Office of the Washington State Climatologist

June 2022 Report and Outlook

June 8, 2022

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

May Event Summary

In a repeat of what occurred in April, average May temperatures were much below normal across Washington. Averaged statewide, May tied 1962 and 1974 as the 8th coldest May on record (-4.6°F below the 1991-2020 normal). Table 1 lists May temperature and precipitation rankings among the top ten coolest or wettest for selected WA stations. As seen in the table, total May precipitation was variable relative to normal. While most of the state received above normal precipitation, many locations in the central and northern parts of eastern WA received below normal precipitation. Average statewide, however, May still ranks as the 8th wettest May on record (+1.58").

Figure 1 shows the daily temperatures and precipitation at SeaTac Airport compared to normal. Daily maximum and minimum temperatures were below normal throughout the month;

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Station	May Average Temperature	Rank	May Precipitation	Rank	Records Began
Walla Walla	54.5	1	3.66	5	1949
Ritzville	49.6	2	-	-	1916
Wenatchee Pangborn AP	54.6	2	-	-	1960
Ephrata	55.0	3	-	-	1949
Vancouver Pearson AP	55.7	5	4.06	4	1998
Omak	55.0	5	-	-	1998
SeaTac AP	52.6	7 (tie)	3.82	2	1945
Quillayute	49.1	7	9.09	6	1967
Olympia	51.1	8	4.33	6	1941
Spokane AP	51.1	9	-	-	1881

Table 1: May average temperatures and total precipitation and rankings (coldest to warmest and wettest to driest) for selected WA locations.

maximum daily temperatures only exceeded normal on 3 days at SeaTac. There was measurable precipitation on 15 days, 5 more days than the long-term SeaTac May average, and tying as the 8th highest. Unsurprisingly, the month began on a wet note, even in eastern WA. On the 2nd, maximum daily rainfall records were set at Wenatchee Pangborn (0.58"), Ellensburg (0.45"), and Yakima (0.29"). Hoquiam (0.94") and Bellingham AP (0.62") set maximum rainfall records on the 5th. On the 6th, Pullman (0.64") measured a maximum daily rainfall record.

Aside from the precipitation records, there were also notable colder than normal temperatures early in the month, including temperatures below freezing. Ephrata, for example, recorded a chilly daily record low minimum temperature of 28°F on the 8th. Daily low *maximum* temperature records were set on the 12th at SeaTac (51°F) and Olympia (51°F). On the 13th, Walla Walla set a daily minimum temperature record with 37°F.

Conditions were not quite as wet from the 19th through the 25th for most of the state, but otherwise the month ended with more daily precipitation records and a wet Memorial Day weekend. For example, maximum daily rainfall records were set at Hoquiam (1.01") on the 28th and Walla Walla (0.49") on the 29th.

