MDSCO-2026-07

Maryland Climate Bulletin
July 2026

Prepared by
Dr. Alfredo Ruiz-Barradas
Maryland State Climatologist

This publication is available from:
https://mdsco.umd.edu/ClimateInfo/Bulletin.php

DEPARTMENT OF ATMOSPHERIC & OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland State Climatologist Office

Summary

Statewide averages indicate that July 2026 was warmer and wetter than normal (i.e., 1991-2020 averages). Regionally, monthly mean temperatures were in the 70−81°F range, maximum temperatures were between 79 and 90°F, and minimum temperatures were in the 60−72°F range. Monthly total precipitation was between 2.5 and 9.0 inches.

Maryland Regional Features (Figures 1-5, C1, and D1)

- The mean temperature was warmer than normal in the entire state, particularly in Garrett County (2.6−3.0°F) and to a lesser degree over western Frederick and Montgomery counties and northern Baltimore, Harford, and Cecil counties (1.4−1.8°F).

- The maximum temperature was also warmer than normal everywhere in the state, especially in Garrett County (1.8−2.2°F), and over Kent, Queen Anne's, and Caroline counties (1.6−2.0°F).

- The minimum temperature was warmer than normal across the state too, notably in Garrett County (3.3−3.9°F), and over western Frederick and Montgomery counties (2.1−2.7°F).

- Precipitation was above normal in large areas of the state, especially in Somerset and Worcester counties (3.6−4.4 inches), northeastern Cecil County (2.4−3.2 inches), and southern Baltimore and Harford counties, and Baltimore City (2.0−2.8 inches). Below-normal precipitation occurred largely in Garrett, Allegany, and Washington counties and northern Baltimore and Carroll counties (0.8−1.0 inches deficit), as well as in Prince George's and southern Anne Arundel counties. Somerset and Worcester counties received 80−100% more precipitation than their climatological monthly precipitation, Wicomico got 50−80% more, and northeastern Cecil County, southern Baltimore and Harford counties, and Baltimore City received 50−60% more than their climatological July precipitation. On the other hand, Garrett, Allegany, and Washington counties received 10−40% less than their climatological monthly precipitation.

- Drought conditions improved during this month as the extent of the Extreme and Severe Drought diminished along the Eastern Shore, while Garrett and western Allegany counties were drought-free. Drought conditions remained the same as in June over Montgomery and western Washington counties with Moderate Drought, over the northern counties in the Piedmont with Severe Drought, and over eastern Queen Anne's and northeastern Caroline counties with Extreme Drought. The drought-free conditions slightly expanded eastward, now covering Garrett and western Allegany counties. The large area of Extreme Drought that developed in June on the Eastern Shore changed to Severe Drought by the end of July, while over Calvert and Saint Mary's counties changed to Moderate Drought. The areas of Severe Drought over Wicomico, Anne Arundel, Prince George's, and Charles counties that appeared in June changed to Moderate Drought by the end of July, while the area of Moderate Drought over Worcester, Somerset, and eastern Allegany counties changed to Abnormally Dry.

Maryland Climate Divisions (Figures 6-7, B1, and B2)

- All the climate divisions were warmer than normal in July, with Climate Division 8, Allegheny Plateau, having the largest departure from normal (2.6°F). Five of the eight climate divisions were wetter than normal, notably Climate Division 1 (Southeastern Shore), which had the largest anomaly (3.53 inches). Among the three drier-than-normal climate divisions, Climate Division 7, Appalachian Mountains, had the largest departure from normal (0.89 inches deficit).

- The statewide mean temperature in July was warmer than normal for a second month in a row (1.3°F) after a warmer-than-normal June (1.1°F) and a colder-than-normal May (0.5°F below). Statewide precipitation was wetter than normal this month (0.84 inches), following drier-than-normal June (1.45 inches deficit) and May (0.53 inches deficit); this is the first time statewide precipitation has been above normal since July 2025.

Extreme daily temperatures, precipitation, and growing degree days (Figures 8-10)

- Statewide maximum daily temperatures from January 1 to July 31 indicated that there were six more hot days (maximum temperatures larger than 86°F) than normal (37 vs. 31) and two more heat waves (two or more consecutive hot days) than normal (8 vs. 6); the last four heat waves occurred in July, and the first one started on June 30 and lasted eight days until July 7. Similarly, there were ten more warm days (maximum temperatures larger than 80°F) than normal (70 vs. 60), and two more warm day spells (two or more consecutive warm days) than normal (9 vs. 7); it was one warm day spell in July, but it lasted the whole month. Statewide minimum daily temperatures indicated there were seven more warm nights (minimum temperatures larger than 68°F) than normal (24 vs. 17) and a normal number of warm night spells (two or more consecutive warm nights; 4); the last two warm night spells occurred in July, and the first one started on July 1 and lasted eight days until July 8. Note that the pairing of heatwaves and warm night spells created dangerous conditions for those without air conditioning.

- Statewide daily total precipitation from January 1 to July 31 showed that the number of days with extreme precipitation (at least 0.64 inches –the 95th percentile in 1951−2000) was one day below normal (9 vs. 10). Three of these days occurred on the10th, 22nd, and 29th of July. The number of dry spells (two or more consecutive days with daily precipitation of no more than 0.04 inches) was one fewer spell than normal (28 vs. 29); the mean duration of the dry spells was one day longer than normal (5 vs. 4). July had five dry spells, with the longest starting on July 13 and lasting 6 days until July 18.

- The cumulative calendar year (January 1 to July 31) modified growing degree days (base 86/50°F) reached around 2475°FDD by the end of July and have been greater than

normal since the second week of March, with a departure above normal of 194°FDD by the end of July. Under these conditions, the modified growing days were 7-8 days ahead of normal for this time of year; in other words, this amount of accumulated growing degree days is normally reached around the 7th or 8th of August. Similarly, the simple growing degree days (base 50°F) reached around 2356°FDD by the end of July and have been above normal since the last week of March, with a departure from normal of 224°FDD by the end of July. The simple growing days were 8-9 days ahead of normal for this time of year. The modified growing degree days curve has closely followed last year's curve since the end of May, but it began to diverge toward lower values in the last days of July.

Historical Context (Figure 11, Tables A1 and A2)

- Statewide mean, maximum, and minimum temperatures in July 2026 (78.0, 88.0, 68.0°F) were above their (1895-2025) long-term means (75.5, 85.9, 65.1°F). The July temperatures were among the 25% of their highest values on record. These temperatures were far from any warm records for the month: 80.1°F for the mean temperature set in 2020, 90.6°F for the maximum temperature set in 2011, and 70.1°F for the minimum temperature set in 2025. Statewide precipitation (5.24 inches) in July was above the long-term mean (4.27 inches), and far from the wettest record of 10.70 inches in 1945.

- Statewide mean, maximum, and minimum temperatures indicated that July 2026 was the eighteenth, twenty-seventh, and fifteenth warmest July since 1895, respectively. At the county level, the counties closest to any record were as follows. In terms of the mean temperatures, Cecil County recorded its eleventh-warmest July, Garrett County its twelfth, and Harford and Queen Anne's counties recorded their thirteenth. Regarding the maximum temperatures, Caroline County had its thirteenth-warmest July, while Cecil and Wicomico counties had their fifteenth-warmest. And when considering minimum temperatures, Garrett County had its third-warmest July, Montgomery County its ninth, Charles County its eleventh, Cecil, Frederick, and Harford counties their twelfth, Carroll County its thirteenth, and Howard and Washington counties their fourteenth-warmest July.

- Statewide precipitation in July 2026 indicated that this was the thirty-fourth wettest July on record. Among the counties, Somerset and Worcester recorded their sixth-wettest July, and Wicomico had its eleventh-wettest.

Century-Plus Trends, 1895-2026 (Figures 12, 13)

- Statewide mean temperature and cooling degree days in July showed significant trends: a warming trend (2.0°F/century) and an increasing trend (69.1°FDD/century). On the other hand, precipitation had a small, non-significant wetting trend (0.13 in/century).

- Regionally, mean temperatures in July showed significant warming trends in most of the state, except in Garrett and Allegany counties. The largest warming trends were observed over Baltimore City (3.0−3.2°F/century), the counties of the central and southwestern Piedmont (2.2−2.8°F/century), and the northern Eastern Shore (2.2−2.4°F/century).

- Regionally, July precipitation had drying and wetting non-significant trends, except for northeastern Cecil County (0.8 in/century). The largest non-significant wetting trends (0.5–0.6 in/century) were over central Carroll and Baltimore counties and northeastern Worcester County, while the largest non-significant drying trends (0.3–0.4 in/century) were over Garrett and Washington counties.

Chesapeake Bay Sea Surface Temperatures (Figures 14, 15, E1)

- Sea surface temperatures in the Chesapeake Bay in July 2026 were between 81 and 83°F. Regionally, they were warmer than the 2007-2020 mean along the western coastal waters of the Bay and in the Chincoteague Bay (0.6−0.8°F), and colder along the eastern coastal waters of the Bay, especially in the Tangier Sound, coastal waters of Dorchester, Wicomico, and Somerset counties, the Pocomoke Sound (0.6−0.8°F below), and in the northern Middle Basin and southern Northern Basin (0.4−0.6°F below). The all-basin mean temperature of 81.5°F in July was just above the 2007-2020 base-period mean (81.4°F) but below the warmest July (83.5°F in 2025) in the 20-year dataset (2007-2026).

Contents

1. Introduction

The Maryland Climate Bulletin is issued by the Maryland State Climatologist Office (MDSCO), which resides in the Department of Atmospheric and Oceanic Science at the University of Maryland, College Park. It documents the surface climate conditions observed across the state in a calendar month and is issued in the second week of the following month.

Maryland's geography is challenging, with the Allegheny and Blue Ridge mountains to the west, the Piedmont Plateau in the center, the Chesapeake Bay, and the Atlantic Coastal Plain to the east. The range of physiographic features and the state's eastern placement within the expansive North American continent contribute to a comparatively wide range of climatic conditions.

The bulletin aims to document and characterize monthly surface climate conditions in the state, situating them within the context of regional and continental climate variability and change, to help Marylanders interpret and understand recent climate conditions.

The monthly surface climate conditions for July 2026 are presented via maps of key variables, such as average surface air temperature, maximum surface air temperature, minimum surface air temperature, total precipitation, and their anomalies (i.e., departures from normal); they are complemented by drought conditions for the state, as given by the U.S. Drought Monitor in Section 3. Statewide and climate division averages for the month are compared using scatter plots in Section 4. Extreme warm daily temperatures and precipitation, as well as growing degree days, are presented from the analysis of daily statewide averaged temperatures and precipitation in Section 5. Monthly statewide averages are placed in the historical context using box-and-whisker plots in Section 6. Century-plus trends in statewide air temperature, cooling degree days, precipitation, and state maps of air temperature and precipitation are presented in Section 7. Maps of monthly sea surface temperature (SST) in the Chesapeake Bay are presented in Section 8, along with basin averages and their annual evolution for the month. Ancillary statewide, climate division, and county-level information for air temperatures and precipitation are provided in tables and plots in Appendices A and B; climatology and variability maps are included in Appendices C and D, along with the percentage of normal precipitation and normalized anomalies; mean and variability of the sea surface temperatures in the Chesapeake Bay are displayed in Appendix E.

2. Data and Methods

Surface air temperatures, total precipitation, and degree-days data in this report are from the following sources:

- NOAA Monthly U.S. Climate *Gridded* Dataset at 5-km horizontal resolution (NClimGrid – Vose et al., 2014) for 1895-present. Available in preliminary status at: https://www.ncei.noaa.gov/data/nclimgrid-monthly/access/
  Data was downloaded on August 12, 2026.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al., 2014) for 1895-present. Available in preliminary status (v1.0.0-20260707) at:
  https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on August 12, 2026.

- NOAA area averages of daily temperatures and precipitation dataset (nClimGrid−Daily −Durre et al., 2022) for 1951-present. Available in preliminary status, v1.0.0, at:
  https://www.ncei.noaa.gov/products/land-based-station/nclimgrid-daily
  Data labeled as "scaled" was downloaded on August 7, 2026.

Drought conditions are from the U.S. Drought Monitor website:
https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Data and sources for the Chesapeake Bay are the following:

- Satellite-based sea surface temperatures from NOAA's CoastWatch Program. The data was made available by the Program's East Coast Node. This satellite-based sea surface temperature data uses data from the Advanced Very High Resolution Radiometer (AVHRR) on the European MetOp satellites, and the Visible Infrared Imaging Radiometer Suite (VIIRS) on the U.S. SNPP and NOAA JPSS satellites. In creating this product, nighttime overpasses for the U.S. East Coast are used, thereby avoiding daytime solar heating of the ocean surface and the associated warm bias in the data. In particular, the acquired product consists of monthly sea surface temperature data for the Chesapeake and Delaware Bays, with a nominal horizontal resolution of 750 m from 2007 to the present. This product is available at:
  https://eastcoast.coastwatch.noaa.gov/data/avhrr-viirs/sst-ngt
  Data was downloaded on August 10, 2026.

- A shapefile of watersheds for the state from the Maryland Department of the Environment and the Department of Natural Resources: the Maryland Watersheds – 8 Digit Watersheds. It contains 138 separate watersheds, identified with an 8-digit numeric code from which three are on the main steam of the Chesapeake Bay: the Upper Chesapeake Bay (code: 02139996; from the mouth of the Susquehanna River to northern side of the mouth of the Gunpowder River), the Middle Chesapeake Bay (code: 02139997; from the Gunpowder River to the mouth of the Chester River), and the Lower Chesapeake Bay (code: 02139998; from the south side of the mouth of the Chester River to the mouth of the Potomac River), which in turn are used to create a one-watershed shapefile for the entire basin. These four watersheds are used to create area-averaged sea surface temperatures for the Bay. The shapefile and associated files are available at:
  https://data.imap.maryland.gov/datasets/maryland::maryland-watersheds-8-digit-watersheds/about

Some definitions:

About climate and climatology. Weather and climate are closely related, but they are not the same. Weather represents the state of the atmosphere (temperature, precipitation, etc.) at any given time. On the other hand, climate refers to the long-term average of weather elements. If the average period is long enough, we can start to characterize the climate of a particular region.

