



Office of the Washington State Climatologist

August 2023 Report and Outlook

August 9, 2023

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

July Event Summary

Mean July temperatures were above normal for nearly the entire state, with the largest anomalies in portions of eastern Washington. Averaged statewide, July was the 11th warmest since records began in 1895, with average temperatures 2.2°F above the 1991-2020 normal. The last few Julys have been warm relative to normal; despite 2023 ranking as the 11th warmest, both July 2022 and July 2021 were even warmer. July precipitation was below normal throughout the state. The statewide average was 49% of normal, tying 1953 and 2004 as the 32nd driest on record.

The July time series of daily maximum and minimum temperatures for Omak is shown in Figure 1; there is no need to display the precipitation time series since there were only a handful of days that recorded a “trace” (<0.01”) of precipitation. The temperatures at Omak and some other stations around the state show a rather eye-pleasing pattern of a series of gradual warm ups and then more rapid cool downs through the month.

As in Omak, several stations in western WA had temperatures in the 90s for the 4th of July. On the 4th, record daily high temperatures were set at

In this Issue

July Event Summary.....	1
Streamflow and Drought Update.....	3
Streamflow Whipsaws.....	4
Climate Summary.....	7
Climate Outlook.....	9

Vancouver (95°F - tie), Quillayute (93°F), and Hoquiam (83°F). On the 5th, there was a record daily maximum temperature recorded at

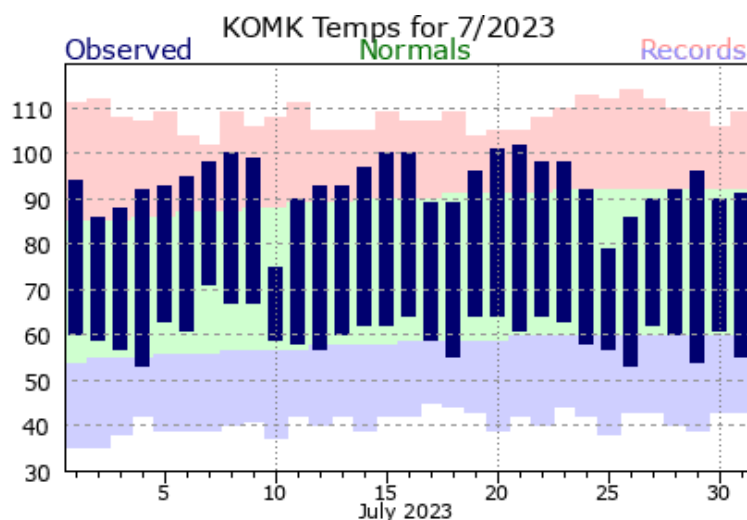


Figure 1: July 2023 daily temperatures for Omak compared to the 1991-2020 normal (green envelope) and previous records (blue and red envelopes; NWS).

Vancouver (96°F) and SeaTac (91°F - tie) despite the smoke aloft from Canadian fires and effects of local fireworks.

A cold front passed through the state on the 10th, and there were several thunderstorms associated with the temporarily cooler air. Yakima recorded a maximum daily rainfall record on the 10th from one of these cells (0.20"). A few days later, warm, dry, and windy conditions were ideal for fire spread in eastern WA, and the National Weather Service issued fire weather watches through the 17th. On the 15th, Dallesport measured a record high daily maximum temperature (105°F - tie). With few wildfires burning, thankfully the fire weather conditions did not cause major fire or smoke impacts at this point in the month.