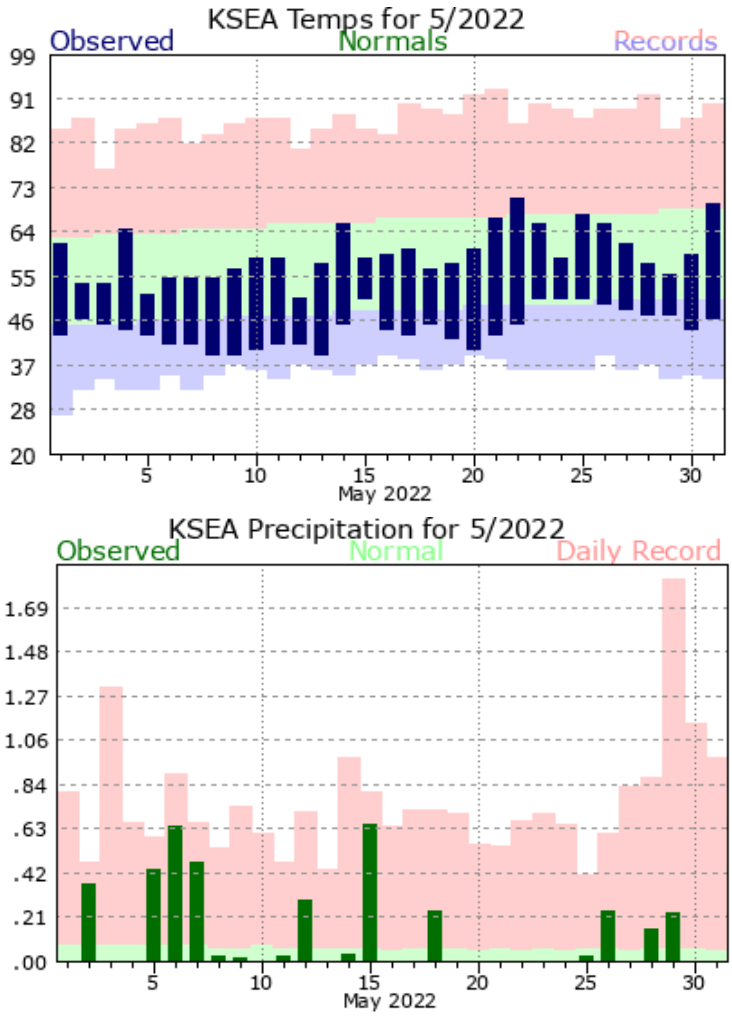


Figure 1: May 2022 daily temperature for Seattle International Airport compared to the 1991-2020 normal (green envelope) and previous records (blue and red envelopes; NWS).

So how did meteorological spring shape up? Figure 2 shows March through May temperatures and precipitation relative to normal. Even though March was generally warm and dry, the cold and wet conditions in April and May were enough to wash out the March signal. March-May temperatures were below normal throughout the state. Averaged statewide, spring tied 1971, 1976, and 1982 as the 19th coldest since records began in 1895. Precipitation, on the other hand, does have some regional variability. Spring precipitation in parts of Okanogan, Ferry, Stevens, Douglas, Grant, and Lincoln counties was between 50 and 90% of normal, while the rest of the state saw normal to above normal precipitation. Even with some dry areas of that state, the statewide average total spring precipitation ranks as the 19th wettest on record.

