# Office of the Washington State Climatologist

July 2022 Report and Outlook

July 11, 2022

http://www.climate.washington.edu/

## June Event Summary

Mean June temperatures were near-normal to below normal throughout WA state. June precipitation was above normal statewide, marking the 3rd month in a row with a significant portion of the state receiving above normal precipitation. Averaged statewide, June precipitation ranks as the 7th wettest since records began in 1895, with 1.64" above the 1991-2020 normal.

In light of the extent and duration of our colder and wetter than normal weather, Table 1 lists the April through June average temperature and total precipitation rankings for a few individual stations across the state. April-June 2022 was the coldest such period at Walla Walla, Ritzville, and Wenatchee, and the wettest at Pullman. What a difference a year can make. In Walla Walla, April-June 2022 was the 2nd wettest in the 74-year record while April-June 2021 was the record driest. For Pullman, April-June 2022 was the wettest over the 82-year record while 2021 was the driest. The contrast between the last two years is certainly stark. Figure 1 shows a map of the Apr-Jun 2022

### In this Issue



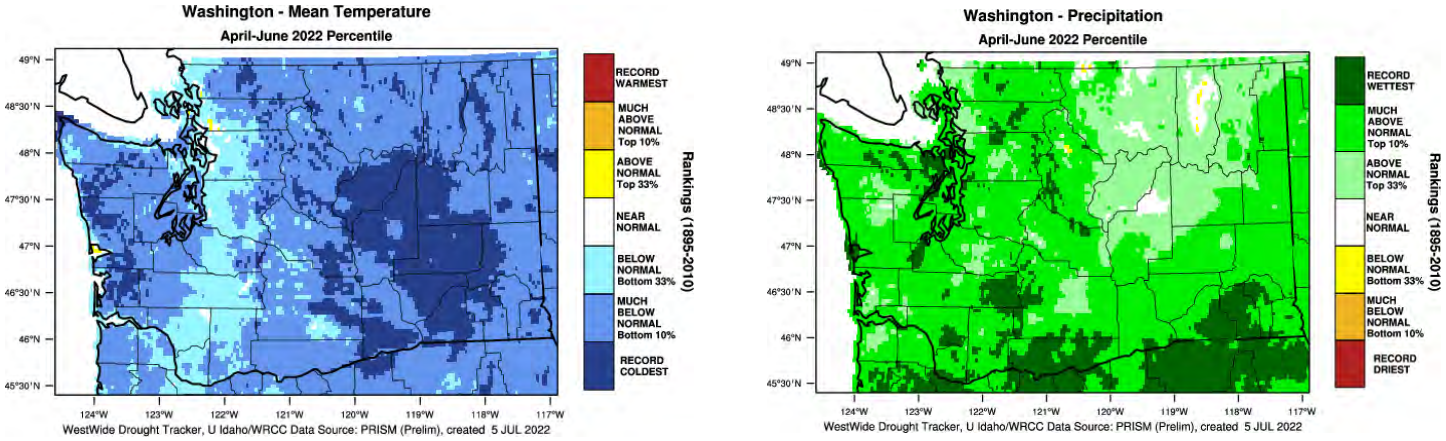



**Figure 1: April-June a) average temperature and b) total precipitation percentiles (Westside Drought Tracker).**

temperature and precipitation percentiles.

Shifting focus to just the month of June, the first half was certainly cooler and wetter than the second half. This is evident in the June daily temperatures and precipitation for Spokane International Airport (Figure 2). A few daily maximum rainfall records were set during the first week of the month, namely at Quillayute (1.14"), Hoquiam (1.00"), and Omak (0.76") on the 4th, and at Bellingham (0.58") on the 5th. But the big event came on the 9th. An unseasonably strong atmospheric river impacted the state, bringing heavy rain and the threat of flooding. Maximum daily rainfall records were set at Hoquiam (1.61"), Quillayute (1.48"), Olympia (1.16"), SeaTac Airport (1.10"), and Bellingham (1.05"), with many of these beating out a rainy June 9 in 1993 for the daily record. This heavy rain also ranks as the 4th wettest June day on record at Hoquiam and the 6th wettest June day at SeaTac AP and Bellingham.