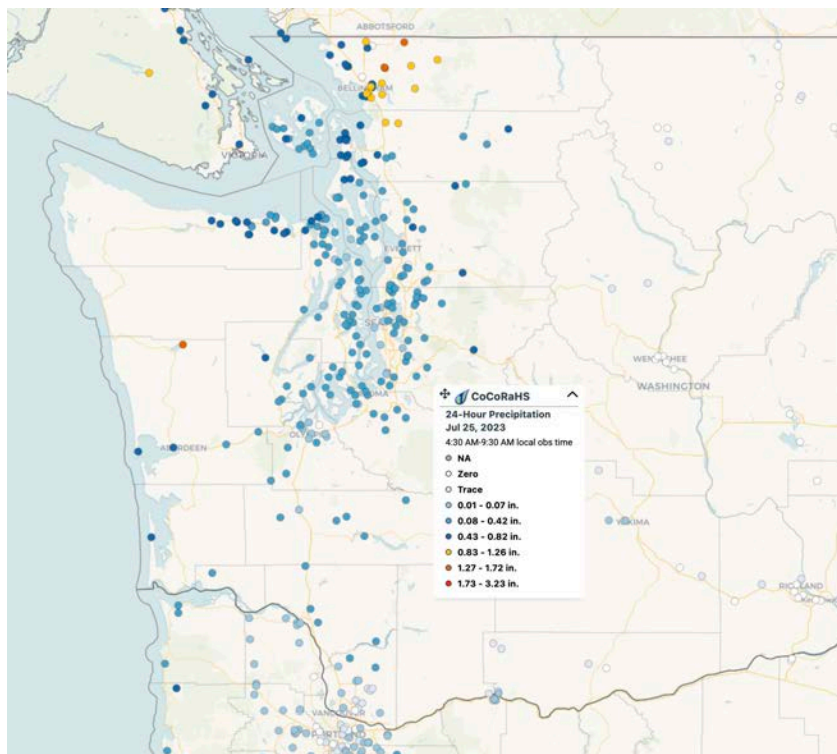


Figure 2: 24-hour precipitation totals on the morning of July 25 from CoCoRaHS volunteers.

Significant rainfall for the month of July fell on the 24th with the passage of a low pressure system more often associated with fall weather. Maximum daily rainfall records were set at Quillayute (1.04"), Bellingham (0.73"), and Hoquiam (0.69"), but even these totals were not enough to ease drought or make up for the precipitation deficits over the last several months. CoCoRaHS precipitation totals for the western two-thirds of the state on the morning of the 25th are shown in Figure 2.

Fire activity closed out the month, with two fires on beginning on the 29th - the lightning-caused Sourdough Fire in the North Cascades National Park and the cause-undetermined Eagle Bluff fire west of Oroville. At the time of this writing, the Eagle Bluff Fire is about 80% contained while the Sourdough Fire has grown and caused closures on parts of SR 20.

Streamflow and Drought Summary

Below normal streamflows have persisted into July due to the drier than usual weather. Figure 3 shows the July 2023 average streamflow at stream gauges around the state, with a majority of the rivers in western WA and north central WA having flows below the 10th percentile. July streamflows were down to record lows at some locations on the Peninsula (Hoko and Calawah Rivers) and along the Canadian border (Similkameen and Kettle Rivers). The drought depiction on the U.S. Drought Monitor (Figure 4) has worsened since the last edition of our newsletter, with “severe drought” (D2) spanning portions of 16 WA counties. The area with both “abnormally dry” or “moderate drought” conditions has also expanded.

More importantly, the Washington State Department of Ecology declared a drought emergency (Figure 5) in 12 watersheds (spanning 12 counties) on July 24 ([press release](#)), due to the rapid snowmelt and recent and long-term dry conditions. In order for a drought emergency to be declared, there also has to be undue hardship expected or already occurring for people, farms, or fish within the area experiencing drought conditions. Therefore, the WA state declared drought area is smaller than those areas on the Drought Monitor in drought conditions. If you’re experiencing impacts from the drier than usual conditions, we wish to hear from you! Please contact OWSC or see the “Report Your Drought Impacts” call-out box below. The “Drought Advisory” issued on July 5 is still applicable for the rest of the state not in “emergency” status.