It is customary to follow the World Meteorological Organization (WMO) recommendation and use 30 years for the average. The 30-year average weather data is traditionally known as Climate Normal (Kunkel and Court 1990) and is updated every ten years (WMO 2017). Establishing a climate normal, or climatology, is important because it allows one to compare a specific day, month, season, or even another normal period with the current normal. Such comparisons characterize anomalous weather and climate conditions, climate variability and change, and help define extreme weather and climate events (Arguez et al. 2012). The current climate normal, or simply the climatology, is defined for the period 1991–2020.

It should be noted that the satellite-based sea surface temperature data set has a short temporal coverage of 20 years, from 2007 to the present, which prevents the calculation of its current climate normal (1991-2020). Instead, the 2007-2020 mean will be used without referring to it as a climatology.

About the anomalies: Anomalies for a given month (e.g., July 2026) are the departures of the monthly value from the corresponding month's 30-year average (i.e., from the average of 30 Julys) during 1991-2020. When the observed monthly value exceeds its climatological value, it is referred to as above normal (e.g., warmer than normal or wetter than normal) or a positive anomaly. In contrast, when this value is smaller than its climatological value, it is referred to as below normal (e.g., colder than normal or drier than normal) or a negative anomaly. In the case of the sea surface temperature anomalies, they are calculated with respect to their 2007-2020 mean.

About variability. The monthly standard deviation of a climate variable measures its dispersion relative to its monthly mean and assesses its year-to-year, or interannual, variability. Anomalies are sometimes compared against that variability to identify extremes in the climate record. When anomalies are divided by the standard deviation, they are referred to as standardized anomalies.

About hot days, warm days, and warm nights. Extreme heat, detrimental to crops without irrigation and to populations lacking air conditioning, is tracked by the count of hot days, warm days and nights, and their consecutive occurrence (e.g., Tschurr et al. 2020, Barriopedro et al. 2023). A hot day is defined as one when the maximum temperature is greater than 86°F, a warm day is when the maximum temperature is greater than 80°F, while a warm night is when the minimum temperature is greater than 68°F. When these conditions persist for two or more days, they are referred to as heat waves for the hot days and warm spells for the warm days and nights. These threshold values correspond to the 89th and 75th percentiles of statewide daily maximum

temperatures and the 95th percentile of statewide daily minimum temperatures for the period 1951- 2000.

About degree days. Degree days represent the difference between the daily mean temperature (calculated as the average of the high and low temperatures) and a predefined base temperature. Since energy demand is cumulative, degree-day totals are typically calculated on a daily, monthly, seasonal, and annual basis.

- *Heating and cooling degree days.* These are used to get a general idea of the amount of energy required to warm or cool buildings. The base temperature used for this purpose is 65°F, which is considered tolerable for human comfort (CPC 2023).
- Growing Degree Days. These are used to estimate the growth and development of plants and insects during the growing season, under the assumption that development occurs only if the temperature exceeds a minimum development threshold temperature, or, in other words, if enough warmth is accumulated. Because actual development varies across plants and insects, and the presence of weeds and precipitation can influence it, a base temperature of 50°F is generally considered acceptable for all plants and insects (OSU 2024). However, this base temperature is best suited for the development of specific crops like corn, sweet corn, soybeans, tomatoes, and a few others.
    - Modified Growing degree days. The modified growing degree days are calculated by establishing base temperatures for the daily maximum and minimum temperatures before determining the daily mean temperature. When the base temperature for the daily maximum temperature is set to 86°F, and the base temperature for the daily minimum temperature is set to 50°F, the growing degree days are specific to corn development, as no appreciable growth is detected at temperatures below 50°F or above 86°F.

About extreme precipitation. This is defined as the number of days per year on which statewide-averaged daily total precipitation is equal to or greater than 0.64 inches. This threshold value represents the 95th percentile of statewide averaged daily total precipitation for 1951-2000.

About the dry day spells. A dry day is defined as a day with precipitation below 0.04 inches. These conditions are referred to as dry spells if they persist for two or more consecutive days. The number and duration of dry spells are particularly important during the vegetation period (Tschurr et al. 2020).

About NOAA's Climate Divisions. The term "climate division" refers to one of the eight divisions in the state that represent climatically homogeneous regions, as determined by NOAA: https://www.ncei.noaa.gov/access/monitoring/dyk/us-climate-divisions

The eight climate divisions in Maryland are:

- Climate Division 1: Southeastern Shore. It includes the counties of Somerset, Wicomico, and Worcester.
- Climate Division 2: Central Eastern Shore. It includes the counties of Caroline, Dorchester, and Talbot.
- Climate Division 3: Lower Southern. It includes the counties of Calvert, Charles, and St. Mary's.
- Climate Division 4: Upper Southern. It includes the counties of Anne Arundel and Prince George's.
- Climate Division 5: Northeastern Shore. It includes the counties of Kent and Queen Anne's.
- Climate Division 6: North Central. It includes the counties of Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery, and the city of Baltimore.
- Climate Division 7: Appalachian Mountains. It includes the counties of Allegany and Washington.
- Climate Division 8: Allegheny Plateau. It includes Garrett County.

Note that these Climate Divisions do not correspond with the *Physiographic Provinces* in the state, as the former follow county lines. Climate Division 8 follows the *Appalachian Plateau Province*, Climate Division 7 follows the *Ridge and Valley Province*; however, Climate Division 6 includes the *Blue Ridge and the Piedmont Plateau provinces,* Climate Divisions 3, 4, and a portion of 6 include the *Upper Coastal Plain Province*, and Climate Divisions 1, 2, 5, and a portion of 6 include the *Lower Coastal Plain (or Atlantic Continental Shelf) Province*.

3. July 2026 Maps

A. Mean Temperatures

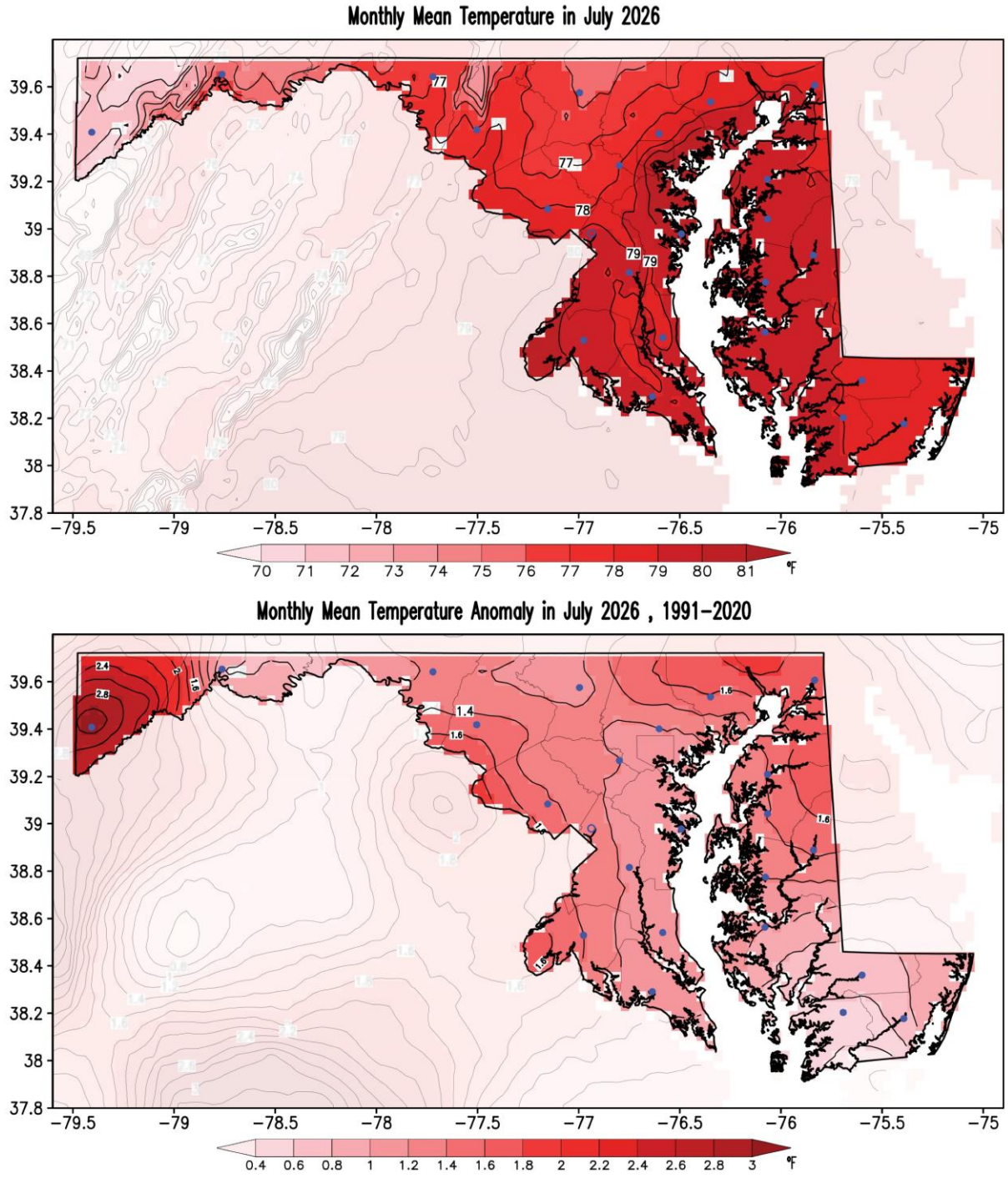

Figure 1. Monthly mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2026. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer-than-normal conditions. Note shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

B. Maximum Temperatures

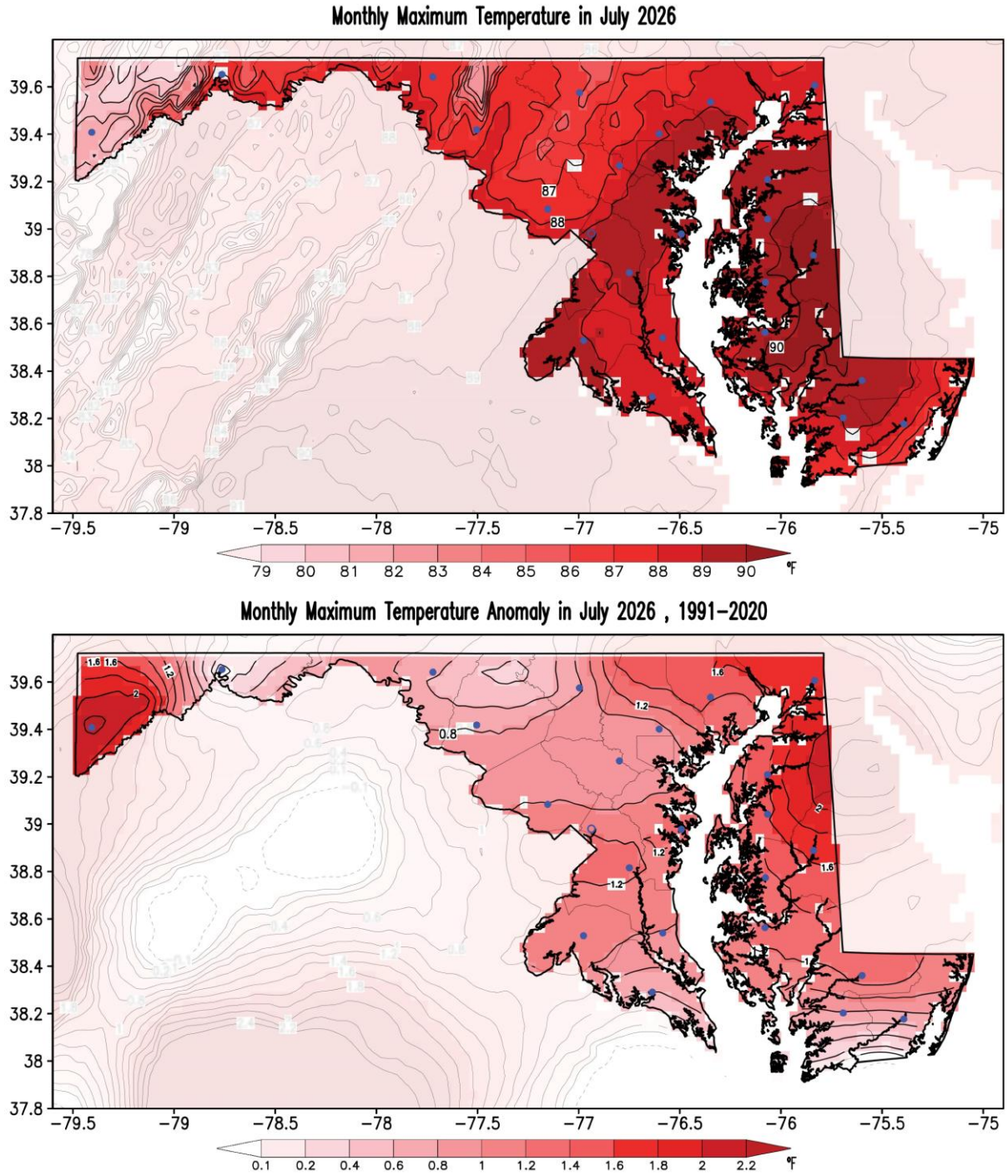

Figure 2. Monthly maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2026. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer-than-normal conditions. Note shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