| Station | Apr-Jun Average Temperature (°F) | Rank | Apr-Jun Precipitation (inches) | Rank | Records Began |
|---|---|---|---|---|---|
| **Walla Walla** | 55.2 | 1 | 9.82 | 2 | 1949 |
| **Ritzville** | 50.1* | 1 (tie) | 4.17 | 10 | 1916 |
| **Wenatchee Pangborn AP** | 54.8 | 1 (tie) | 3.48 | 3 | 1960 |
| **Ephrata** | 55.4 | 3 | - | - | 1949 |
| **Vancouver Pearson AP** | 56.0 | 5 | 12.69 | 1 | 1998 |
| **Omak** | 55.1 | 5 | 4.51 | 2 | 1998 |
| **Spokane AP** | 51.7 | 7 (tie) | - | - | 1881 |
| **Quillayute** | 49.5* | 7 (tie) | 23.76* | 6 | 1967 |
| **Olympia** | 51.4 | 9 | 12.72 | 3 | 1941 |
| **Pullman 2 NW** | - | - | 8.72 | 1 | 1941 |
| **SeaTac AP** | - | - | 9.20 | 5 | 1945 |

**Table 1: Apr-Jun average temperatures and total precipitation and rankings (coldest to warmest and wettest to driest) for selected WA locations. *1-day is missing from the average/total.**

As shown in Figure 2, the second half of the month was drier with more seasonable temperatures. WA had its first heat wave of the summer, with above normal temperatures from the 25th through the 27th in western WA and the 26th through the 28th in eastern WA. Daily high temperature records were generally not set due to the 2022 event nearly overlapping the dates of our extraordinary 2021 heat wave. Temperatures at Hoquiam and Quillayute did get warmer than 2021 on the 25th, however, with daily maximum temperature records of 92°F and 87°F, respectively.

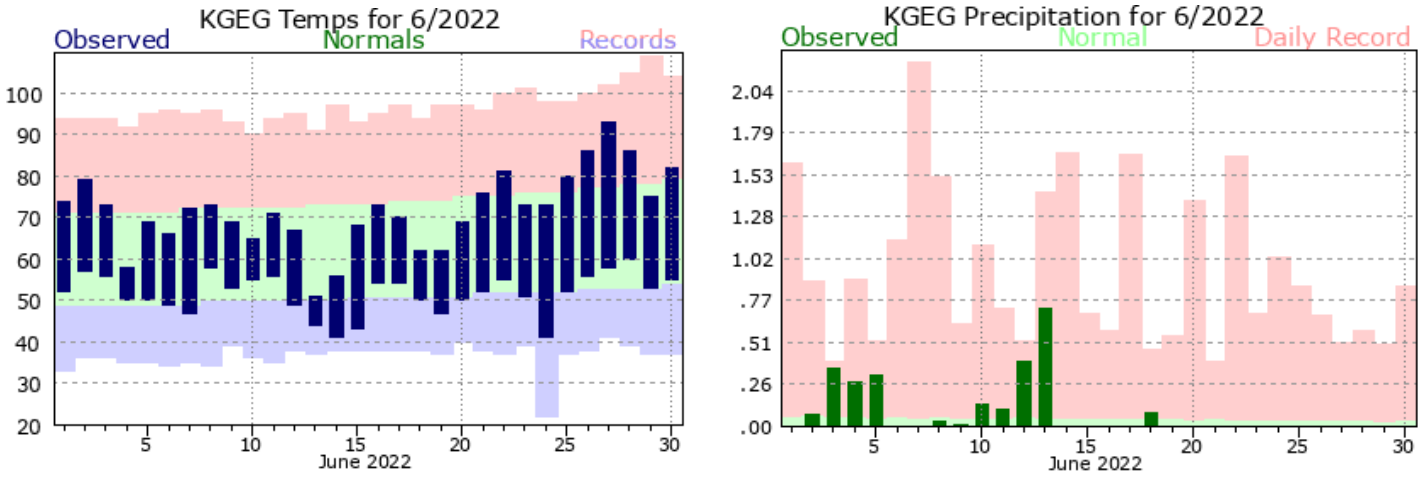



**Figure 2: June 2022 daily temperature for Spokane International Airport compared to the 1991-2020 normal (green envelope) and previous records (blue and red envelopes; NWS).**

# Streamflow and Drought Summary

Most of our low and middle elevation snowpack has melted, even with our colder and wetter than usual spring. Nevertheless, snow is hanging on in some of the higher elevations of the Cascade Mountains, however. At this point in the year, we begin to report on streamflow. Average June streamflow is shown in Figure 3 and was above normal to much above normal throughout most of the state. This was caused by more rain than usual in those areas where streamflow is driven by precipitation and also due to melting of our higher than normal snowpack in areas where spring streamflow is driven by snowmelt. The record high June streamflow in southeastern WA is notable, and is a stark difference to the meager streamflows at the same time last year.