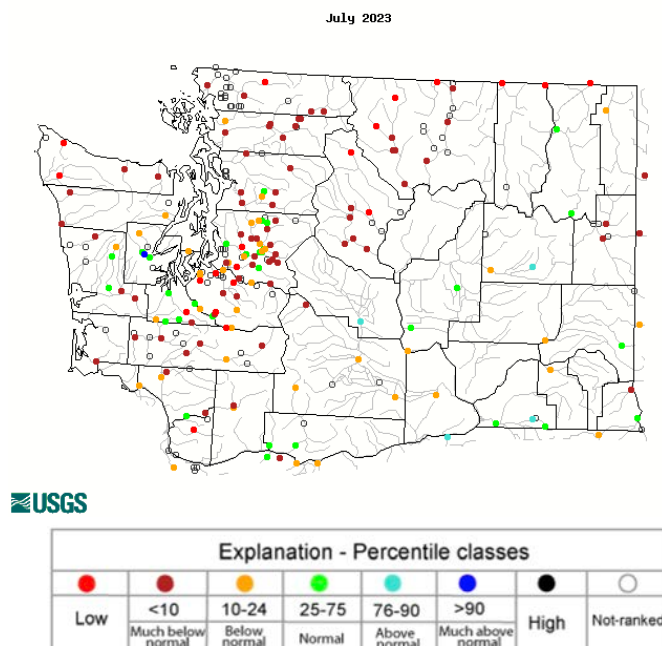


Figure 3: July 2023 average streamflow (USGS).

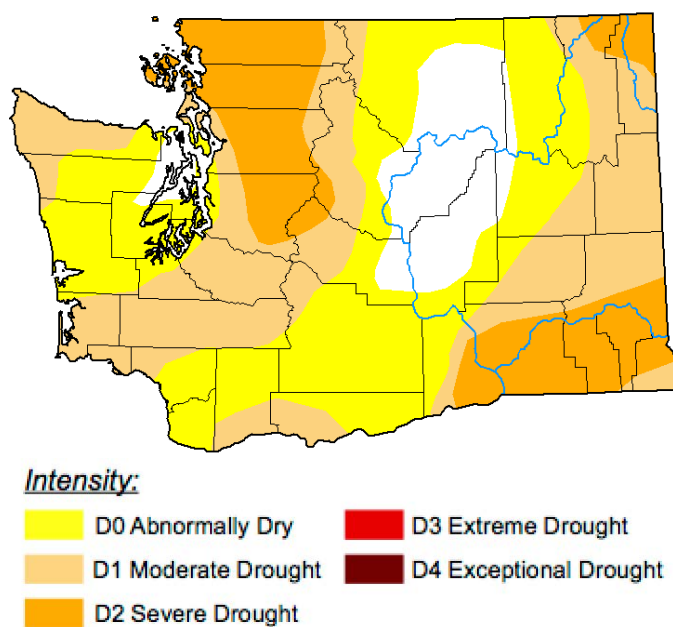


Figure 4: The August 3, 2023 edition of the U.S. Drought Monitor.

Washington Drought Declaration Areas



Figure 5: A map of the 12 watersheds in declared drought by WA State. The rest of the state remains in a “Drought Advisory” (Ecology).



Report Your Drought Impacts

Are you experiencing a drought impact? Your on-the-ground observations are critical in helping us understand the broad picture of drought in the state. The National Drought Mitigation Center and partners have developed Condition Monitoring Observer Reports on Drought (CMOR-drought), a short survey that allows the public to enter their observations regarding crops, water supply, fire, etc. We would greatly appreciate your input, and these reports help experts assess drought impacts for both the U.S. Drought Monitor depiction and on the state level.