C. Minimum Temperatures

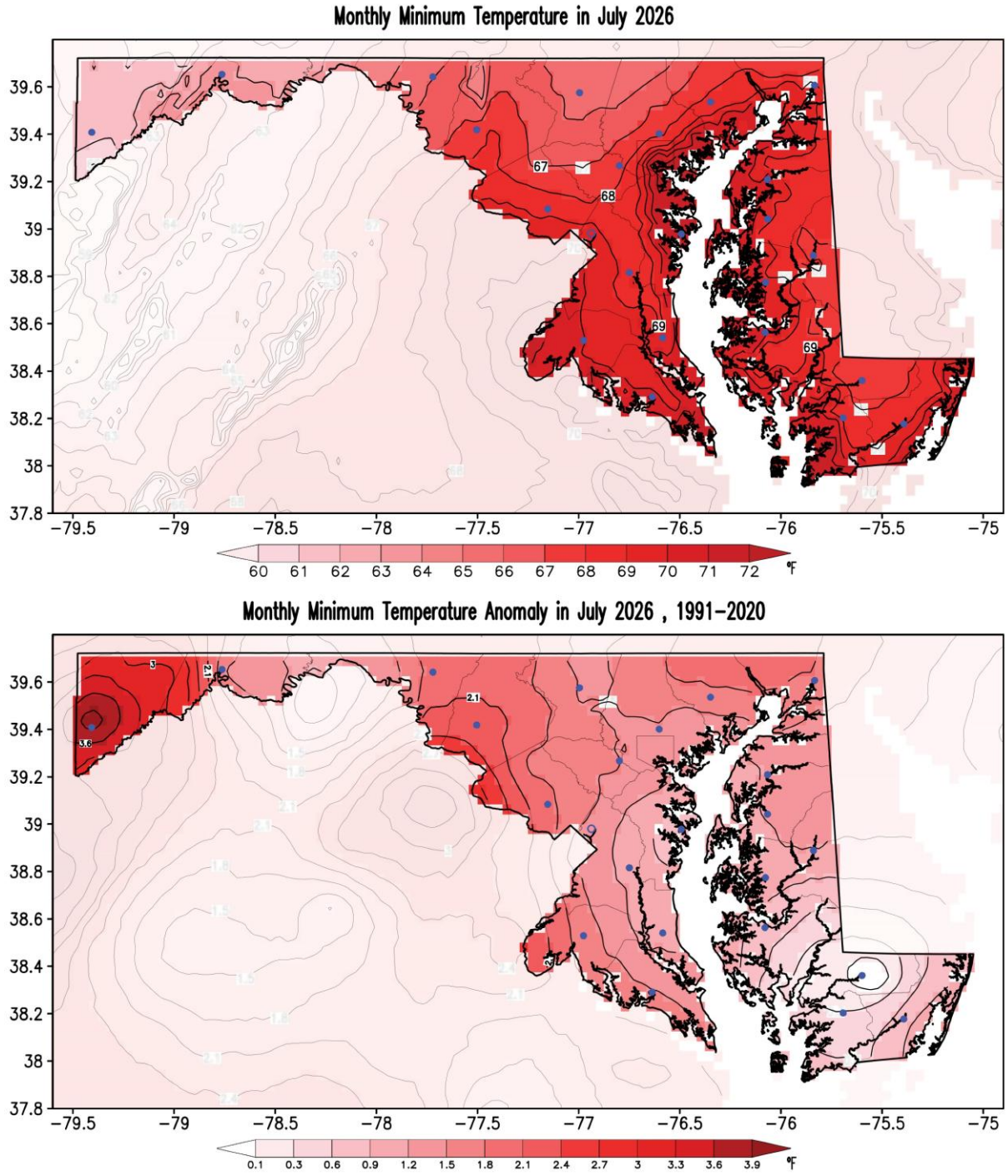

Figure 3. Monthly minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2026. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer-than-normal conditions. Note shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

D. Precipitation

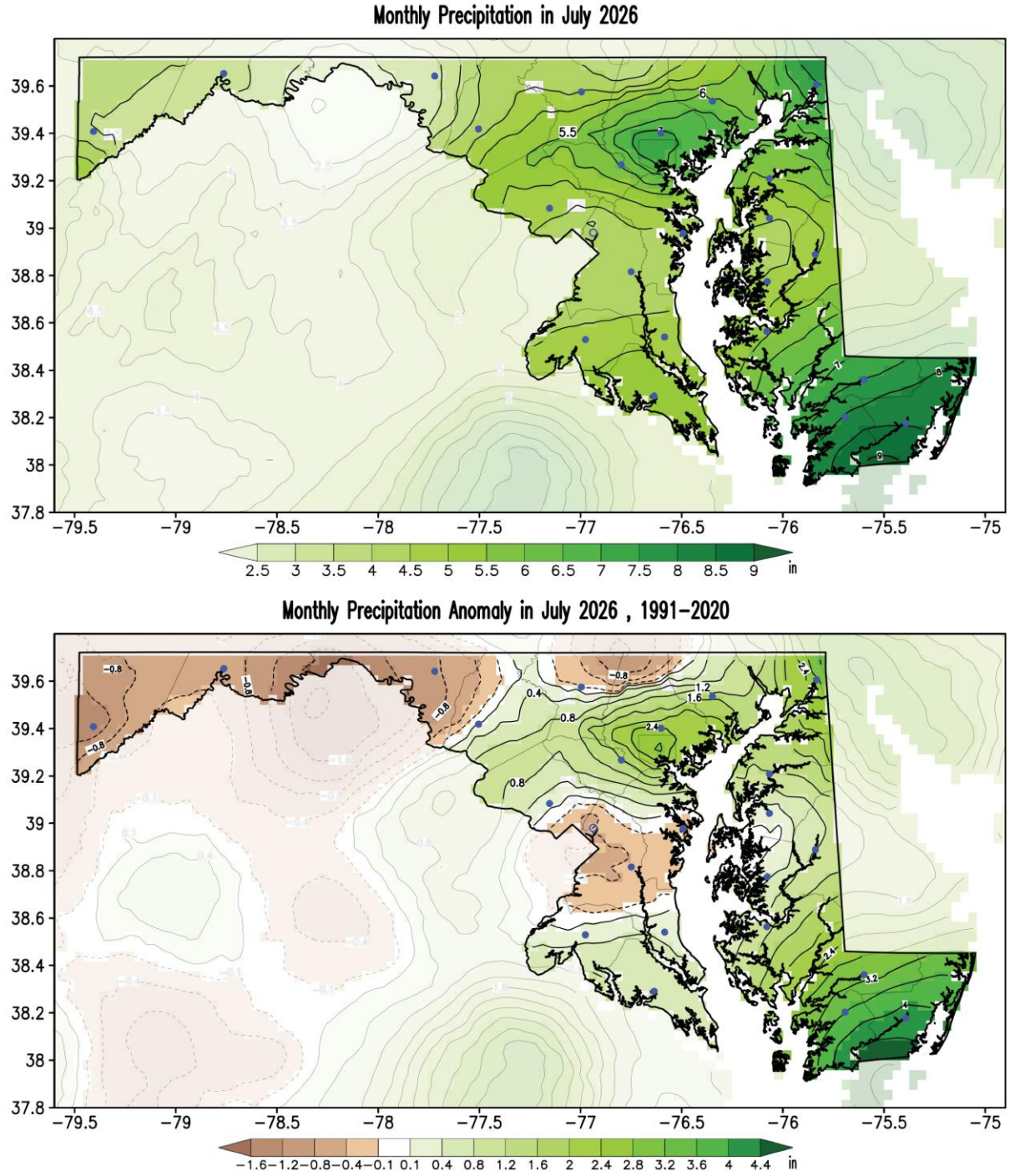

Figure 4. Monthly total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2026. Precipitation is measured in inches, as indicated by the color bar. Brown/green shading in the anomaly map indicates drier/wetter-than-normal conditions. Note shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

E. Drought

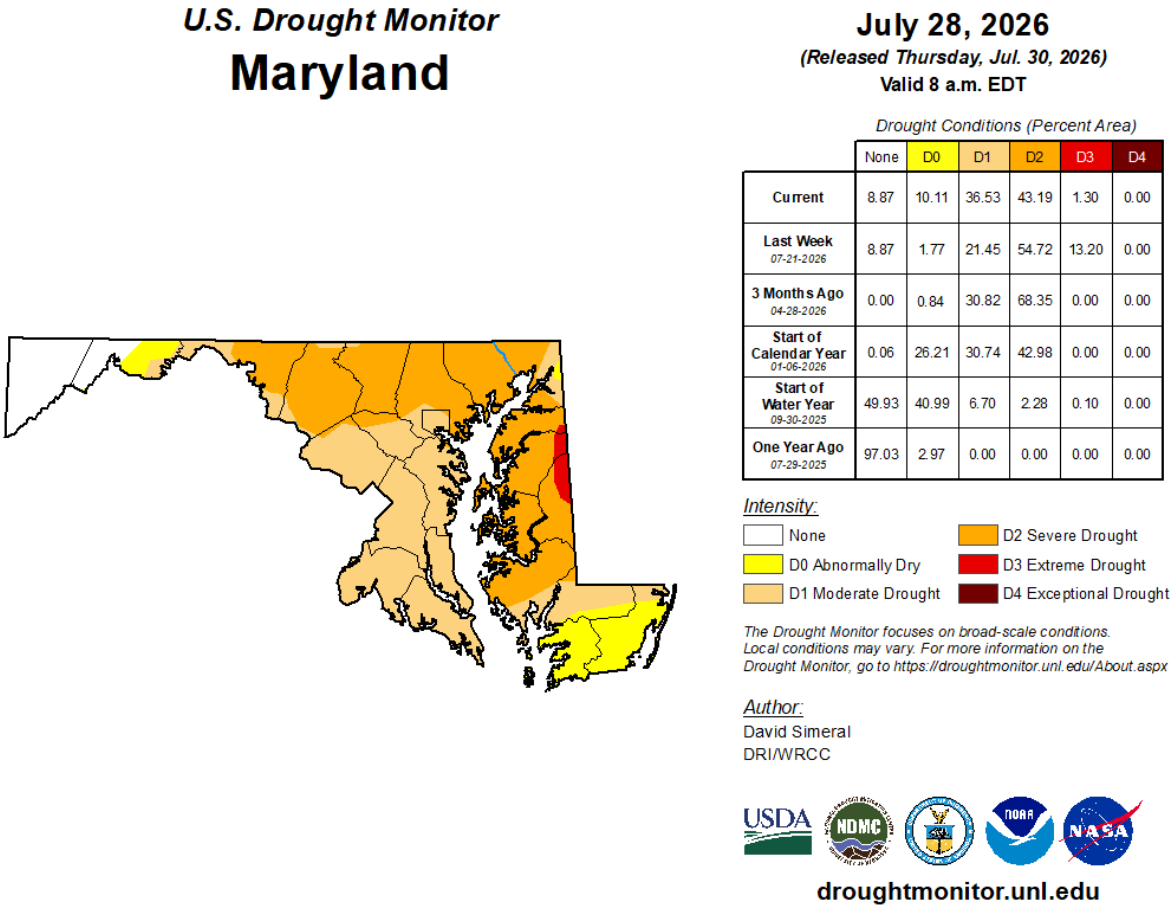

Figure 5. Drought conditions as reported by the U.S. Drought Monitor on July 28, 2026. Drought conditions improved as the extent of the Extreme and Severe Drought diminished along the Eastern Shore and Garrett and western Allegany counties have no drought. White shading indicates regions without drought. Yellow shading indicates Abnormally Dry regions; light orange shading shows regions under a Moderate Drought, dark orange shading shows regions under Severe Drought, and red shading (in the southern-most tip of Saint Mary's County) shows regions under Extreme Drought. Numbers in the table indicate the percentage of the state covered under the particular drought category at the time (in the left column). Typically, areas shown in yellow (Abnormally Dry) indicate land that is entering or exiting drought. Light orange areas (Moderate Drought) highlight land that may experience a low water supply and crop and pasture damage. Dark orange areas (Severe Drought) show land with water shortages and an increased likelihood of crop and pasture losses. Red areas (Extreme Drought) indicate land where crop losses are widespread, streamflow is severely reduced, river water temperatures are warm, and wells are running dry. Current conditions can be monitored on the U. S. Drought Monitor website. If interested, you can help monitor drought conditions by submitting a report of your local soil conditions through the National Drought Mitigation Center's Drought Impact Toolkit by using the Condition Monitoring Observer Reports system.

