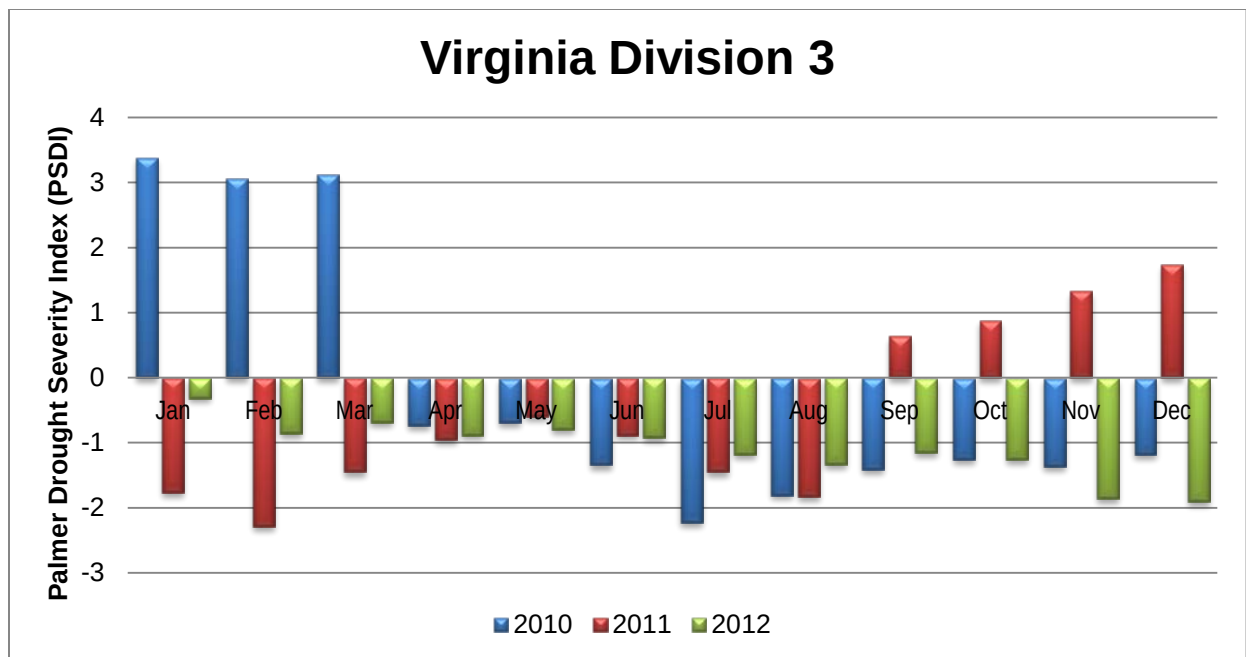


Figure 5. Palmer Drought Severity Index (PDSI) for the Western Piedmont, 2010–2012.