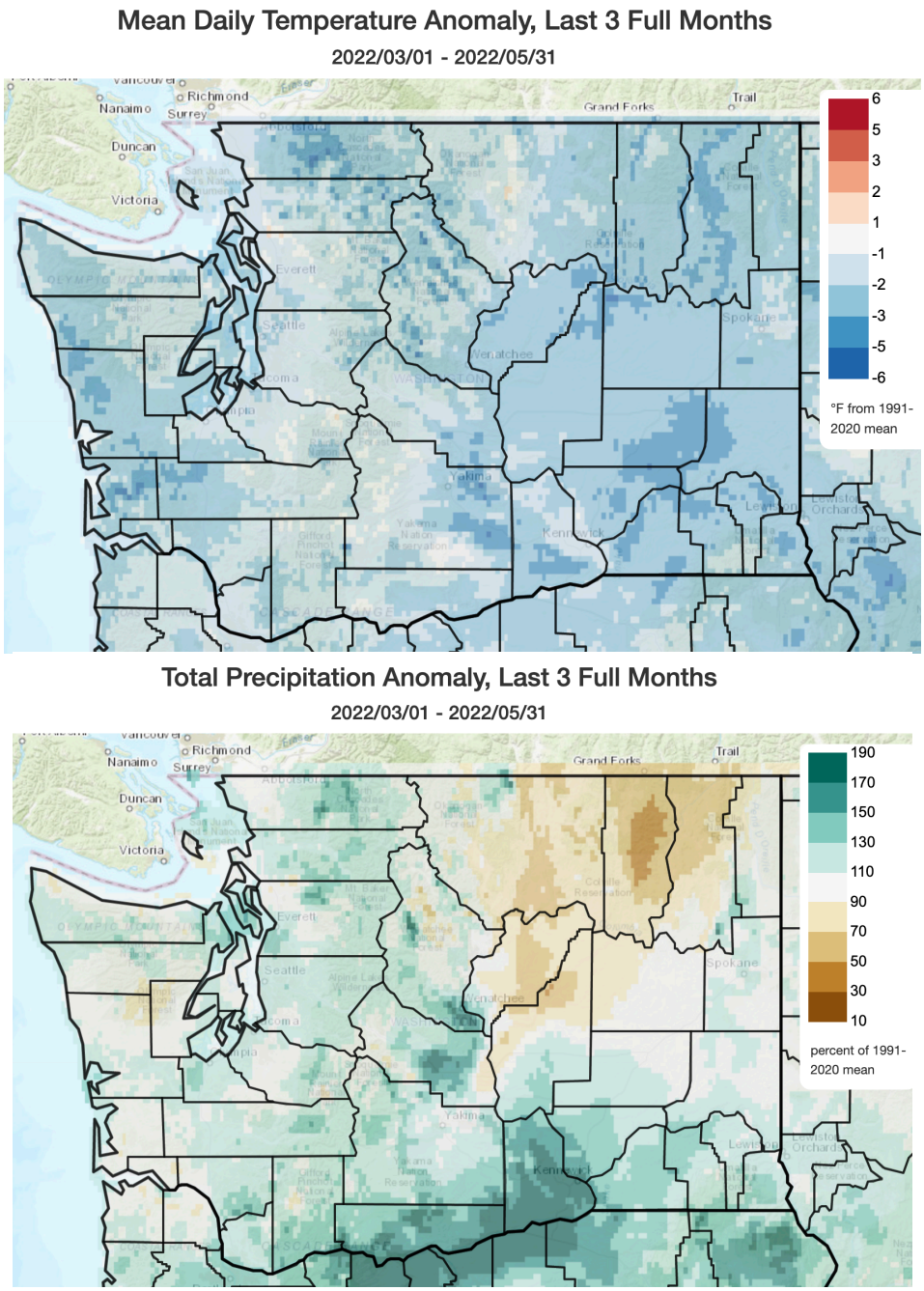


Figure 2: March-May 2022 temperature departures from the 1991-2020 normal and percent of normal precipitation for WA (Climate Toolbox).

Snowpack and Drought Summary

Snowpack is above normal throughout WA state. The colder than normal May temperatures allowed the snowpack to melt more slowly throughout the month, and some locations even picked up some new snow in early May. Figure 3 shows the snow water equivalent (SWE) value on June 1. The white circles, mostly on the eastern slopes of the Cascades and in north central WA, represent Snotel stations that have melted out completely, which is not unusual for this time of year. The higher elevation sites have ample snow at this point in the year, with many measuring between 25 and 50" of SWE.

The wetter and colder than normal spring conditions have helped ease drought throughout WA. Since the last edition of our newsletter, the WA drought depiction has improved on the U.S. Drought Monitor (Figure 4), particularly in the southern areas of eastern WA, where May was especially wet. Much of the remaining drought on the USDM is from longer term precipitation deficits beginning last spring.

Additionally, the WA Department of Ecology amended the drought declaration that was issued for nearly the entire state in July 2021. On May 26, only five watersheds - in parts of Okanogan, Lincoln, Stevens, and Spokane counties - remain in declared drought status (Figure 5) due to streamflow forecasts being below normal through the remainder of the spring and summer. The rest of eastern WA was downgraded to a "drought advisory" and western WA has no drought concerns at this time.