Whipsaws in Washington State Streamflows

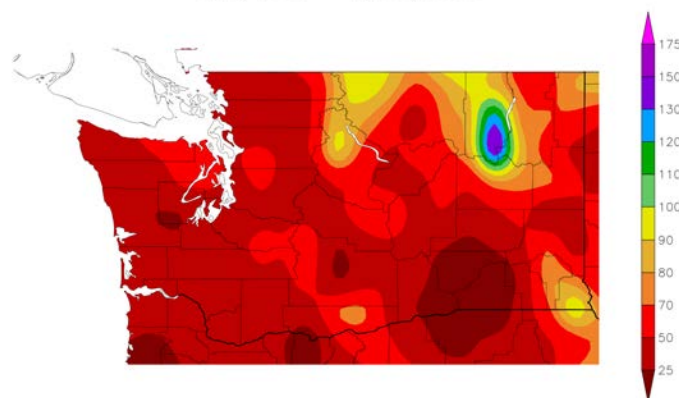
A Message from the State Climatologist

At the risk of belaboring the obvious, we would first like to point out that we have been experiencing unusually dry weather in Washington state. A map of the precipitation during May through July 2023 expressed as a percent of normal (Figure 6) shows that aside from a single wet bullseye in Ferry County, precipitation totals for the 3-month period have been considerably below normal. At least one-half of the state has received less than 50% of normal precipitation and there are a few spots in the below 25% category. Not surprisingly, one result is that state streamflows are mostly on the low side, as illustrated above in the Streamflow and Drought Summary. But how long has this been the case?

We address that question by presenting a time series of the duration hydrograph of 7-day average runoff for WA state back to 1 October 2021, courtesy of the USGS (Figure 7). This metric for the streamflow consists of the integral (sum) of

the estimated flows (based on stream gauges) out of the watershed basins over 7 days divided by the of area of the state. The result is equivalent to the amount of precipitation averaged across the state that would be needed to supply the water flowing out of its basins. Of course there is a seasonal

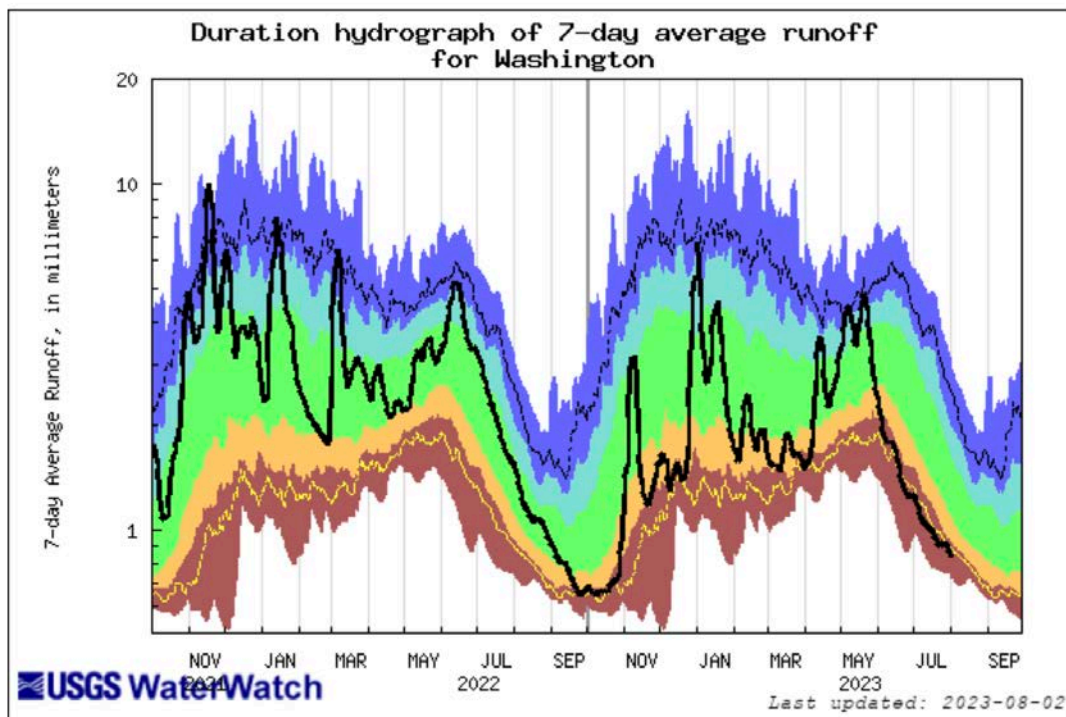
Percent of Normal Precipitation (%)
5/1/2023 – 7/31/2023



Generated 8/1/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

Figure 6: May-July 2023 percent of normal (1991-2020 baseline) precipitation across Washington (HPRCC).