4. July and MJJ 2026 Statewide and Climate Divisions Averages

A. July Scatter Plots

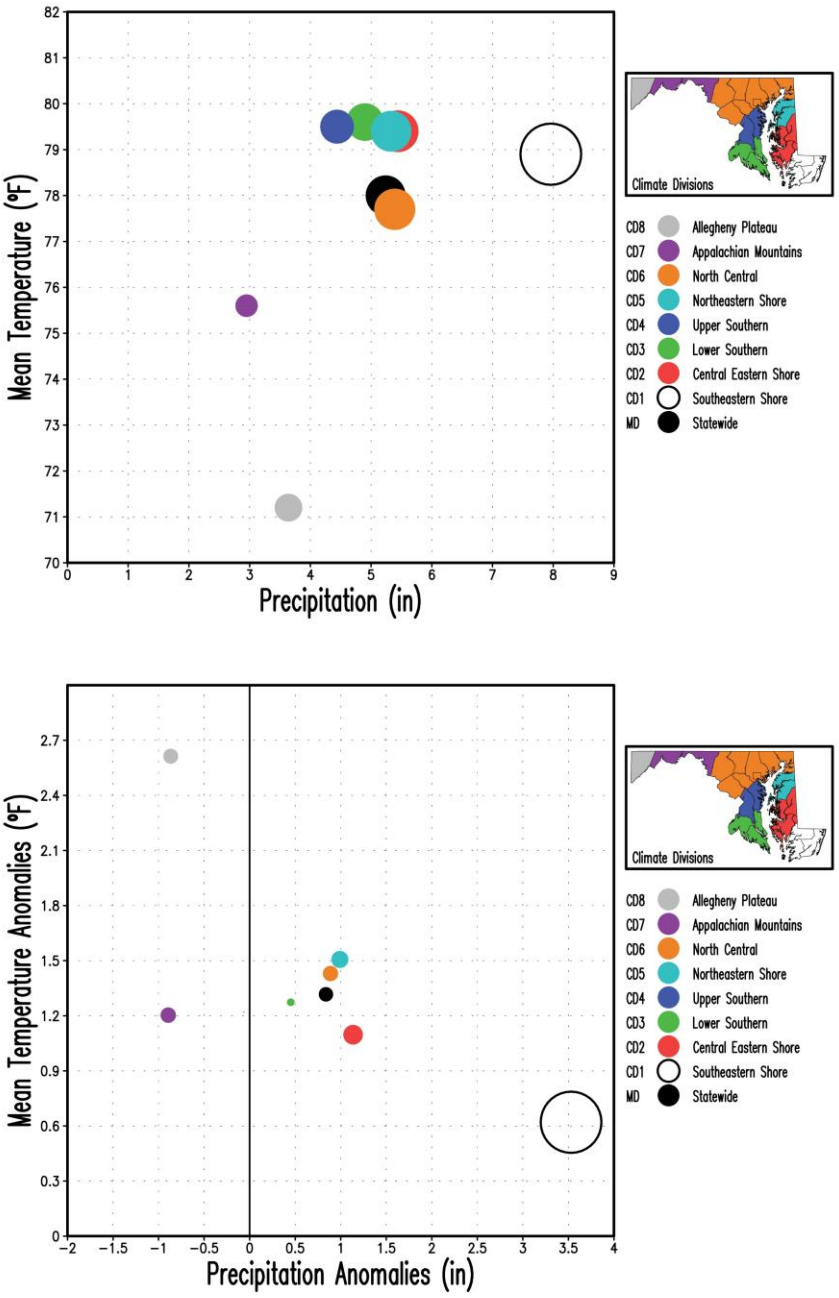

Figure 6. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for July 2026. The upper panel displays the mean temperature and total precipitation, while the bottom panel displays their anomalies relative to the 1991-2020 climatology. Temperatures are in °F and precipitation is in inches. The size of the circles is proportional to the total precipitation scaled down by the maximum precipitation (7.96 inches in CD1, top panel) and by the maximum precipitation anomaly (3.53 inches in CD1, bottom panel) among the nine regions. Note that the color of the filled circles corresponds to the color in the Climate Divisions according to the inset map.

B. May – July Scatter Plots

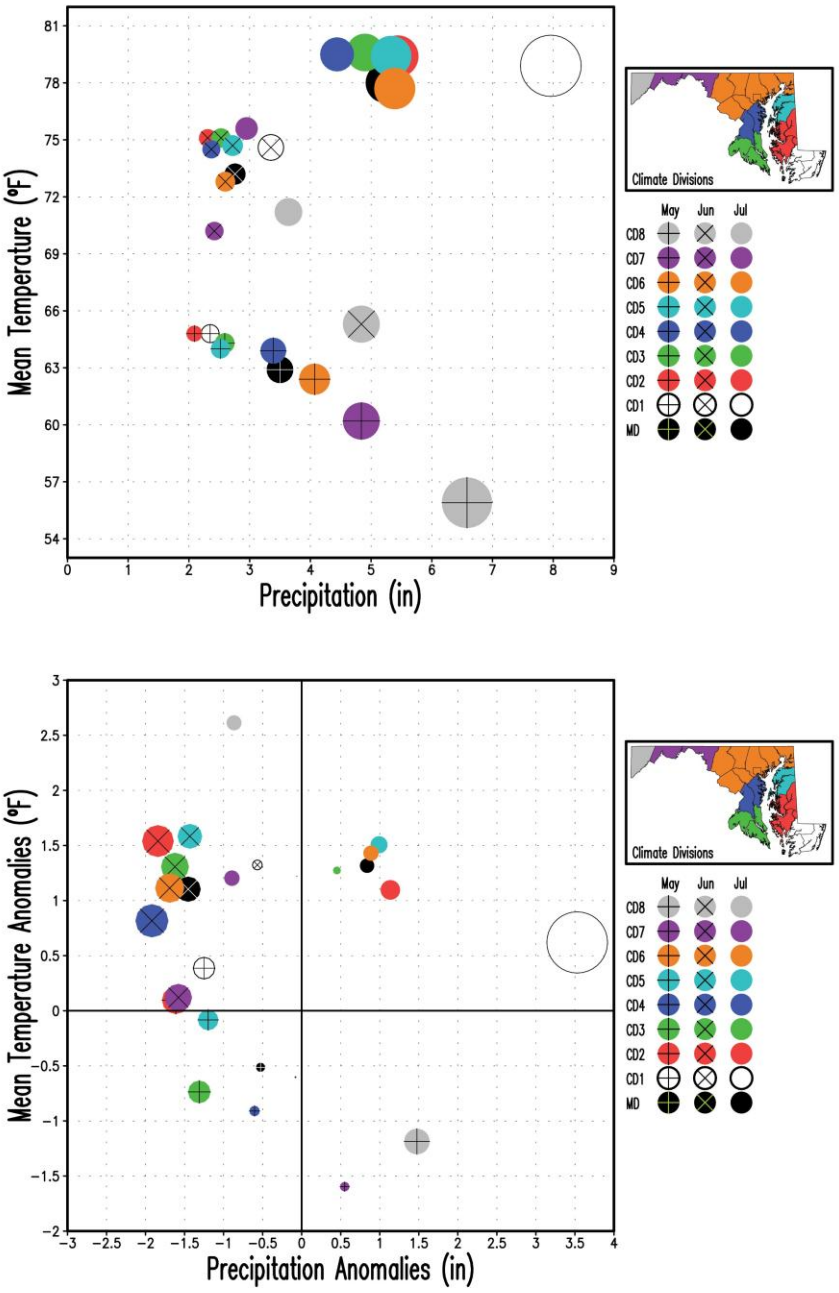

Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for May, June, and July 2026. The upper panel displays the mean temperature and total precipitation, while the bottom panel shows their anomalies relative to the 1991-2020 climatology. Temperatures are in °F, and precipitation is in inches. The size of the circles is proportional to the total precipitation scaled down by the maximum precipitation (7.96 inches in CD1 in July, top panel) and by the maximum precipitation anomaly (3.53 inches in CD1 in July, bottom panel) among the nine regions and three months. July is displayed with filled circles only, while June and May are displayed with superposed multiplication and addition signs, respectively.

5. Extremes in Statewide Averages

A. Hot Days, Warm Days, and Warm Nights

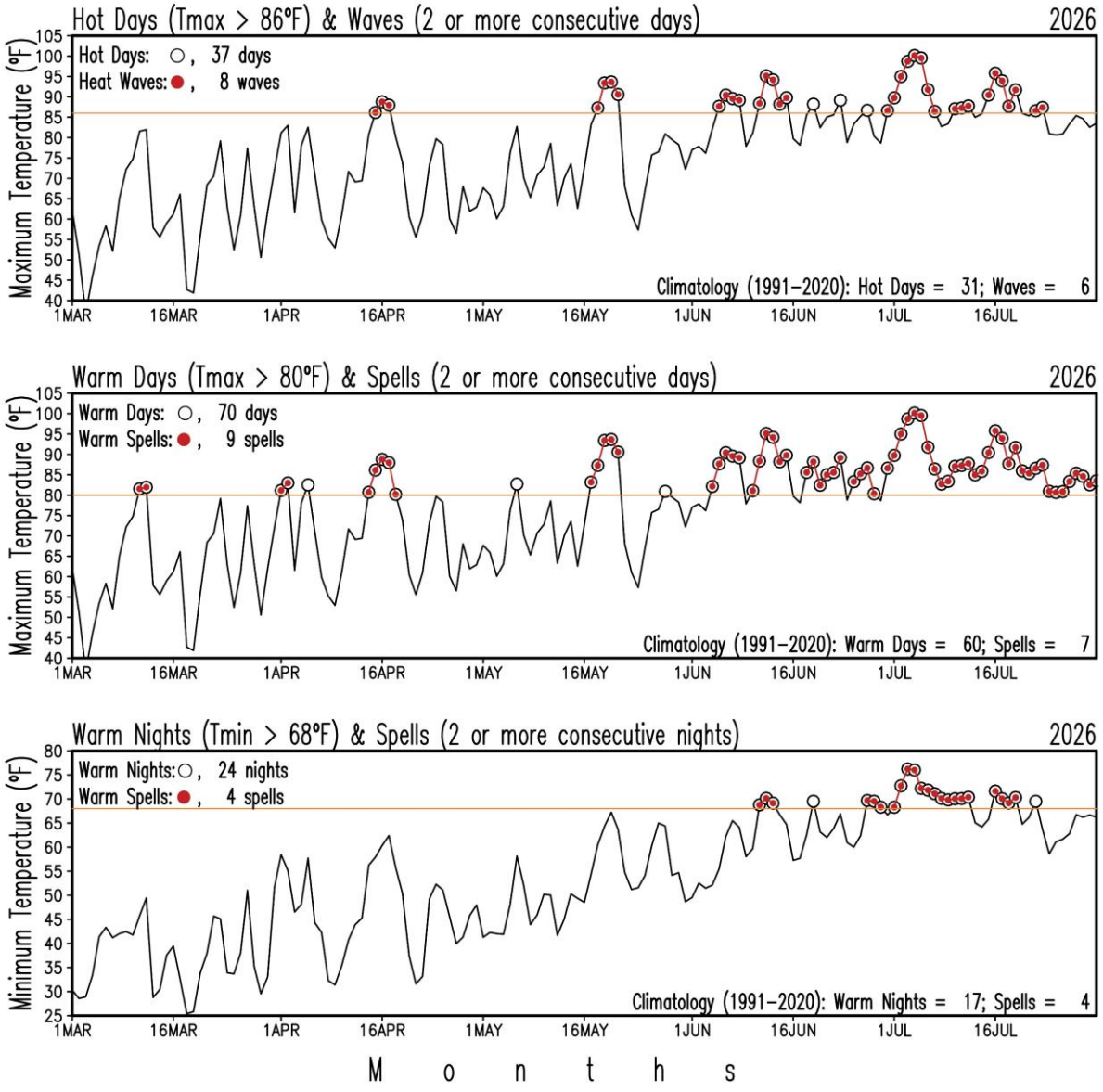

Figure 8. Maryland (statewide) number of hot days, warm days, warm nights, and their consecutive occurrence for the period January 1 – July 31, 2026. The upper panel shows hot days in open circles and heat waves in red-filled circles from statewide daily maximum temperatures. The middle panel shows warm days in open circles and warm day spells in red-filled circles from statewide daily maximum temperatures. The bottom panel shows warm nights in open circles and warm night spells in red-filled circles from statewide daily minimum temperatures. The orange line in each panel marks the threshold temperatures of 86°F, 80°F and 68°F for each case. Figures at the county and climate division levels, as well as summary tables, are available on the MDSCO website, along with near-real-time figures.

B. Extreme Precipitation and Dry Spells

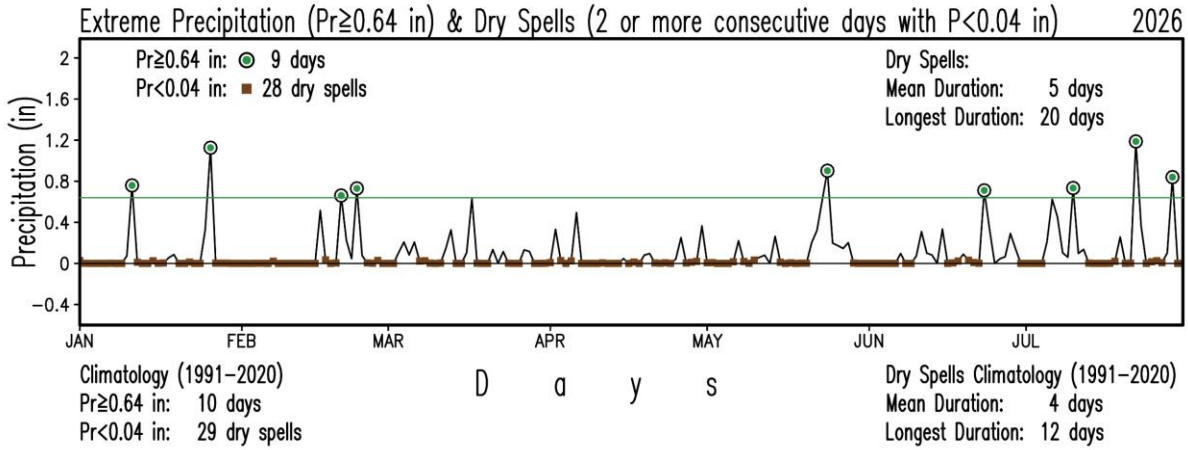

Figure 9. Maryland (statewide) number of days with extreme precipitation and dry spells for the period January 1 – July 31, 2026. Days with extreme precipitation (precipitation of 0.64 in or more) are identified by green-filled circles. Dry spells (consecutive days with daily total precipitation less than 0.04 in) are shown by brown-filled squares. Both extremes are identified from the statewide total daily precipitation. Figures at the county and climate division levels, as well as summary tables, are available on the MDSCO website, along with near-real-time figures.