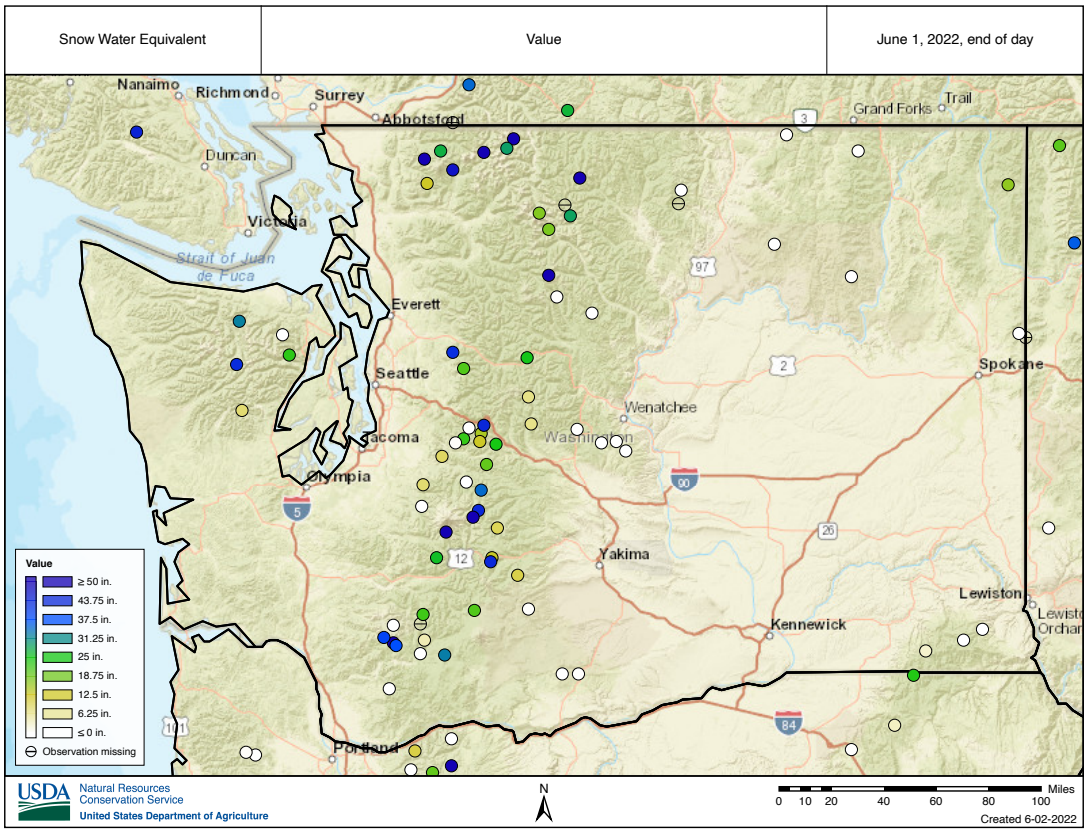


Figure 3: June 1, 2022 values of snow water equivalent in inches (from NRCS).

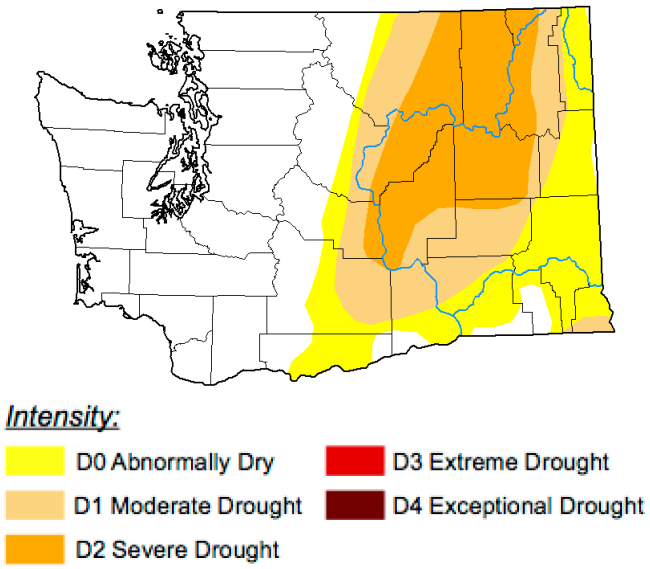


Figure 4: The June 2, 2022 edition of the U.S. Drought Monitor.

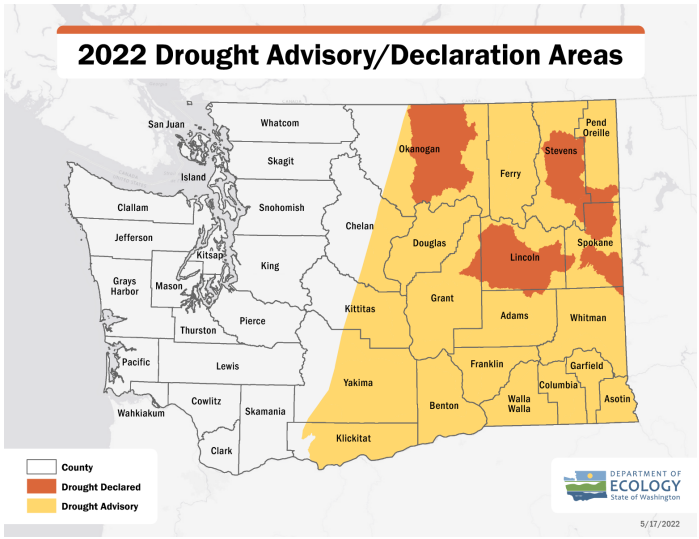


Figure 5: WA state "Drought Advisory" and "Drought Emergency" areas as issued on May 26, 2022 (from ECY).