Explanation - Percentile classes					
lowest-10th percentile	5	10-24	25-75	76-90	95 90th percentile -highest
Much below Normal	Below normal	Normal	Above normal	Much above normal	Runoff

Figure 7: 7-day average runoff averaged over Washington for October 2021 through July 2023 (USGS).

cycle to the runoff, as depicted by the green band in Figure 7, with a minimum near the end of September after our dry summers. There are two high runoff peaks, with the first occurring in late November/early December with our fall rains, and a later peak in late May/early June due to snowmelt. Figure 7 shows that the latter peak occurred relatively early in 2023, due to our extremely warm May, which was tied for the warmest on record going back to 1895. But in late May, the runoff nosedived to levels near the 5th percentile for the time of year. It continued through July 2023, with runoffs at or below the 5th percentile level.

We now consider previous temporal variations in runoff. The effects of the prolonged summer of

2022 are obvious, with very low runoff values persisting well into October 2022 after the usual increase in flows. In retrospect, we were fortunate to have a wet spring and early summer in 2022; presumably stream conditions in September and October 2022 would have been even worse if the dry season of 2022 had not gotten such a late start. Looking further back into the past, there was record runoff for the time of year that occurred in November 2021. This peak reflects in large part the extreme flows that occurred in the northwest part of WA state resulting in severe flooding, especially in the watershed of the Nooksack River in Whatcom County. We note here that major swings in the runoff during the wet time of year from late fall through winter are common, with periods of heavy precipitation interspersed with

intervals of drier and/or colder weather yielding temporarily lower streamflows. In other words, 20% of the time the runoff should be in either the much above normal or much below normal categories.

The climate models used for future projections are indicating, as a group, a tendency for wetter winters and drier summers, with substantial differences in the trends amongst the models. Moreover, our region will continue to experience significant interannual and multiyear fluctuations in precipitation (and temperature). But given the relatively dry summers of the past couple of decades in an overall sense – possibly but by no means certainly a signature of climate change – will there be increasing seasonality in the runoff in WA state? We will be keeping track.

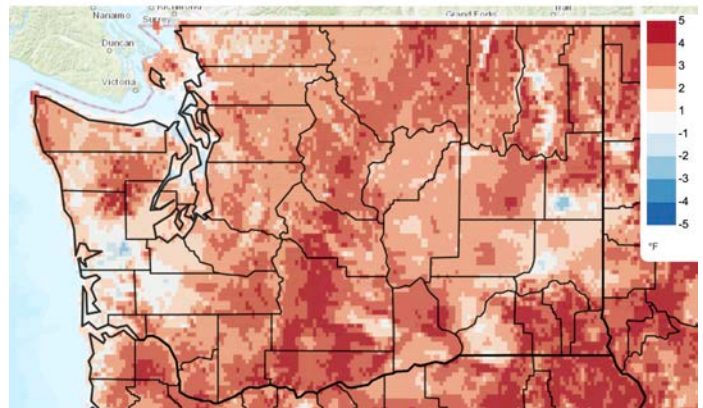
Climate Summary

Mean July temperatures were above normal for a majority of the state, with average temperatures between 1 and 4°F above normal for a majority of the state. For example, Spokane and Quillayute were warm spots relative to their normals, at 3.4 and 3.8°F above normal, respectively (Table 1). Bellingham was closer to normal but still above, with a positive anomaly of 1.0°F. As shown on the map on the right-hand-side, some areas in the southwestern and southeastern portions of WA had near-normal to below normal July temperatures.