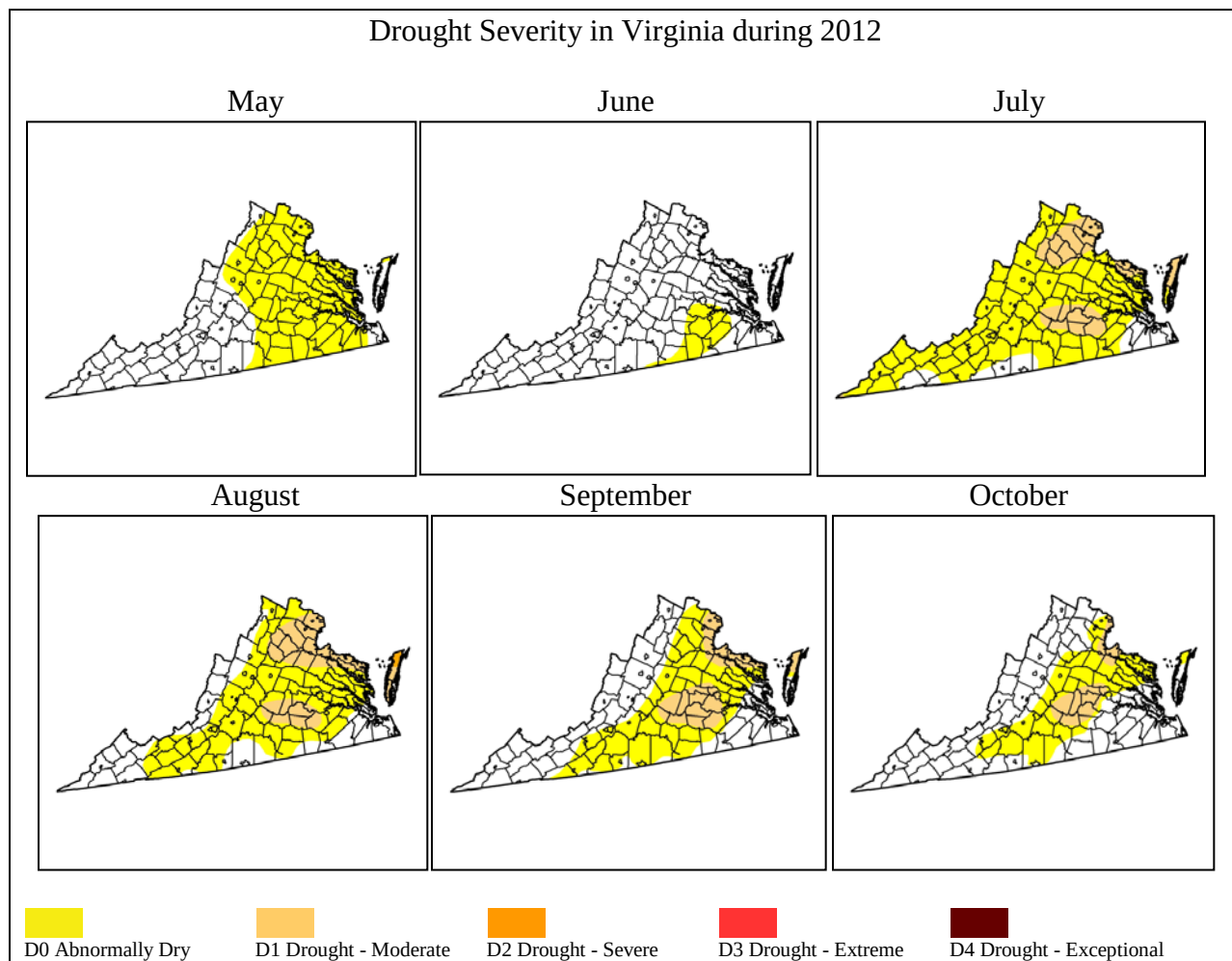


Figure 6. Mid-month values of the United States Drought Monitor (DM) – Drought Intensity Index for Virginia in 2012.

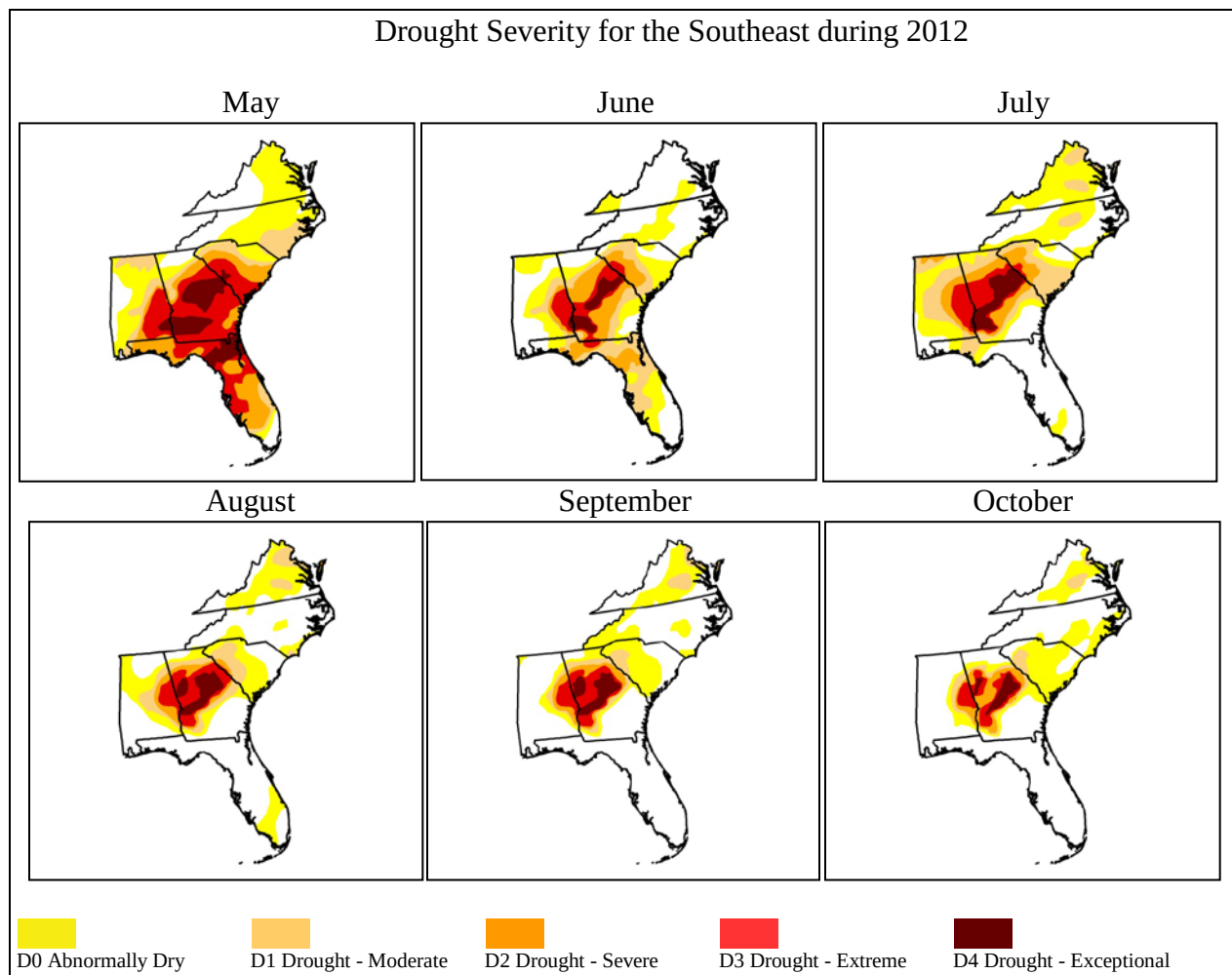


Figure 7. Mid-month values of the United States Drought Monitor (DM) – Drought Intensity Index for the Southeast in 2012.

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