C. Modified and Simple Growing Degree Days

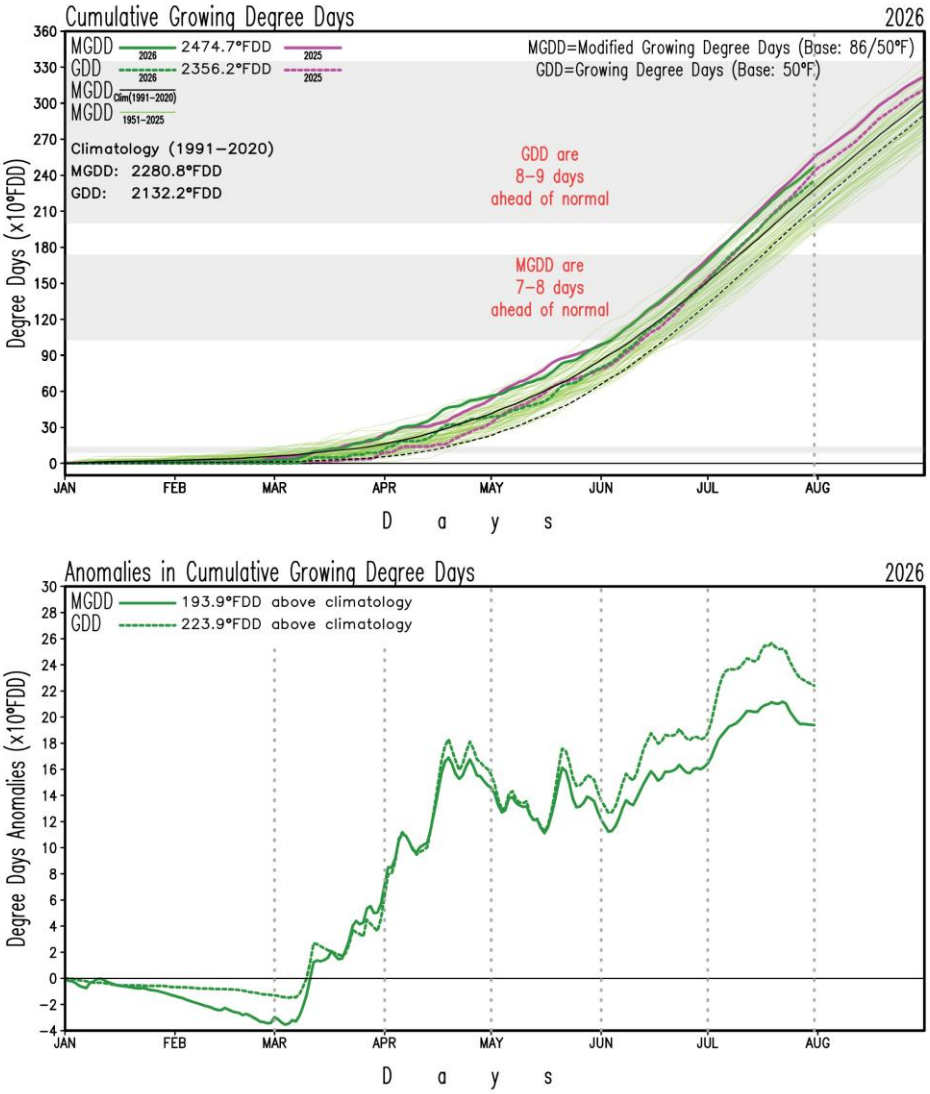

Figure 10. Maryland (statewide) cumulative modified and simple growing degree days (upper panel) and their anomaly with respect to the 1991-2020 climatology (lower panel) for the period January 1 – July 31, 2026. The modified growing degree days are shown with the continuous thick green line in the upper panel and for reference their 1991-2020 climatology and the year 2025 are displayed with continuous black and purple lines, respectively; the continuous thin light-green lines display the cumulative modified growing degree days every year from 1951 to 2024. Similarly, the simple growing degree days are shown as dashed thick lines. The gray-shaded areas mark ranges of values for emergence (82-140), tassel-silk (1024-1740), and physiological maturity (2000-3350) in corn development (IPAD, 2023). The red annotations in the upper panel display how many days ahead of climatology the June 30 accumulated values were. Anomalies relative to the 1991-2020 climatology in the cumulative modified growing degree days (bottom panel) are displayed as the continuous green line, while those for the growing degree days are shown as the dashed green line. The vertical dotted gray lines mark the start of the months since March. The accumulated growing degree days and their anomalies as of July 31 are displayed at the top left of each panel. Analysis is from statewide daily maximum and minimum temperatures. Figures at the county and climate division levels, as well as summary tables, are available on the MDSCO website, along with near-real-time figures.

6. July 2026 Statewide Averages in the Historical Record

A. Box and Whisker Plots

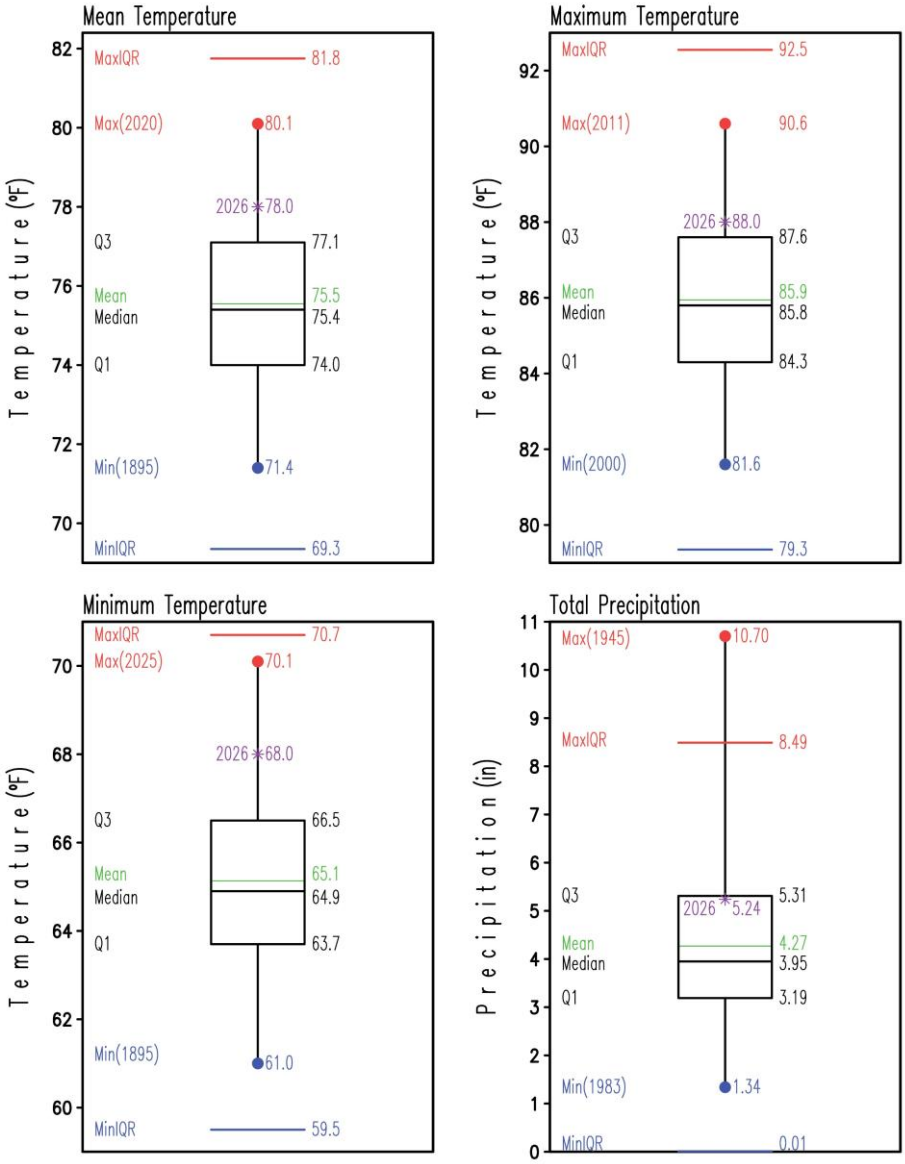

Figure 11. Box and Whisker plots of Maryland (statewide) monthly mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and total precipitation (lower right) for July for the period 1895-2025. Conditions for July 2026 are represented by the label and asterisk in purple. Statistics for the period 1895-2025 are labeled at the left side of each box and whisker plot, and their values are at their right. Temperatures are in °F, and precipitation is in inches. The mean is the green line within the box, while the median is the black line within the box. The lower (Q1) and upper (Q3) quartiles, indicating the values of the variable that separate 25% of the smallest and largest values, are the lower and upper horizontal black lines of the box, respectively. The blue and red dots mark the minimum and maximum values in the period at the end of the whiskers; the year of occurrence is shown in parentheses. The blue and red horizontal lines represent extreme values defined by Q1-1.5×(Q3-Q1) and Q3+1.5×(Q3-Q1), respectively.

7. 1895-2026 July Trends

A. Statewide Averages in Mean Temperature, Cooling Degree Days, and Precipitation

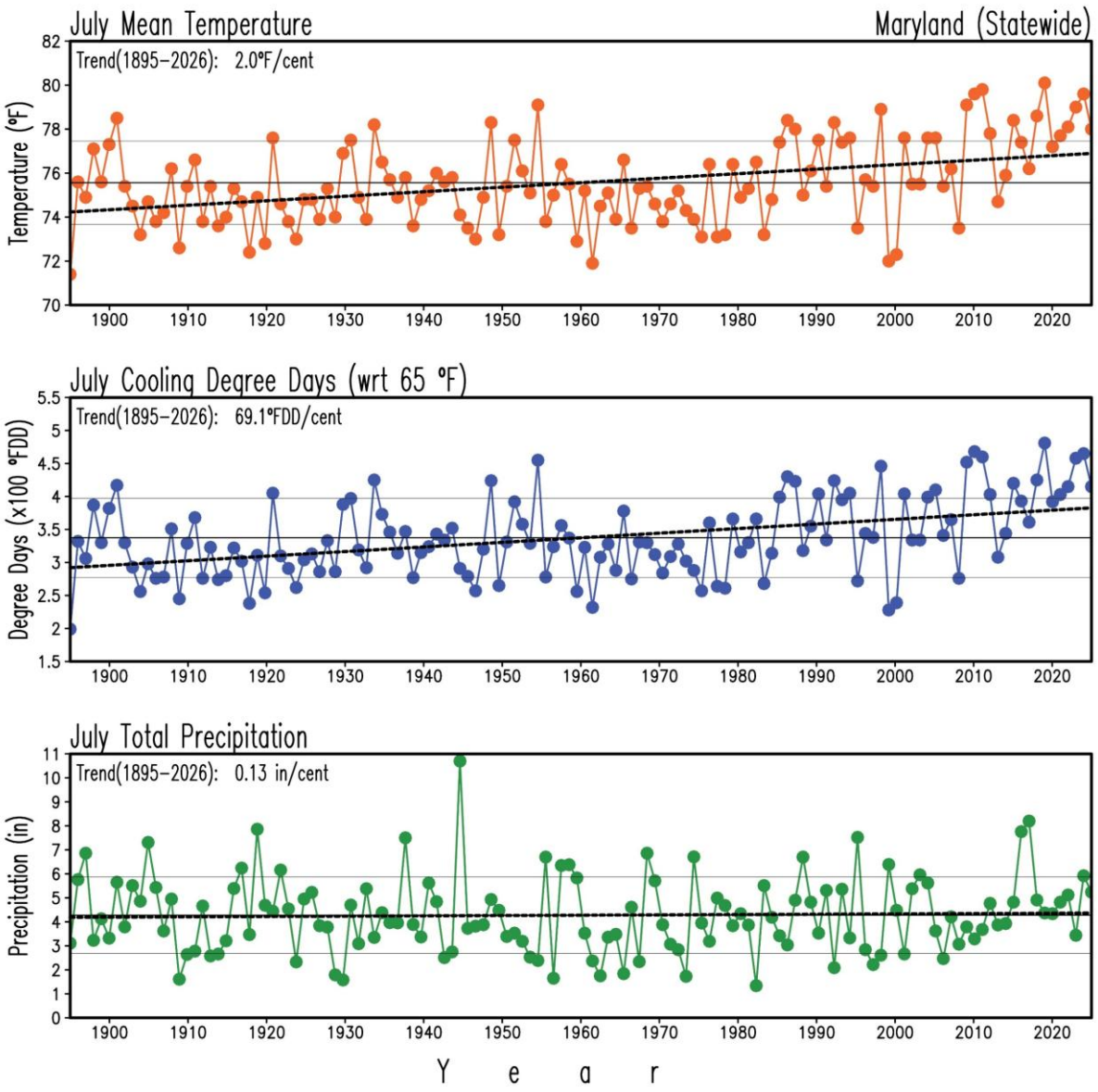

Figure 12. Maryland (statewide) mean surface air temperature, cooling degree days, and precipitation in July for the period 1895-2026. Temperature is in °F, cooling degree-days are in °F, and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (75.6°F, 337.5°FDD, and 4.28 in, 1895-2026), and the double thin, continuous gray lines indicate the standard deviation (1.9°F, 59.9°FDD, and 1.60 in) above/below the long-term mean. The thick dashed black lines show the long-term linear trend. The warming temperature trend (2.0°F/century), the increasing cooling degree-days trend (69.1°FDD/century) are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000), but not the small precipitation wetting trend (0.13 in/century).