Cool and wet conditions in June are reflected in the U.S. Drought Monitor (Figure 4). Only "moderate drought" and "abnormally dry" conditions are now shown on the Drought Monitor, which has shown massive improvements in drought over the last several months. Figure 5 shows the changes made to the Drought Monitor over the last 12 weeks (since mid-April), which encompasses most of the time period in which our weather had turned cooler and wetter. The depiction in WA is now solely representing longer term precipitation deficits beginning in 2021 and beyond.

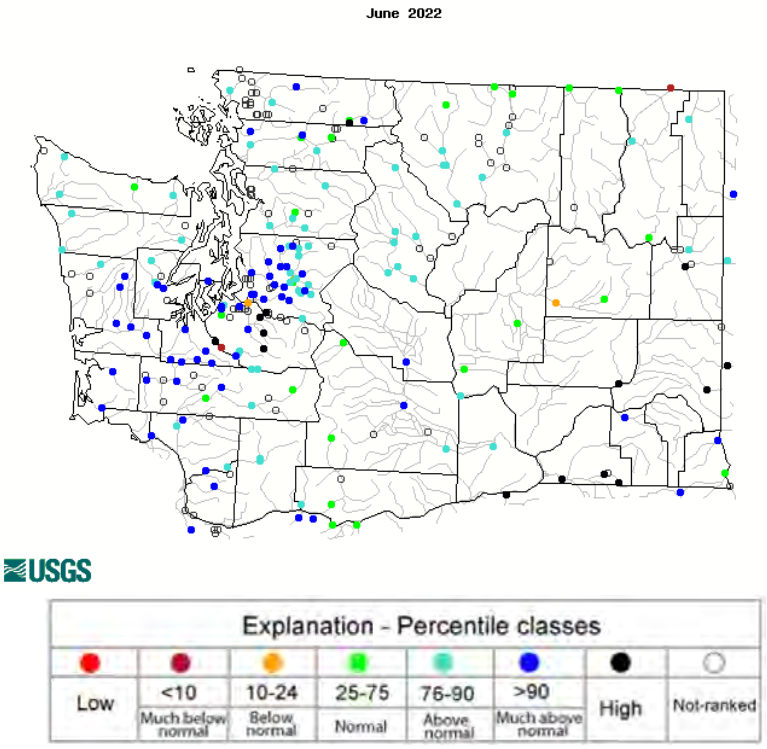



**Figure 3: June 2022 average streamflow for WA (USGS).**

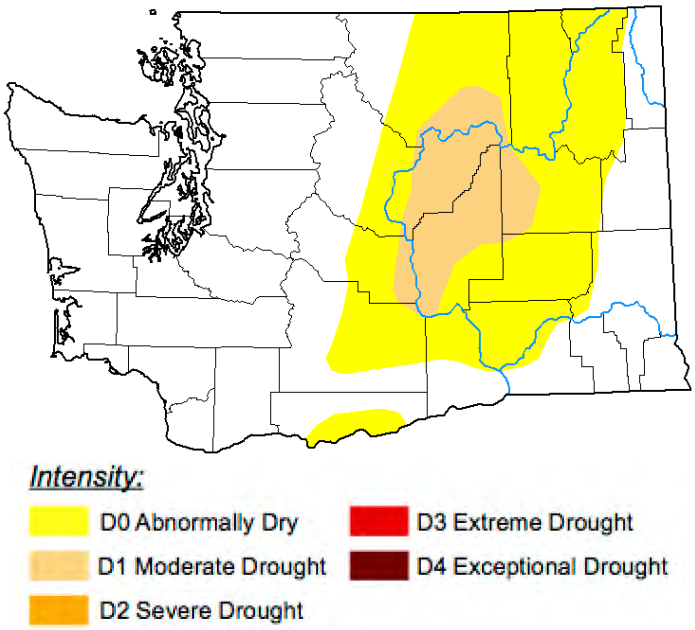



**Figure 4: The July 7, 2022 edition of the U.S. Drought Monitor.**

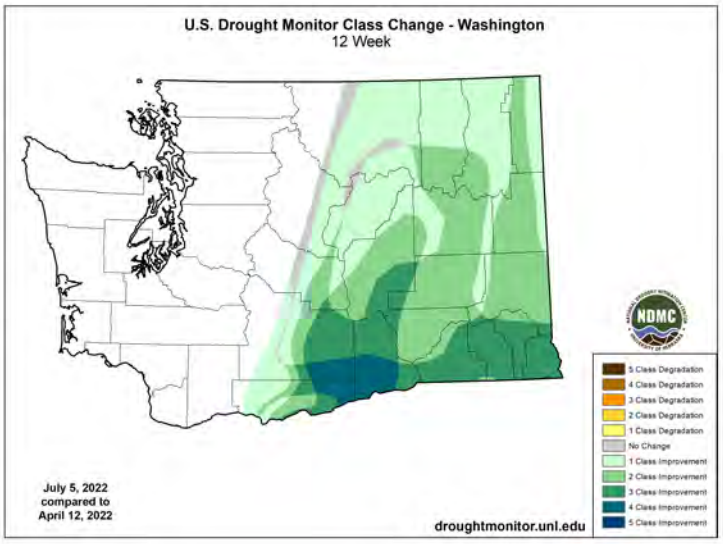



**Figure 5: The category changes made to the U.S. Drought Monitor over the 12 weeks from April 12 to July 5, 2022.**

# U.S. Climate Resilience Toolkit Climate Explorer

A Message from the State Climatologist

There is a large and growing number of web applications serving climate data. Notably, the U.S. Climate Resilience Toolkit (toolkit.climate.gov/tools) has over 500 digital tools in its catalog catering to a wide range of users. Here we show some examples from just one of these applications, the Climate Explorer: https://crt-climate-explorer.nemac.org/

The Climate Explorer focuses on historical records and climate projections for the counties of the United States. Historical values are provided for both individual cities as well as counties; the former are selectable off a map produced when a particular county is selected. The variables range from average temperatures and total precipitation to the number of days with temperatures or precipitation amounts at various thresholds, with the results shown for years as a whole, or by month for groups of years. Some of this output is expressed as deviations from normal, with the climatological norms based on the period of 1961-1990. Here we illustrate one type of historical data available, namely counts of the number of days with precipitation totals reaching 1.00" at Sea-Tac (Figure 6a) and 0.50" at Spokane (Figure 6b) through 2020. These kinds of measures, rather than annual precipitation totals, may be more relevant to some issues, in this case such as stormwater design capacity. Both locations appear to lack much if any change in the annual number of very rainy days, at least in the historical record through 2020. Many more options including maps are available for surveying historical data sets.

There are also a variety of ways to visualize climate projections through the remainder of the century. Results are available for 32 model