Cool Waters off the Coast of the Pacific Northwest and in the Puget Sound

A Message from the State Climatologist

We have enjoyed a cool spring in WA state and perhaps it is no surprise that regional ocean temperatures are also on the cool side. A sea surface temperature (SST) anomaly map for a 7-day period near the end of May 2022 (Figure 6) shows negative anomalies off the coast of the Pacific NW, and in the central and eastern tropical Pacific Ocean (more about the latter below). Cool near-surface temperatures are also present in Puget Sound; surface water temperatures at the NOAA tide gauge in Tacoma are about 0.7°F cooler during the last week of May 2022 than the same interval in 2021.

While a quantitative analysis is beyond the scope of the present piece, it appears that the cold waters off the Pacific Northwest coast can be attributed to our recent cloudy and cool weather. Often SSTs along the coast reflect the sense of the winds, with winds from the north forcing upwelling of relatively cold water from below. There were some periods of upwelling wind anomalies during the past winter, but the past spring has included overall wind anomalies along the coast from the southwest (not shown), which implies suppressed upwelling. Instead, our tentative interpretation is that the negative SST anomalies are due to the unsettled weather that has brought cool air temperatures, clouds and occasional storms that promote vertical mixing in the upper ocean, which also tends to cool near-surface waters. This weather may be due, at least in part, to La Niña. The NINO3.4 index was at -1.1°C during April 2022, a value which ties with 1950 for the strongest negative anomaly in the record for the month of April. From a local perspective, the anomalous atmospheric forcing of the ocean is apparent in the real-time data from