B. Temperature and Precipitation Maps

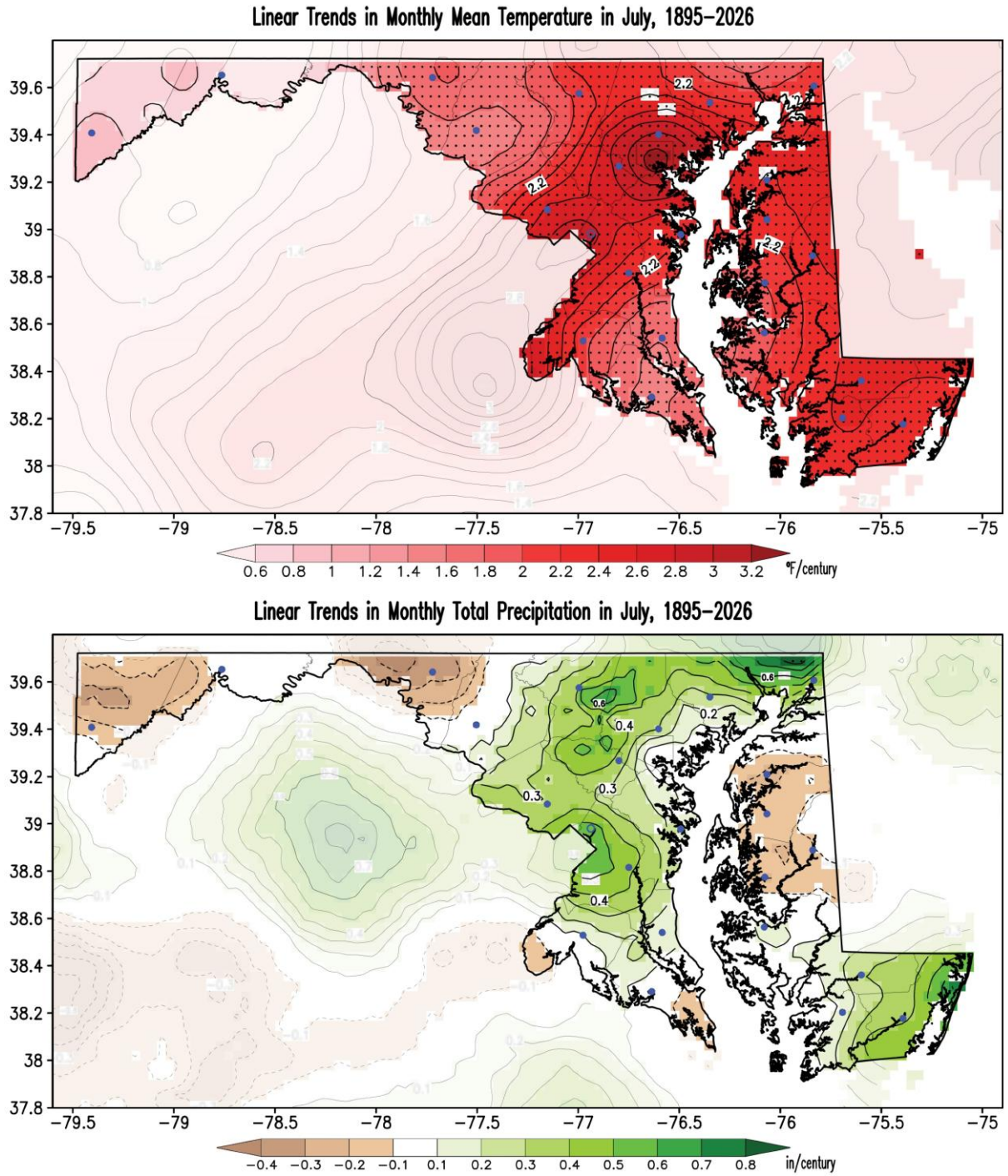

Figure 13. Linear trends in surface air mean temperature and precipitation in July for the period 1895-2026. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Brown/green shading in the precipitation map shows drying/wetting trends. Stippling in the maps indicates regions where trends are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000). Note that shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

8. Chesapeake Bay's Sea Surface Temperatures

A. July 2026 Sea Surface Temperature Maps

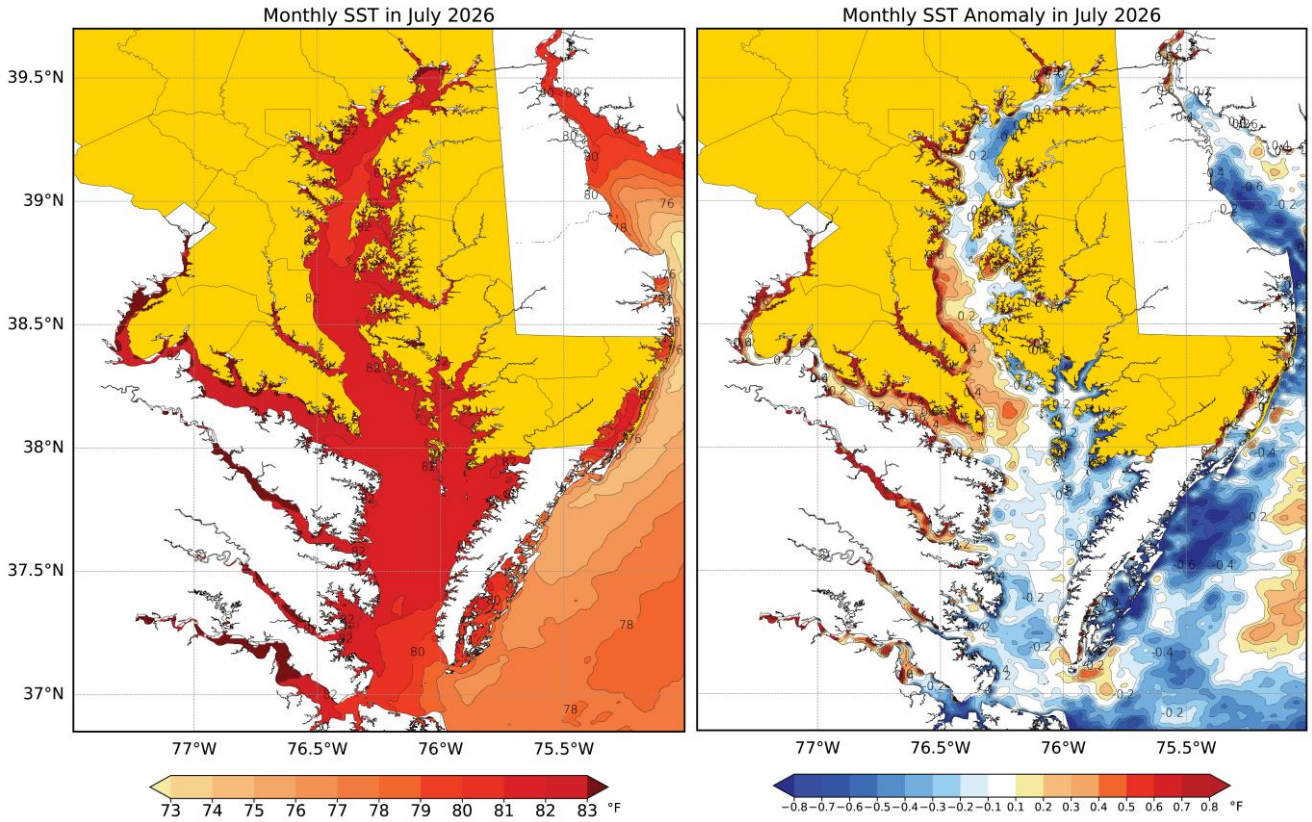

Figure 14. Monthly sea surface temperature (left panel) and its anomaly (right panel) in the Chesapeake Bay and surrounding coastal areas in July 2026. Temperatures are in °F, following the color bar. Blue/orange shading in the anomaly map marks colder/warmer temperatures than the 2007-2020 mean. For clarity, the temperatures and their anomalies have been smoothed using a 9-point spatial smoother applied four times. Note that Maryland has been shaded yellow to facilitate focus on the state waters.

B. July Upper, Middle, Lower, and Entire Basins Sea Surface Temperature Averages

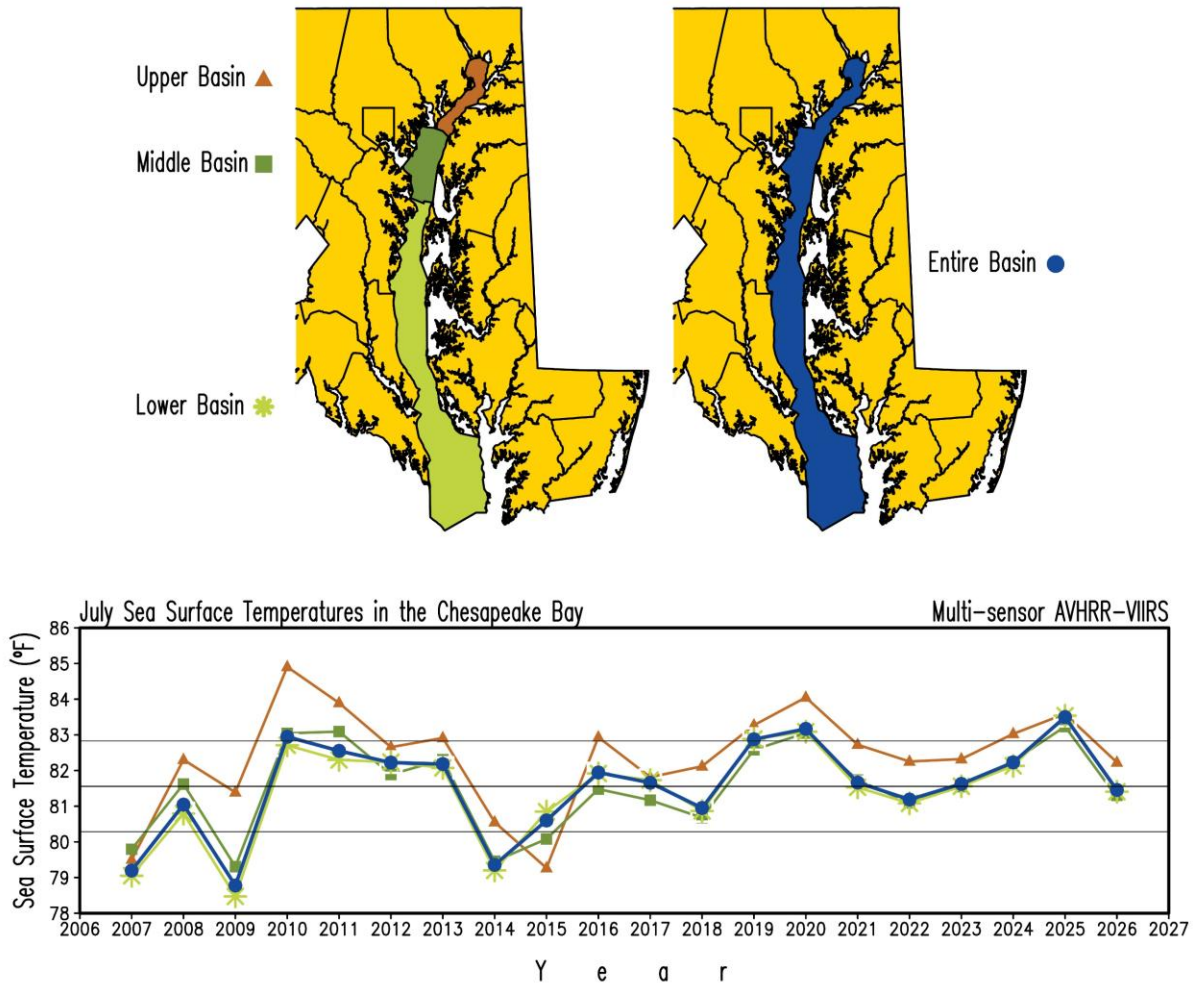

Figure 15. Watersheds in the Chesapeake Bay (top panel) and their area-averaged sea surface temperatures in July for the period 2007-2026 (bottom panel). Temperatures are in °F. The color of the lines corresponds to the color of the watersheds in the Bay, as indicated on the maps: Brown for the Upper Bay, dark green for the Middle Bay, light green for the Lower Bay, and Navy Blue for the Entire Bay. The mean temperature for the Entire basin in July 2026 was 81.5°F, while for the Upper, Middle, and Lower basins was 82.2, 81.3, and 81.4°F, respectively. The thin, continuous black line in the lower panel displays the 2007-2026 mean for the Entire Basin (81.6°F), and the double thin, continuous gray lines indicate the standard deviation (1.3°F) above/below the long-term mean. The 2007-2026 mean temperatures for the Upper, Middle, and Lower basins in July were 82.4, 81.5, and 81.5°F, with standard deviations of 1.4, 1.2, and 1.3°F, respectively.

Appendix A. July 2026 Data Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	78.0	115
Climate Division 1	78.9	108
Climate Division 2	79.4	113
Climate Division 3	79.6	116
Climate Division 4	79.5	117
Climate Division 5	79.4	120
Climate Division 6	77.7	115
Climate Division 7	75.6	107
Climate Division 8	71.2	121
Allegany	74.6	104
Anne Arundel	79.7	111
Baltimore	77.9	113
Baltimore City	79.9	114
Calvert	79.1	108
Caroline	79.2	115
Carroll	76.3	111
Cecil	78.7	122
Charles	79.8	116
Dorchester	79.5	112
Fredrick	76.9	111
Garrett	71.2	121
Harford	78.6	120
Howard	77.4	112
Kent	79.4	114
Montgomery	78.0	117
Prince George's	79.2	117
Queen Anne's	79.4	120
Saint Mary's	79.4	111
Somerset	79.4	107
Talbot	79.6	114
Washington	76.6	107
Wicomico	78.9	108
Worcester	78.6	110

Region	Total Precipitation (in)	Rank (#)
Statewide	5.24	99
Climate Division 1	7.96	126
Climate Division 2	5.44	104
Climate Division 3	4.90	88
Climate Division 4	4.44	77
Climate Division 5	5.33	97
Climate Division 6	5.39	103
Climate Division 7	2.95	42
Climate Division 8	3.64	44
Allegany	2.98	37
Anne Arundel	4.70	82
Baltimore	5.93	108
Baltimore City	7.09	119
Calvert	4.75	79
Caroline	5.15	90
Carroll	4.73	95
Cecil	6.74	113
Charles	4.74	90
Dorchester	5.87	109
Fredrick	4.54	92
Garrett	3.64	44
Harford	5.77	97
Howard	5.51	105
Kent	5.77	103
Montgomery	4.88	93
Prince George's	4.27	72
Queen Anne's	4.95	93
Saint Mary's	5.17	87
Somerset	8.05	127
Talbot	4.66	84
Washington	2.92	47
Wicomico	7.36	122
Worcester	8.35	127

Table A1. Monthly mean surface air temperature (left) and total precipitation (right) at Maryland (statewide), climate division, and county levels for July 2026. Temperatures are in °F, and precipitation is in inches. The rank is the position the variable for July 2026 occupies among the 132 Julys, after the 132 values have been arranged from lowest to highest using the *standard competition ranking method*. The closer to 132 the rank is, the larger (i.e., the warmer/wetter) the value of the surface variable is in the record; similarly, the closer to 1 the rank is, the smaller (i.e., the colder/drier) the value of the surface variable is in the record.