July precipitation was below normal throughout essentially the whole state. Large areas of the state received less than 30% of normal precipitation, from SeaTac AP (15% of normal) to Vancouver (0% of normal), and Pullman (21% of normal) to Spokane (29% of normal), etc. (Table 1). The northwestern part of the Olympic Peninsula and some locations east of the Cascade Mountains in the Lower Columbia Basin were the exceptions and received closer to normal July precipitation: between 70 and 110% of normal totals.

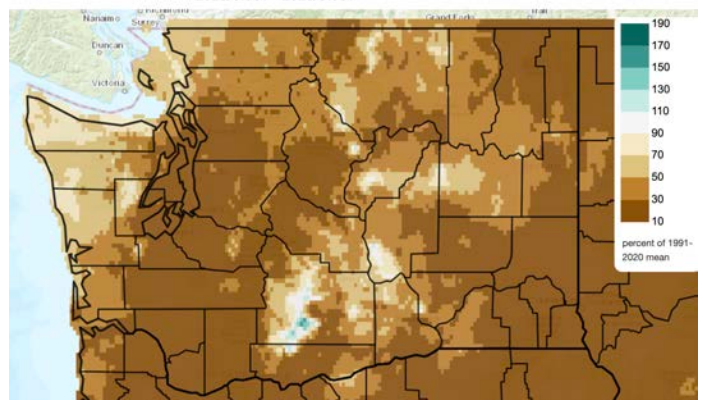
We generally restrict this section to a review of the previous month's temperatures and precipitation across Washington state, but thought it could not hurt to mention that a marine heat wave has developed in the coastal waters of the PNW over the last month or so. The anomalies in sea surface temperature are typically 2 to 2.5°C or 4°F, with some locations much warmer relative to normal. Temperature perturbations of this magnitude tend to have impacts not just on marine ecosystems, but also inland temperatures, especially west of the crest of the Cascades (Mass et al. 2022).

Mean Daily Temperature Anomaly, Last Full Month
2023/07/01 - 2023/07/31



July temperature (°F) departure from normal relative to the 1991-2020 normal (Climate Toolbox).

Total Precipitation Anomaly, Last Full Month
2023/07/01 - 2023/07/31



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

Reference:

Mass, C., C. Randall, R. Conrick, and D. Ovens, 2022: The relationship between Northeast Pacific sea surface temperatures, synoptic evolution, and surface air temperatures over the Pacific Northwest, [Weather and Forecasting](#), 37, 1741-1759.

Station	Mean Temperature (°F)			Precipitation (inches)		
	Average	Normal	Departure from Normal	Total	Normal	Percent of Normal
Western Washington						
Olympia	65.3	64.2	1.1	0.03	0.53	6
Seattle WFO	68.5	66.5	2.0	0.17	0.78	22
SeaTac AP	68.5	67.1	1.4	0.09	0.60	15
Quillayute	63.1	59.3	3.8	1.34	1.58	85
Hoquiam	62.9	60.3	2.6	0.73	0.85	86
Bellingham AP	64.9	63.9	1.0	0.00*	0.88	-
Vancouver AP	71.8	69.0	2.8	T	0.42	0
Eastern Washington						
Spokane AP	74.4	71.0	3.4	0.12	0.42	29
Wenatchee	77.3	74.7	2.6	0.09	0.24	38
Omak	76.6	73.7	2.9	T	0.52	0
Pullman AP	67.9	67.0	0.9	0.08	0.39	21
Ephrata	77.1	75.3	1.8	0.09	0.30	30
Pasco AP	77.6	74.7	2.9	0.04	0.15	27
Hanford	81.0	78.2	2.8	0.13	0.20	65

Table 1: July 2023 climate summaries for locations around Washington with a climate normal baseline of 1991-2020. *There are 4 days missing (July 24-27) from the Bellingham precipitation total.