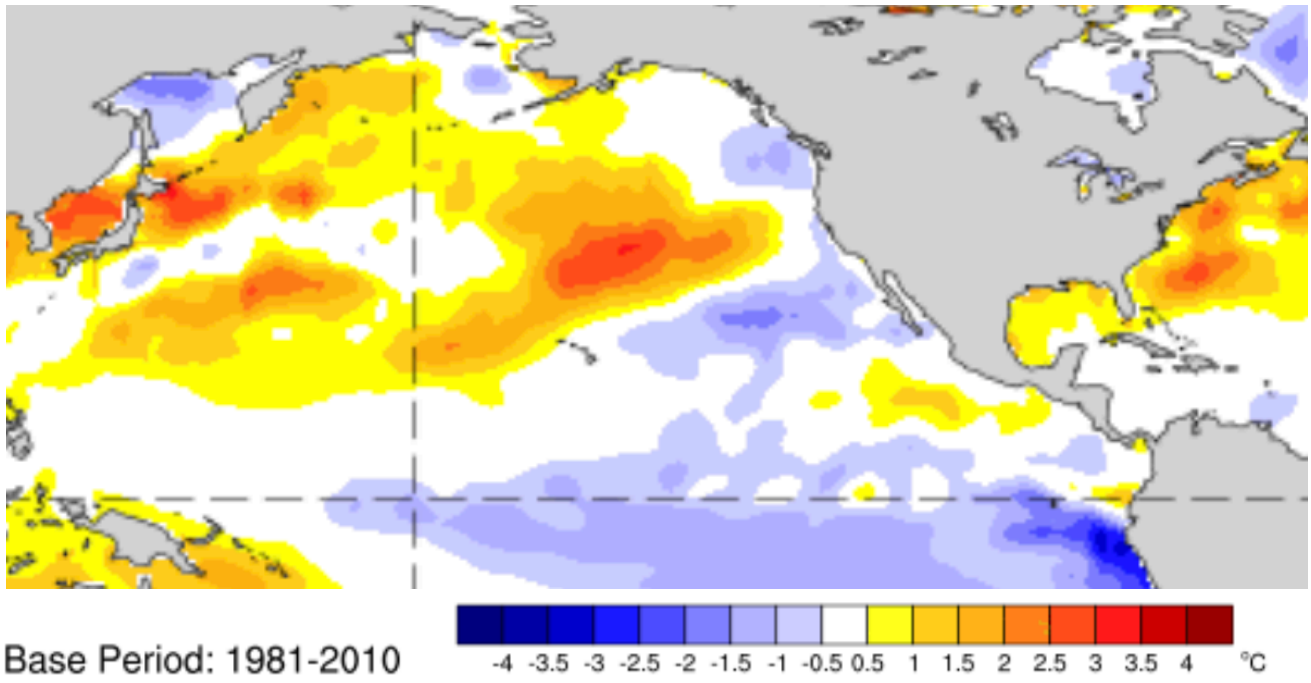


Figure 6: Sea surface temperature anomalies (base period 1981-2010) for the week of 22-28 May 2022 (NOAA's Physical Science Laboratory).

the Puget Sound dashboard – reviewed in the February 2022 edition of this newsletter - which shows negative anomalies in atmospheric heating greater than 100 W/m² and more than one standard deviation from normal at times during the past April and May (Figure 7).

We expect that most residents of WA state may be more than ready for some warmer temperatures typical of late spring. On the other hand, the inclement weather has had some silver linings. Since our focus here is on ocean conditions, we would like to point out that the relatively cool waters along the Pacific Northwest coast are favorable for a variety of marine species including salmon. A "stoplight" plot from NOAA's Northwest Fisheries Science Center (Figure 8) illustrates how the last two years represent a turnaround from recent warm years including the major marine heat wave of 2014 into 2017 (aka the Blob) with an additional period of poor conditions on its heels in 2019-20. Assuming no big changes in regional ocean conditions relative to historical norms over the next couple of seasons, perhaps there will be at least decent returns of adult salmon from the year classes entering the marine environment this year.