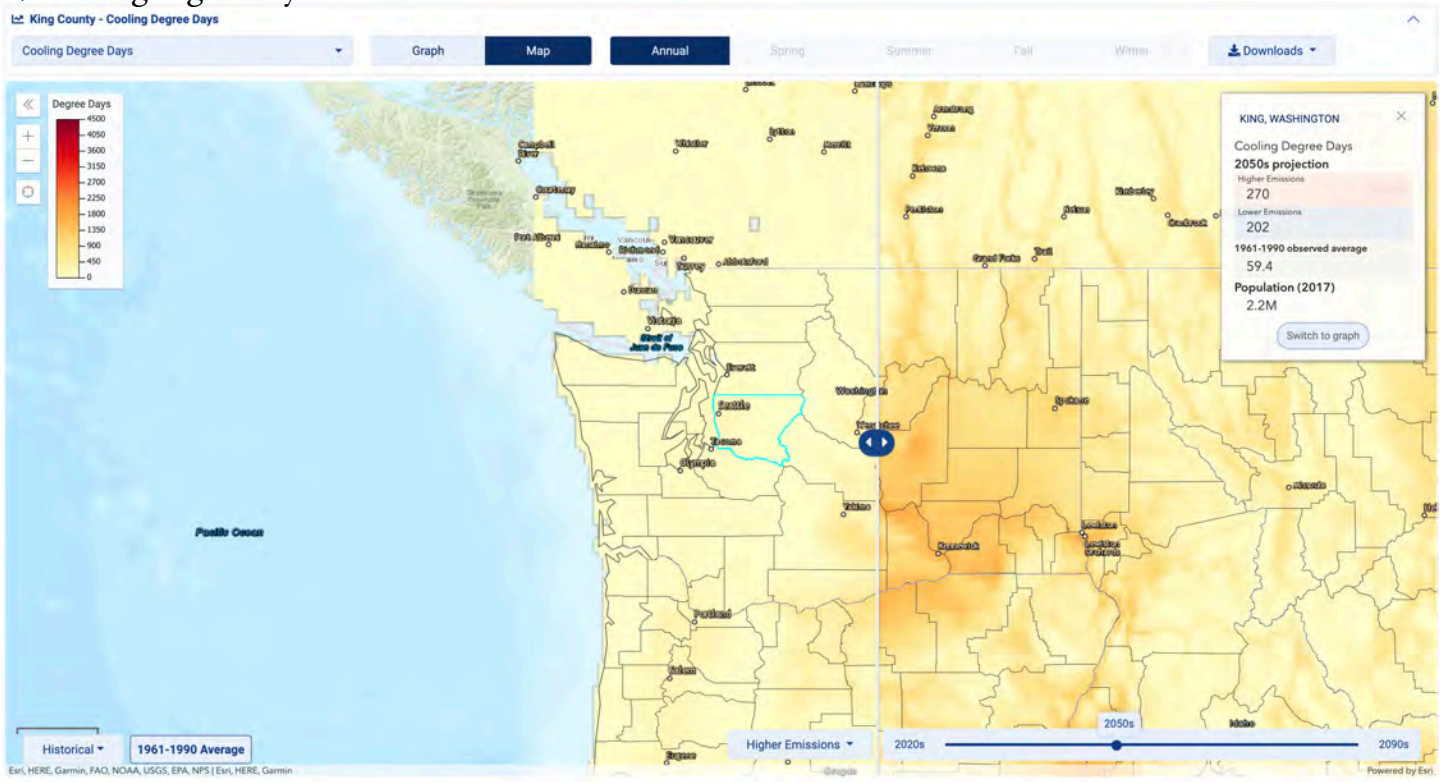
a) Seattle Tacoma International Airport


b) Spokane International Airport


**Figure 6: Days per year of precipitation of at least a) 1.00" at SeaTac Airport and b) 0.50" at Spokane International Airport through 2020 (Climate Explorer).**

ensembles from both the RCP4.5 and RCP8.5 scenarios of CMIP5, which perhaps can be thought as representing a range from something close to a best case to a worst case in terms of future greenhouse gas emissions and concentrations. The climate models used in these projections have coarse horizontal resolutions, and their output is statistically-downscaled to a 1/16 degree grid using the localized constructed analogs method (LOCA; Pierce et al. 2014). This technique picks the best analog day in the observations, accounting for local spatial scales of coherence, towards specifying the local area in the vicinity of a grid cell being downscaled. It is designed to be able to handle extreme events more realistically than some of the other statistical downscaling techniques. That being said, all downscaling methods have their