B. Maximum and Minimum Temperatures

Region	Maximum Air Temperature (°F)	Rank (#)
Statewide	88.0	106
Climate Division 1	88.6	111
Climate Division 2	89.8	116
Climate Division 3	88.8	100
Climate Division 4	89.2	105
Climate Division 5	89.6	117
Climate Division 6	87.7	99
Climate Division 7	86.8	90
Climate Division 8	80.9	103
Allegany	86.2	84
Anne Arundel	89.2	102
Baltimore	88.2	104
Baltimore City	89.5	107
Calvert	88.4	100
Caroline	90.3	120
Carroll	86.6	92
Cecil	88.5	118
Charles	89.3	105
Dorchester	89.6	114
Fredrick	86.9	91
Garrett	80.9	103
Harford	88.5	108
Howard	87.6	100
Kent	89.3	117
Montgomery	87.6	104
Prince George's	89.1	106
Queen Anne's	89.7	116
Saint Mary's	88.4	99
Somerset	88.5	109
Talbot	89.6	117
Washington	87.5	94
Wicomico	89.6	118
Worcester	87.9	111

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	68.0	118
Climate Division 1	69.3	107
Climate Division 2	69.0	108
Climate Division 3	70.3	118
Climate Division 4	69.7	113
Climate Division 5	69.1	117
Climate Division 6	67.7	122
Climate Division 7	64.4	119
Climate Division 8	61.5	130
Allegany	63.1	114
Anne Arundel	70.2	111
Baltimore	67.6	116
Baltimore City	70.3	118
Calvert	69.8	112
Caroline	68.1	112
Carroll	65.9	120
Cecil	68.9	121
Charles	70.4	122
Dorchester	69.2	106
Fredrick	67.0	121
Garrett	61.5	130
Harford	68.6	121
Howard	67.3	119
Kent	69.6	117
Montgomery	68.4	124
Prince George's	69.2	116
Queen Anne's	69.0	114
Saint Mary's	70.4	117
Somerset	70.2	105
Talbot	69.7	111
Washington	65.6	119
Wicomico	68.3	103
Worcester	69.3	107

Table A2. Monthly maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for July 2026. Temperatures are in °F. The rank is the position the variable for July 2026 occupies among the 132 Julys, after the 132 values have been arranged from lowest to highest using the *standard competition ranking method*. The closer to 132 the rank is, the larger (i.e., the warmer) the value of the surface variable is in the record; similarly, the closer to 1 the rank is, the smaller (i.e., the colder) the value of the surface variable is in the record.

Appendix B. July 2026 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

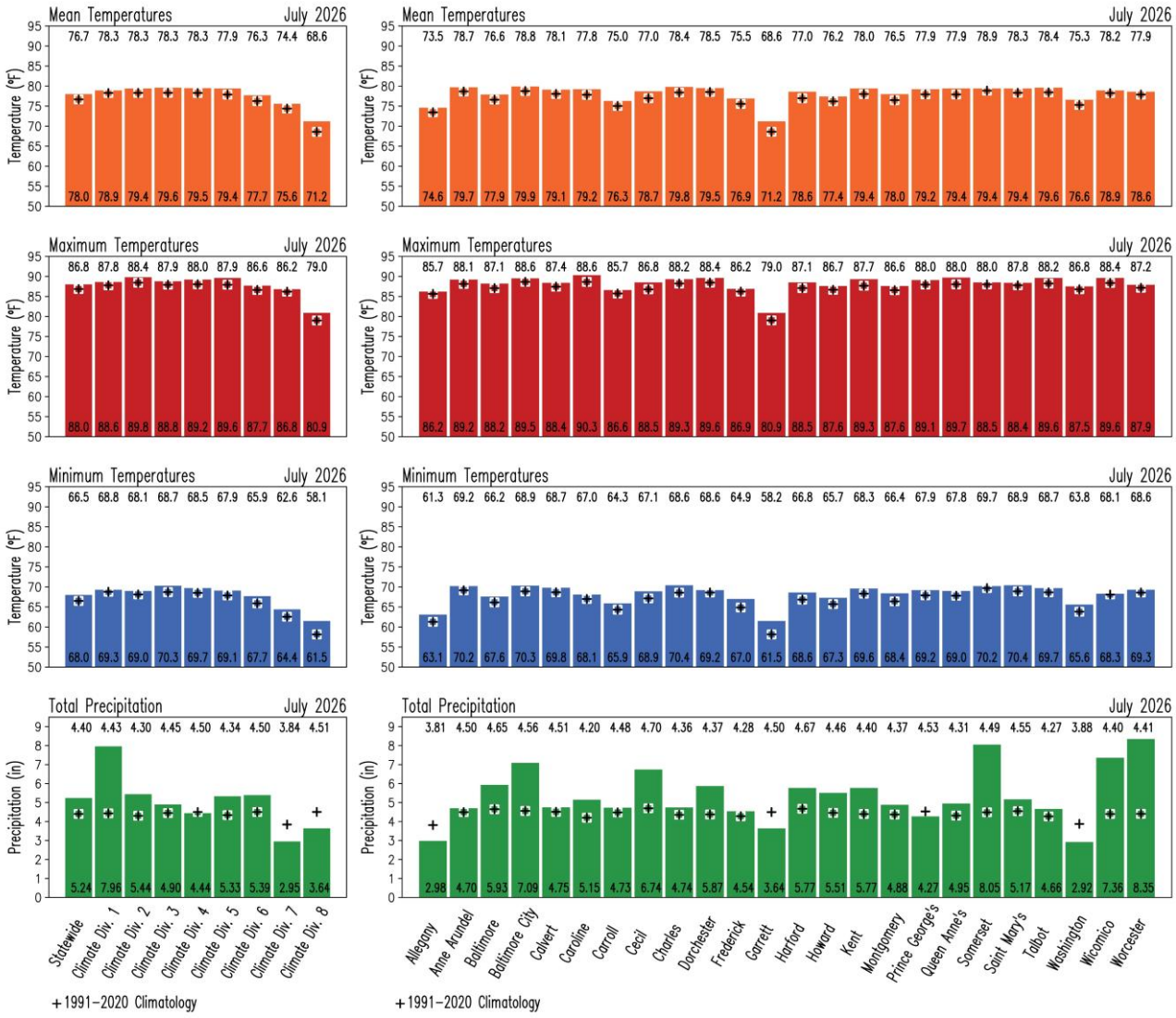

Figure B1. Monthly surface variables for Maryland in July 2026. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue), and total precipitation (green) at statewide and climate division (left column), and county (right column) levels. Temperatures are in °F, and precipitation is in inches. The numbers at the base of the bars indicate the magnitude of the variable for July 2026. For comparison, the corresponding 1991-2020 climatological values for July are displayed as black addition signs, and their magnitudes are shown at the top of the panels.

B. Temperatures and Precipitation Anomalies

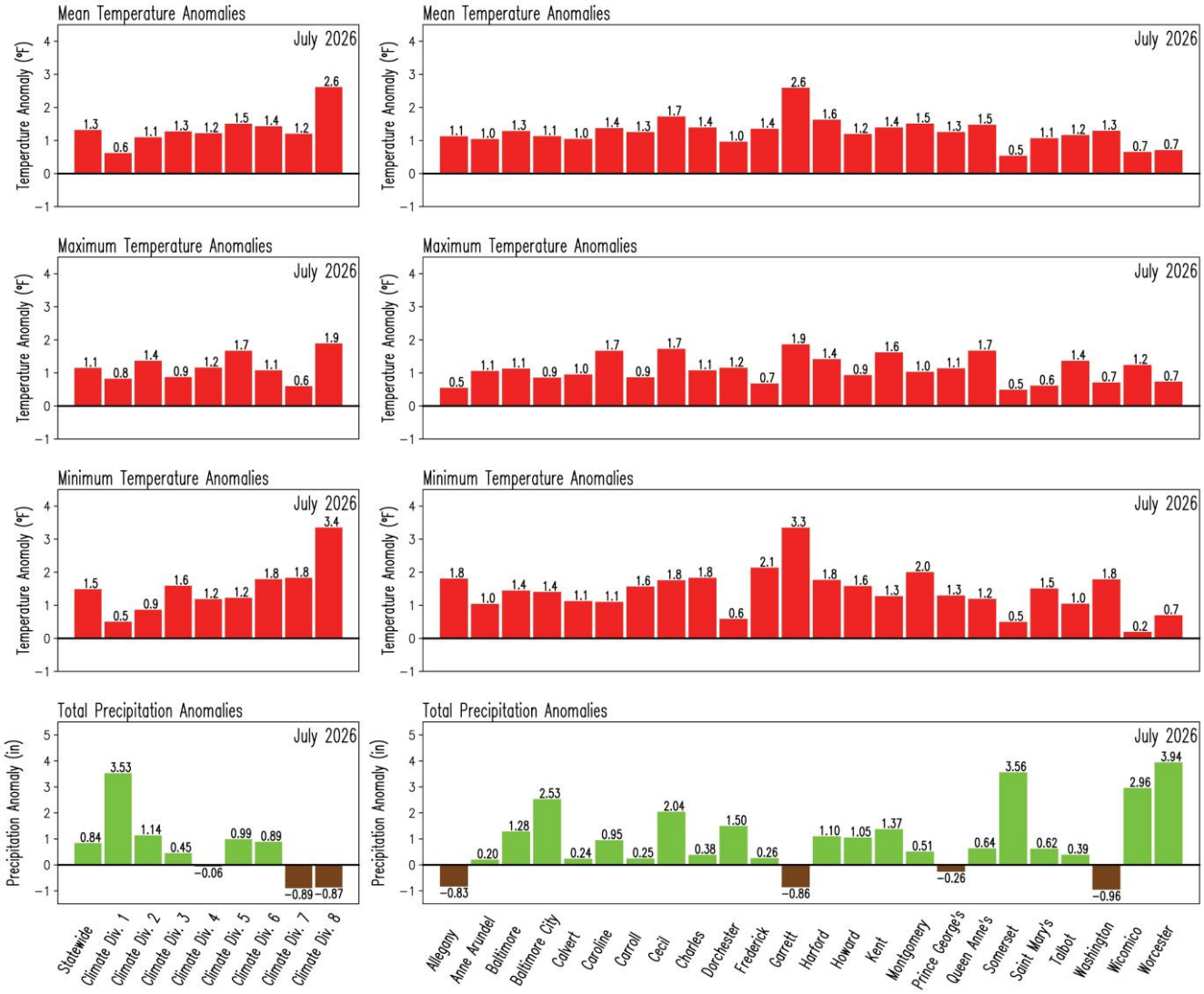

Figure B2. Anomalies in the monthly surface variables for Maryland in July 2026. Anomalies are with respect to the 1991-2020 climatology. Red color represents positive (warmer than normal) anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and minimum surface air temperature (third row from top), while green/brown color indicates positive/negative (wetter/drier than normal) anomalies in total precipitation (bottom row) at statewide and climate division (left column) and county (right column) levels. Temperatures are in °F, and precipitation is in inches. The numbers outside the bars indicate the magnitude of the anomaly for July 2026.

Appendix C. July 1991-2020 Climatology and July 2026 Precipitation as Percentage of Climatology Maps