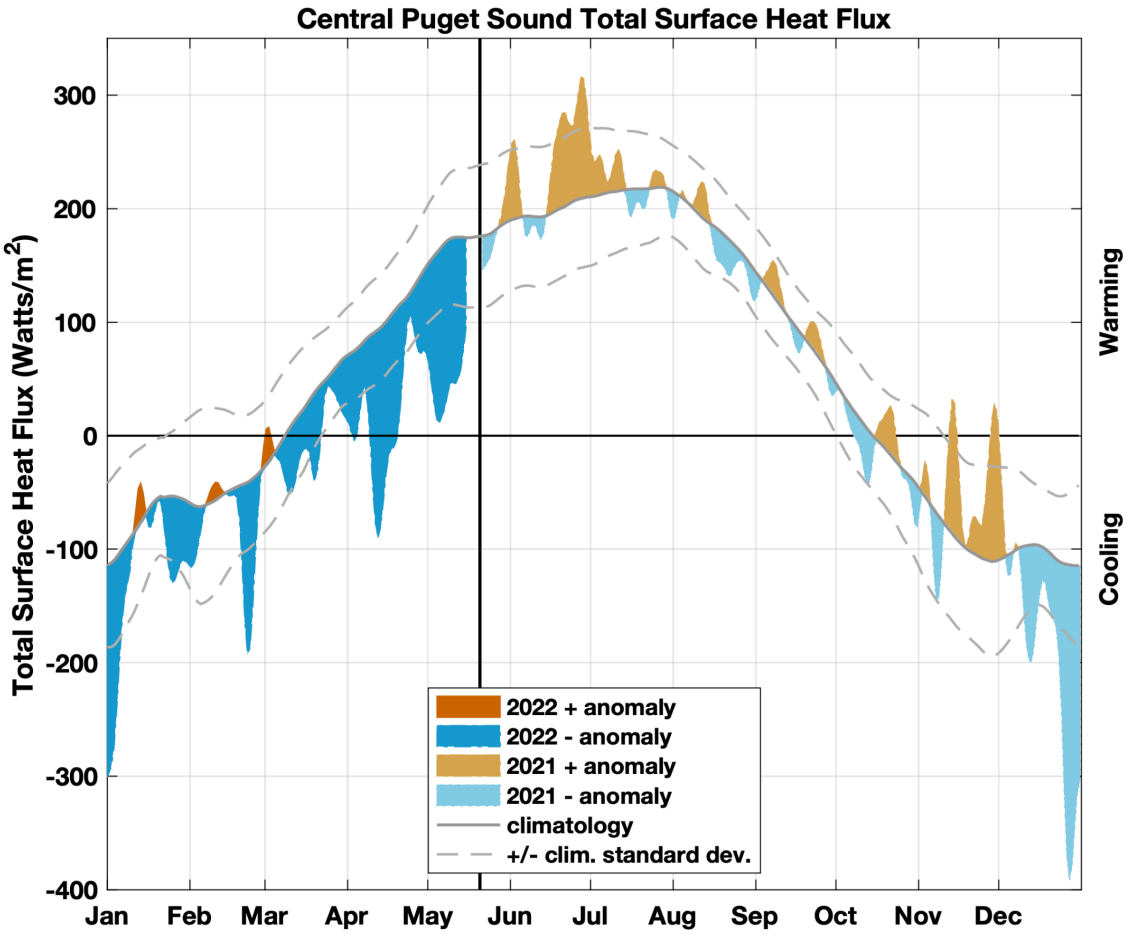


Figure 7: June 2021-May 2022 total surface heat flux for the Central Puget Sound region compared to a 7-year climatology ([Puget Sound Metrics Dashboard](#)).

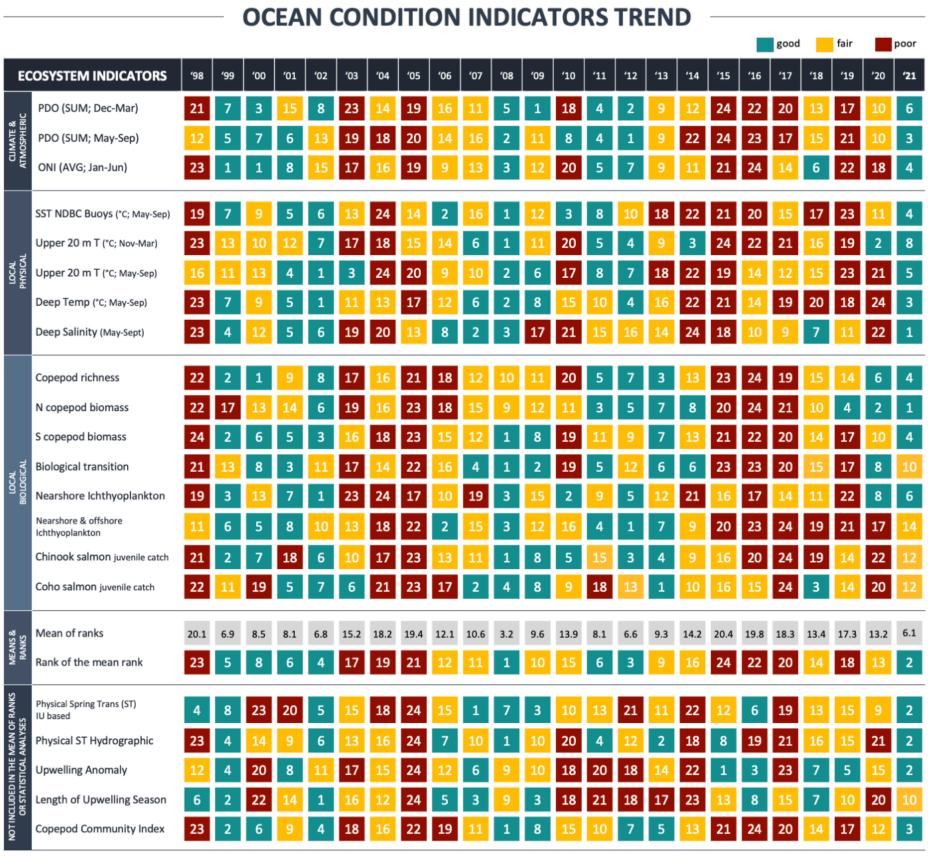
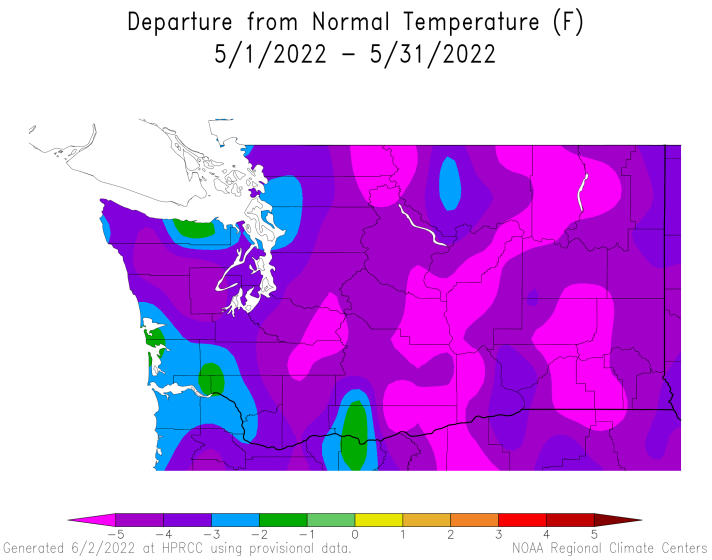