a) Cooling degree days




b) Days with maximum temperatures >90°F

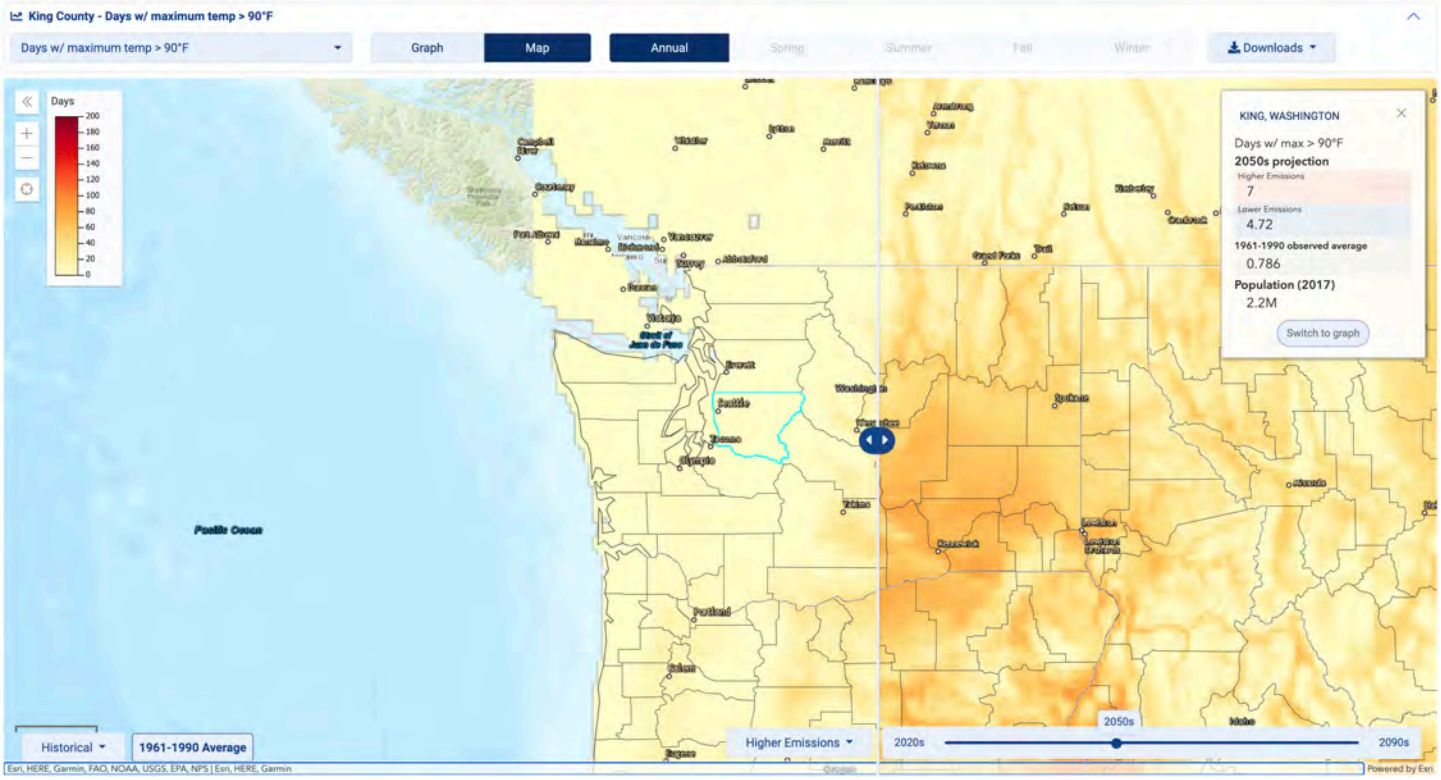



**Figure 7: a) Cooling degree days per year and b) number of days per year with maximum temperatures exceeding 90°F for the period of 1961-1990 (left of the slider bar) versus projected for the 2050s. The inset on the upper right refers to King County, WA as a whole (Climate Explorer).**

drawbacks, and in some cases the most meaningful comparisons are between model results for future versus historical periods, as provided by the Climate Explorer.

Examples of such comparisons are shown here for two measures of hot temperatures, specifically cooling degree days (Figure 7a) and annual counts of days reaching 90°F (Figure 7b), with specific results for King County shown as insets. Days above 90°F in King County, are expected to average between 4 and 7 per year by the 2050s, according to Figure 7a. The maps shown in Figures 7a-b are screenshots; in practice the slider bar represents an effective way to see how these kinds of measures of the climate are projected to change. In the screenshots shown, everything to the left represents the historical 1961-1990 average while everything to the right shows the 2050s ensemble projection. Note that there is the option to download the results shown in graphs and maps — both historical and model data — for further analysis.

The present piece cannot do justice to all that is available through the Climate Explorer, with the U.S. Climate Resilience Toolkit representing a vastly more extensive resource. So we will stop here and encourage you to rummage around for yourself.

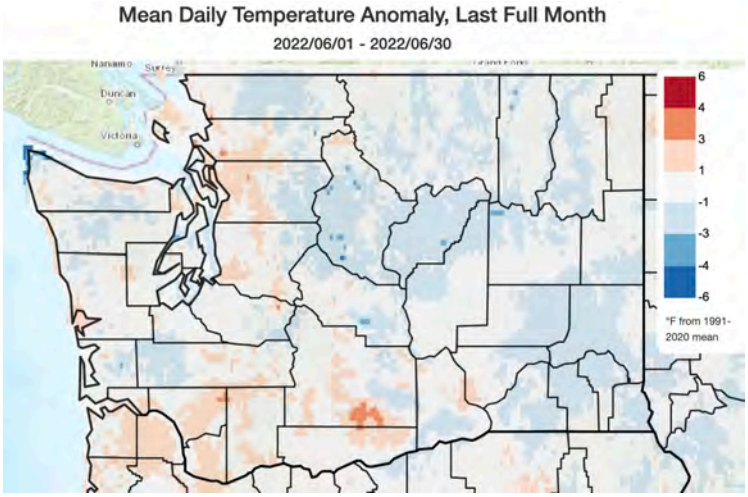
**References**

Pierce, D.W., D.R. Cayan, and B.L. Thrasher, 2014: Statistical downscaling using localized constructed analogs (LOCA). J. Hydrometeorology, v.15, 2558, doi:10.1175/JFM-D-14-0082.1