Climate Outlook

According to the Climate Prediction Center (CPC), El Niño is present and an “El Niño Advisory” is in effect. Over the last month, above normal sea surface temperatures (SSTs) have persisted across much of the equatorial Pacific Ocean and have strengthened slightly in the east-central equatorial Pacific Ocean. El Niño persisting through next winter is essentially a sure thing; [ENSO models](#) have its chances at 96% for Dec 2023-Feb 2024. There is also model consensus that the event will be a moderate to strong El Niño.

The CPC August temperature outlook (Figure 8) has increased odds of above normal temperatures for the entire state. The chances of above normal temperatures are higher for western WA, between 50 and 60% on the three-tiered scale. August precipitation is uncertain for the state with equal chances of below, near-normal, or above normal precipitation (i.e., a 33.3% chance of each of the three outcomes occurring) almost everywhere. A small area in southeastern WA has slightly elevated odds of above normal August precipitation.

The three-month August-September-October (ASO) temperature outlook (Figure 9) is calling for higher chances (40-50%) of above normal temperatures statewide. The ASO precipitation outlook indicates elevated chances of below normal precipitation statewide. The odds are highest for the northern tier of the state, with between 40 and 50% on the three-tiered scale.

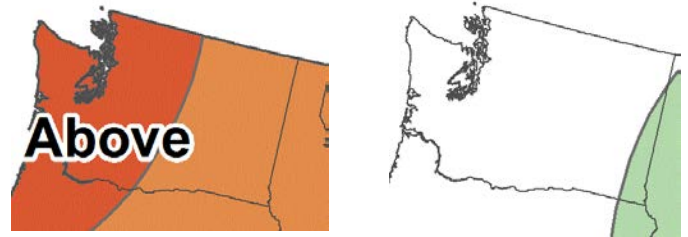


Figure 8: August outlook for temperature (left) and precipitation (right).

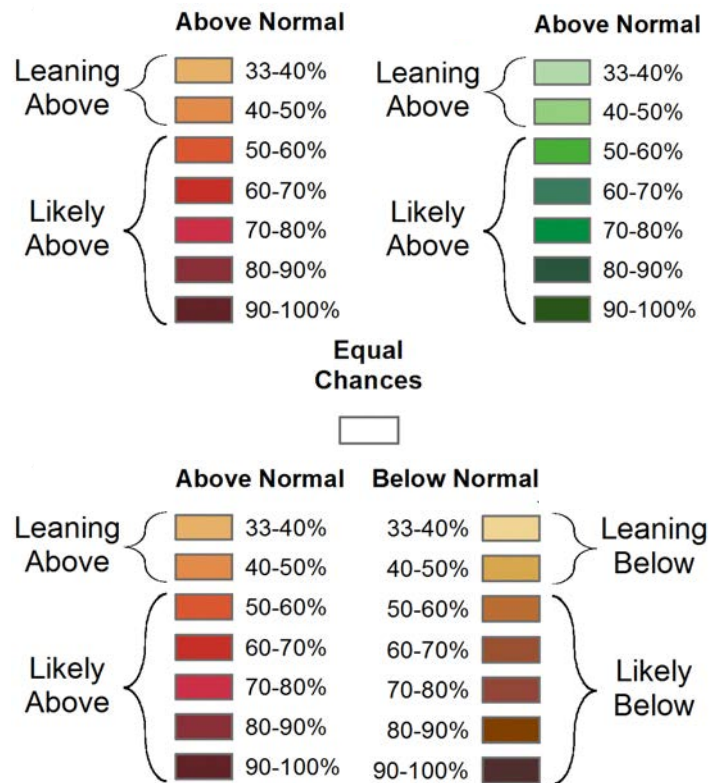


Figure 9: August-September-October outlook for temperature (left) and precipitation (right) (Climate Prediction Center).