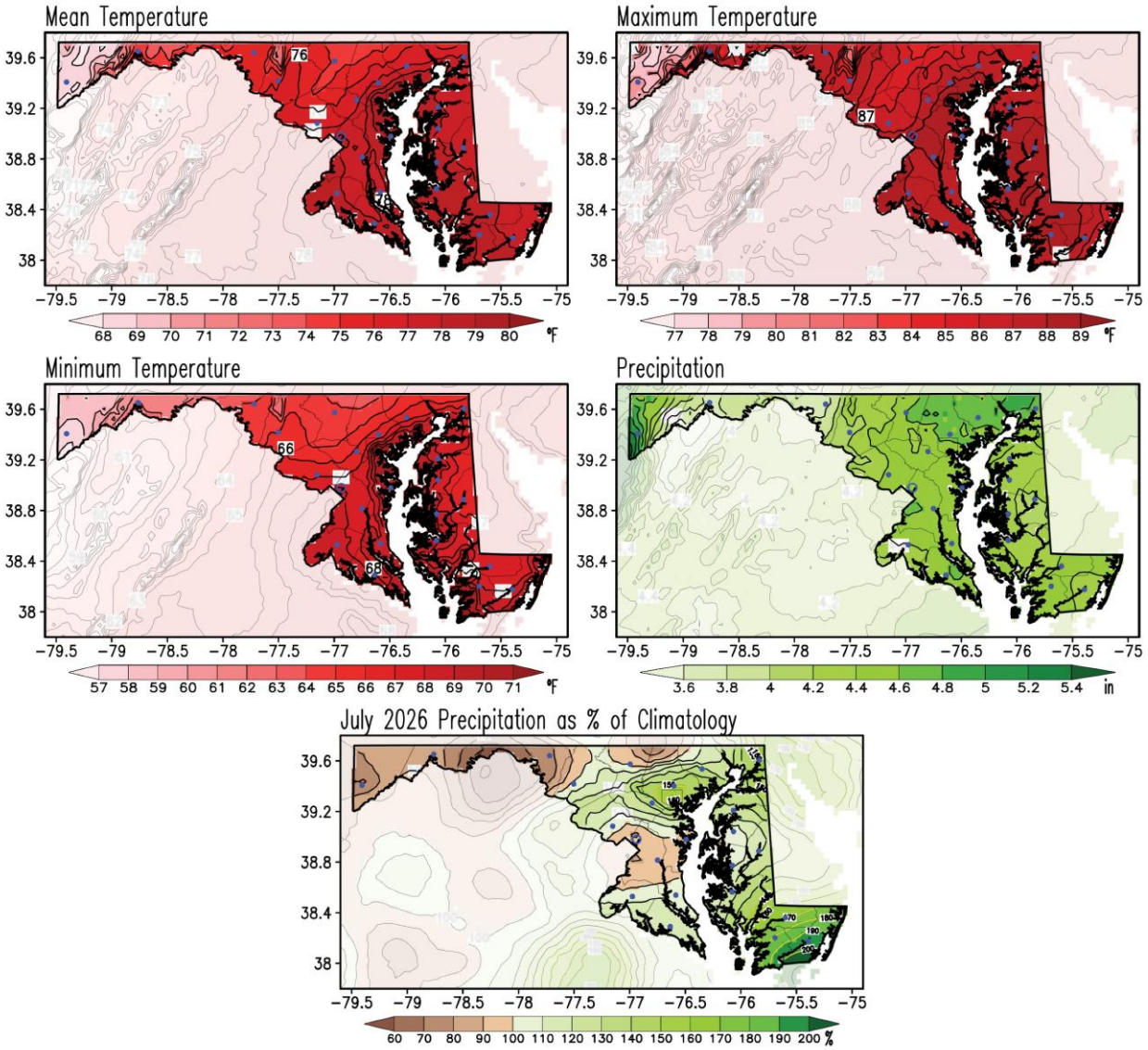

Figure C1. July climatology of the monthly mean, maximum, and minimum surface air temperatures, and total precipitation for the period 1991-2020 (upper and middle rows), and precipitation in July 2026 as a percentage of climatology (bottom row). Temperatures are in °F, and precipitation in inches according to the color bars. This is the current climate normal against which the July 2026 conditions are compared to obtain the July 2026 anomalies (from Figures 1 to 4). Precipitation as a percentage is calculated by dividing the total precipitation (from Figure 4) by the climatology (from the middle right panel) and multiplying that ratio by 100, so the units are expressed as a percentage of the climatology (%); the brown/green shading in this map indicates drier/wetter than normal conditions, and yellow isolines are for percentages equal to or more than 150%. Note that shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

Appendix D. July Standard Deviation and July 2026 Standardized Anomalies Maps

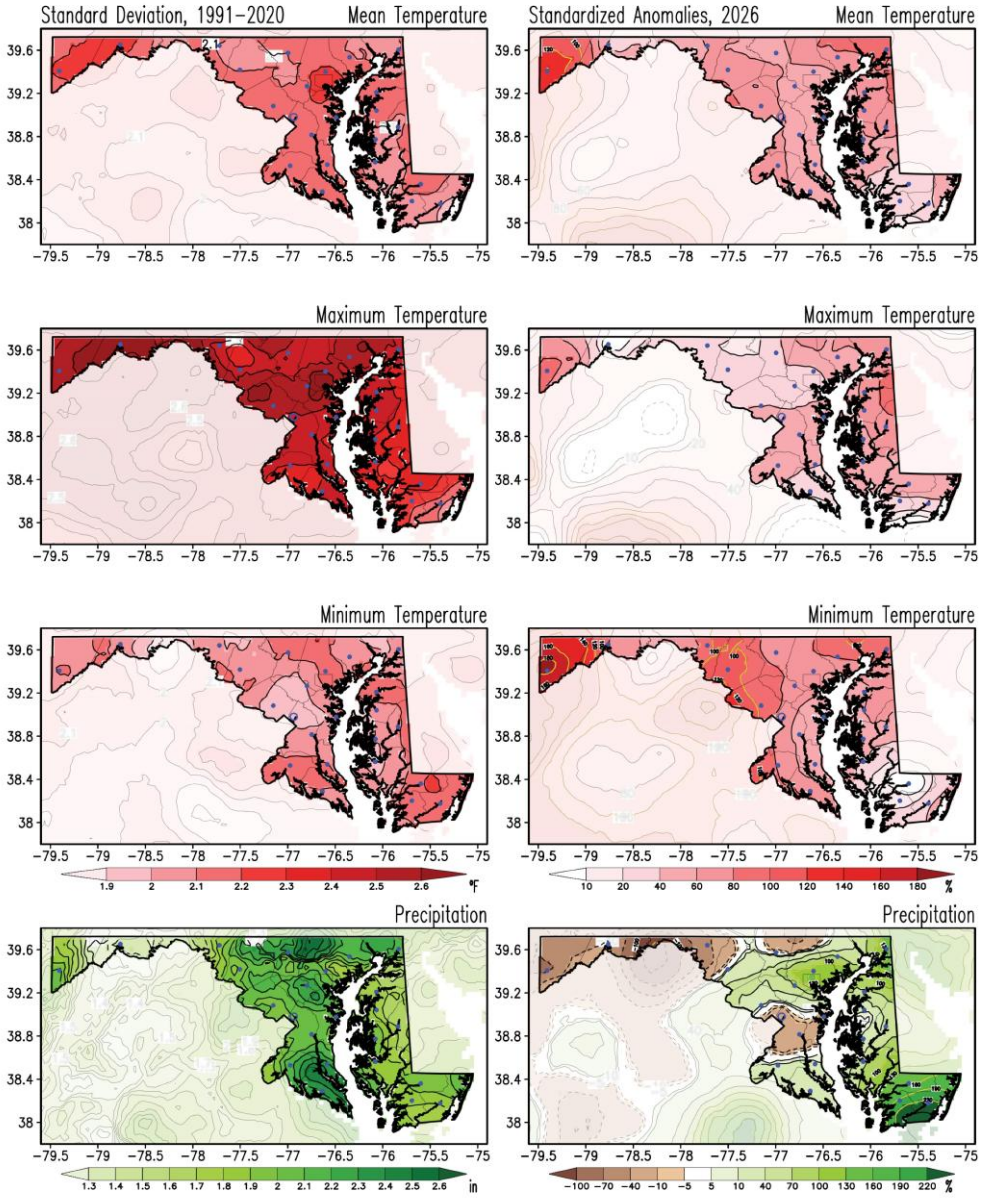

Figure D1. Standard deviation for July and standardized anomalies of temperatures and precipitation for July 2026. Standard deviations for monthly mean, maximum, and minimum surface air temperatures and total precipitation were obtained from the 1991-2020 period (left column). Anomalies for July 2026 (right column) are obtained as a percentage of the standard deviations. The standard deviations for temperature are in °F, and those for precipitation are in inches according to the color bars. Red shading in the anomaly temperature maps marks warmer-than-normal conditions; brown/green shading in the anomaly precipitation map marks drier/wetter than normal conditions. The standardized anomalies are obtained by dividing the raw anomalies (from Figures 1 to 4) by the standard deviation (from left column panels) and multiplying the ratio by 100; hence, the units are in percent (%); yellow isolines highlight anomalies larger than ±1 standard deviation. Note that shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

Appendix E. July 2007-2020 Mean and Standard Deviation of Sea Surface Temperature Maps

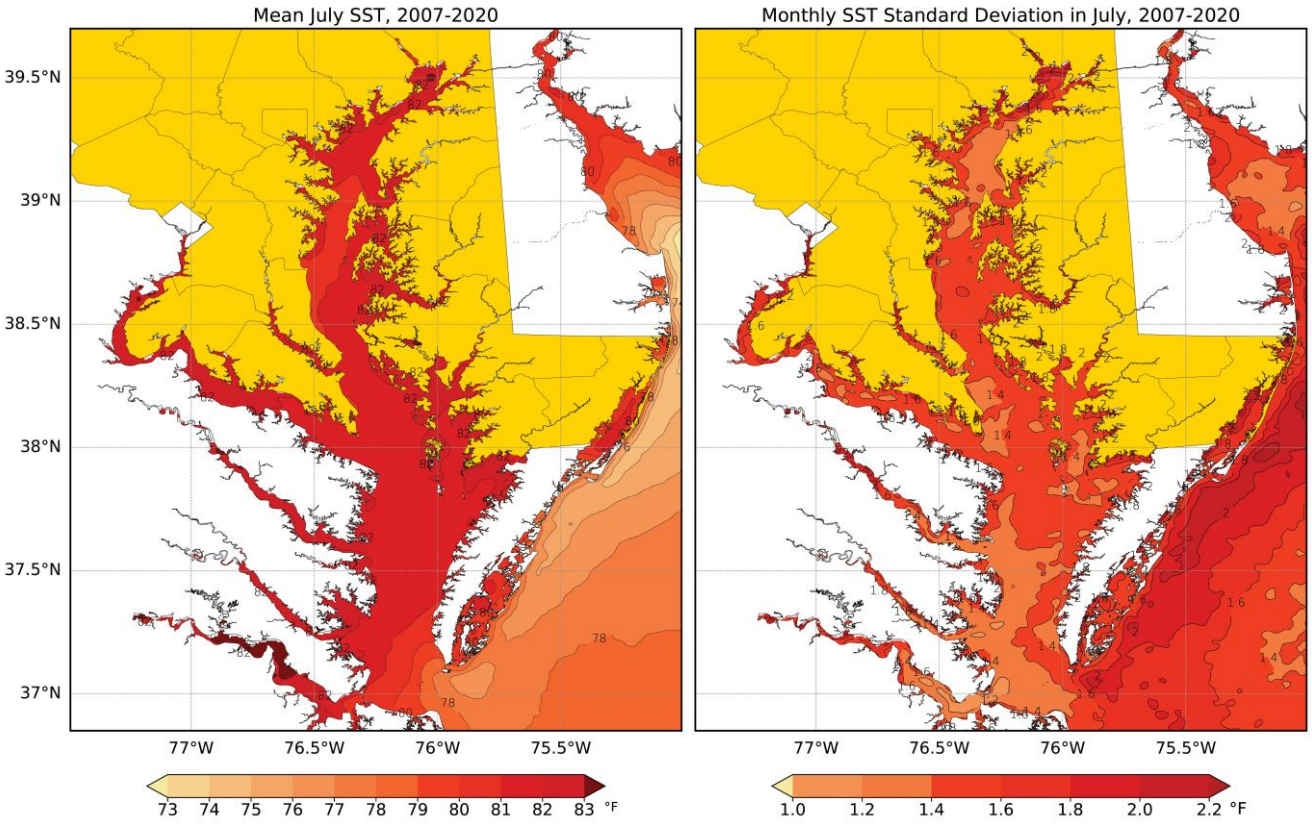

Figure E1. Mean (left panel) and standard deviation (right panel) of sea surface temperatures in the Chesapeake Bay and surrounding coastal areas in July for the period 2007-2020. The mean and standard deviation of the temperatures are in °F according to the color bars. The mean temperature map is the current mean against which July 2026 conditions are compared to obtain July 2026 anomalies (see Figure 14). For clarity, the mean and standard deviation of the temperature have been smoothed using a 9-point spatial smoother, applied four times. To facilitate comparison between the mean July map (left panel) and the July 2026 map (Figure 14, left panel), the shading schemes are the same. Note that Maryland has been shaded yellow to facilitate focus on the state waters.

References

Arguez A., I. Durre, S. Applequist, R. S. Vose, M. F. Squires, X. Yin, R. R. Heim Jr, and T. W. Owen, 2012: NOAA's 1981-2010 U. S. Climate Normals. An Overview. *Bulletin of the American Meteorological Society*. 93, 1687-1697, doi:10.1175/BAMS-D-11-00197.1 https://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/documentation/1981-2010-normals-overview.pdf.

Barriopedro, D., R. García-Herrera, C. Ordóñez, D. G. Miralles, and S. Salcedo-Sanz, 2023: Heat waves: Physical understanding and scientific challenges. Reviews of Geophysics, 61, e2022RG000780. https://doi.org/10.1029/2022RG000780.

CPC, Climate Prediction Center, 2023: Degree Days Explanation. https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ddayexp.shtml

Durre, I., A. Arguez, C. J. Schreck III, M. F. Squires, and R. S. Vose, 2022: Daily high-resolution temperature and precipitation fields for the Contiguous United States from 1951 to Present. Journal of Atmospheric and Oceanic Technology, doi:10.1175/JTECH-D-22-0024.1

IPAD, 2023. Metadata for Corn https://ipad.fas.usda.gov/cropexplorer/Definitions/csc.htm

Kunkel, K. E., and A. Court, 1990: Climatic Means and Normals—A Statement of the American Association of State Climatologists (AASC), *Bulletin of the American Meteorological Society*, 71(2), 201-204. Retrieved Aug 20, 2022, from https://journals.ametsoc.org/view/journals/bams/71/2/1520-0477-71_2_201.xml

OSU, 2024: The Ohio State Phenology Calendar. https://weather.cfaes.osu.edu/gdd/glossary.asp

Santer, B. D., and co-authors, 2000: Statistical significance of trends and trend differences in layer-averaged atmospheric temperature time series. *J. Geophys. Res.*, 105, 7337–7356, doi:10.1029/1999JD901105.

Tschurr, F., I. Feigenwinter, A. M. Fischer, and S. Kotlarski, 2020: Climate Scenarios and Agricultural Indices: A Case Study for Switzerland. Atmosphere, 11, 535. https://doi.org/10.3390/atmos11050535

Vose and co-authors, 2014: NOAA Monthly U.S. Climate Gridded Dataset (NClimGrid), Version 3. *NOAA National Centers for Environmental Information*. DOI:10.7289/V5SX6B56.

WMO, 2017: WMO Guidelines on the Calculation of Climate Normals. WMO-No. 1203, Series. 29pp. https://library.wmo.int/doc_num.php?explnum_id=4166.