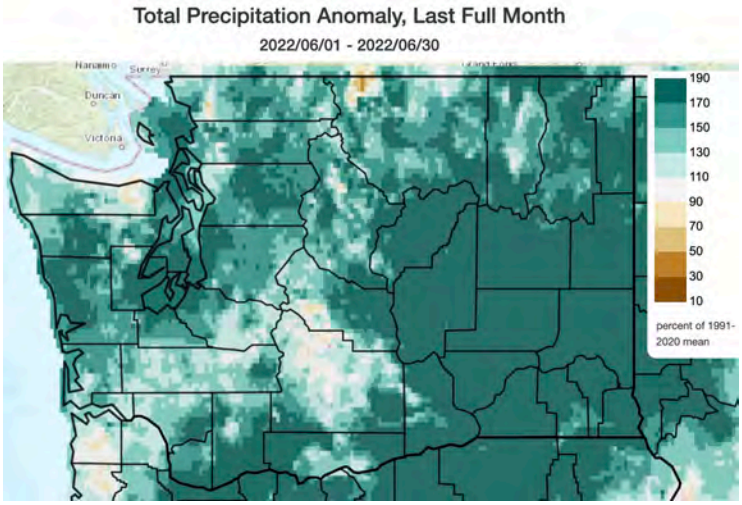
U.S. Federal Government, 2021: U.S. Climate Resilience Toolkit Climate Explorer. [Online] https://crt-climate-explorer.nemac.org/ Accessed July 6, 2022.

# Climate Summary

June temperatures were near-normal or below normal for a majority of the state. According to the map from the Climate Toolbox, the below normal temperatures were mostly in eastern WA and typically in the range of 1-3˚F below normal. Wenatchee is an example with average June temperatures 1.4˚F below normal (Table 2). Near-normal temperatures were also common, as evidenced by SeaTac Airport (-0.9˚F), Quillayute (0.1˚F), Omak (-0.2˚F), and Pullman (-0.5˚F; Table 2). There were a few areas with above normal June temperatures, mainly in the Puget Sound region and southwestern WA. For example, Hoquiam and Pasco were above normal for the month, with temperatures of 2.5 and 2.1˚F above normal, respectively.




**June temperature (˚F) departure from normal relative to the 1991-2020 normal (Climate Toolbox).**




**June total precipitation percent of 1991-2020 normal (Climate Toolbox).**

June precipitation was above normal for nearly the entire state, with values in eastern WA exceeding 200% of normal in many places. For example, June precipitation totals in Spokane, Wenatchee, and Omak were 210, 242, and 250% of normal, respectively. Precipitation totals in western WA were generally higher, but the percentages of normal less than those for eastern WA. Precipitation in western WA was between 110 and 225% of normal with totals between 2 and 4.5" (Table 2).

| Station | Mean Temperature (°F) | | | Precipitation (inches) | | |
|---|---|---|---|---|---|---|
| | Average | Normal | Departure from Normal | Total | Normal | Percent of Normal |
| Western Washington | | | | | | |
| Olympia | 58.7 | 59.1 | -0.4 | 3.04 | 1.46 | 208 |
| Seattle WFO | 61.6 | 61.4 | 0.2 | 2.71 | 1.57 | 173 |
| SeaTac AP | 61.1 | 62.0 | -0.9 | 2.67 | 1.45 | 184 |
| Quillayute | 55.6 | 55.5 | 0.1 | 4.15 | 3.30 | 126 |
| Hoquiam | 59.6 | 57.1 | 2.5 | 4.52 | 2.01 | 225 |
| Bellingham AP | 60.4 | 59.8 | 0.6 | 3.11 | 1.61 | 193 |
| Vancouver AP | 64.0 | 63.3 | 0.7 | 3.22 | 1.61 | 200 |
| Eastern Washington | | | | | | |
| Spokane AP | 61.9 | 62.3 | -0.4 | 2.46 | 1.17 | 210 |
| Wenatchee | 65.1 | 66.5 | -1.4 | 1.21 | 0.50 | 242 |
| Omak | 64.9 | 65.1 | -0.2 | 2.45 | 0.98 | 250 |
| Pullman AP | 59.3 | 59.8 | -0.5 | 3.94 | 1.17 | 337 |
| Ephrata | 66.6 | 67.2 | -0.6 | 1.49 | 0.65 | 229 |
| Pasco AP | 69.9 | 67.8 | 2.1 | 1.11 | 0.61 | 182 |
| Hanford | 69.5 | 69.9 | -0.4 | 0.97 | 0.57 | 170 |

**Table 2: June 2022 climate summaries for locations around Washington with a climate normal baseline of 1991-2020.**

# Climate Outlook

According to the Climate Prediction Center (CPC), La Niña conditions are still present in the Pacific Ocean. This is rather late in the season for La Niña to be persisting, but there have been signs of its weakening since mid-May. Over the last 4 weeks, sea-surface temperature anomalies have weakened throughout the equatorial Pacific Ocean. La Niña tends to be accompanied by cooler than normal temperatures in WA during the period of April through June, but the precipitation signal here is mixed, with the eastern portion of the state actually more on the dry side. Therefore it is unclear the extent to which we can blame, or thank, La Niña for the anomalous weather of spring 2022 in WA state. ENSO models have the chances of La Niña for the July-September period lower (52%) and nearly equal to chance of neutral conditions (46%), but the chances of La Niña increase to 59% by the October-December period.

The CPC outlook for July (Figure 8) shows a higher likelihood of cooler than normal temperatures for western WA. There are equal chances of below, equal to, or above normal temperatures for the rest of the state. July precipitation is also uncertain; there are equal chances of below, equal to, or above normal precipitation statewide.

The three-month outlook for July-August-September (JAS) is shown in Figure 9. For most of western and north central WA, there are equal chances of below, near-normal, or above normal summer temperatures. For southeastern and northeastern WA, there are higher chances of above normal temperatures. For precipitation, there are increased chances of below normal precipitation for eastern WA, but equal chances of below, equal to, or above normal precipitation for the rest of the state.

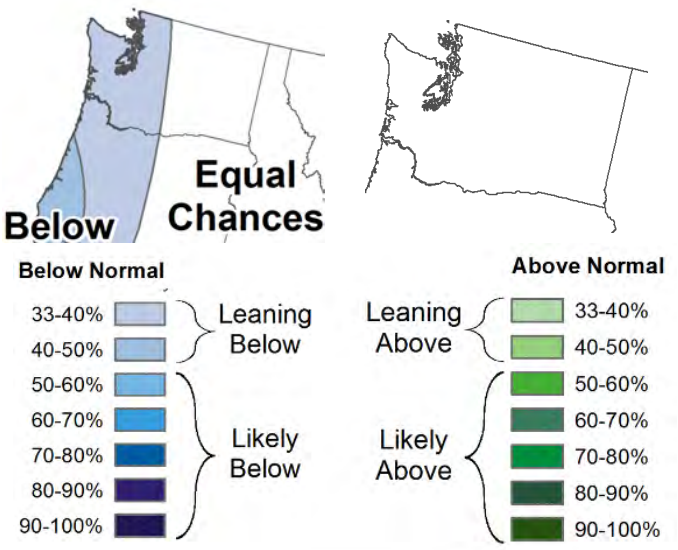



**Figure 8: July outlook for temperature (left) and precipitation (right).**

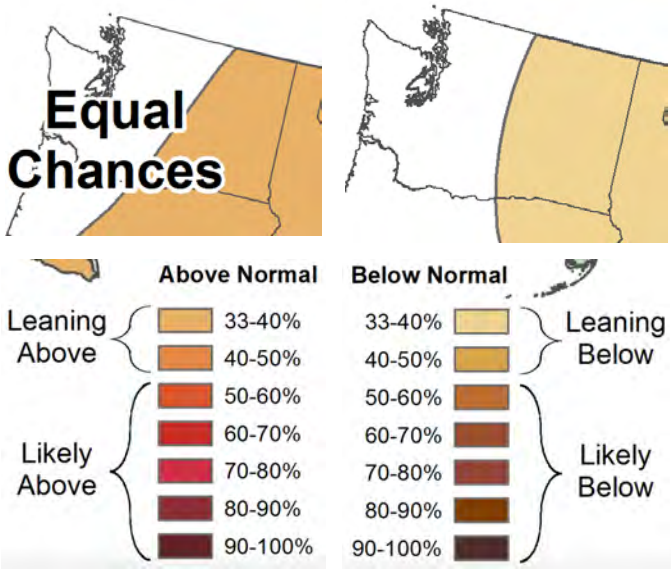



**Figure 9: July-August-September outlook for temperature (left) and precipitation (right) (Climate Prediction Center).**