Figure 8: Ranking and color-coding of indicators used to represent the favorability of ocean conditions with respect to Pacific NW juvenile salmon growth and survival for the years of 1998-2021 from [NOAA's Northwest Fisheries Science Center](#).

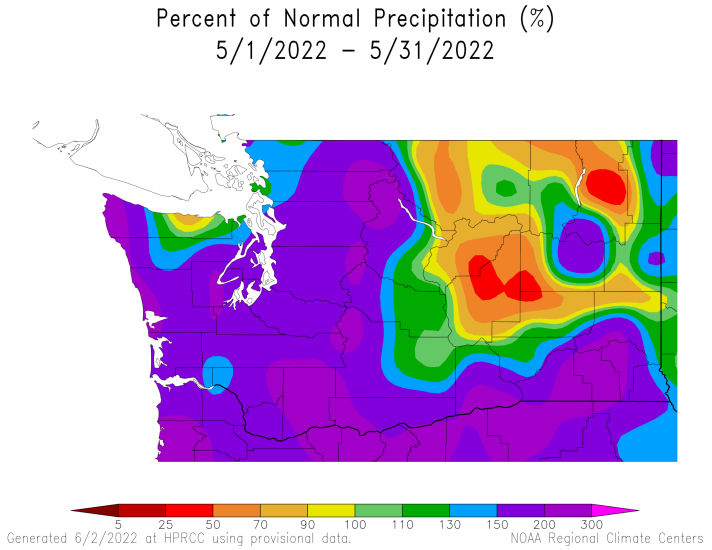
Climate Summary

Much colder than normal temperatures continued into May, and average May temperatures were below normal throughout WA. According to the map from the High Plains Regional Climate Center and Table 2, anomalies were between 2 and 6°F below normal for a majority of the state, with a few exceptions. The central Puget Sound and southwestern WA were not quite as cold relative to normal. For example, Vancouver was 2.6°F below normal for the month.

Precipitation was much above normal for locations in western and southern WA. Both coastal locations of Hoquiam and Quillayute recorded 214% of normal May precipitation. There was more variability in eastern WA with areas in the northern and central part of the region generally receiving below normal May precipitation. Ephrata was particularly dry relative to its normal, only receiving 48% of normal precipitation. Spokane, on the other hand, measured near-normal precipitation with 97% of normal.



May temperature (°F) departure from normal relative to the 1991-2020 normal (HPRCC).



May total precipitation percent of 1991-2020 normal (HPRCC).

Station	Mean Temperature (°F)			Precipitation (inches)		
	Average	Normal	Departure from Normal	Total	Normal	Percent of Normal
Western Washington						
Olympia	51.1	54.5	-3.4	4.33	2.26	192
Seattle WFO	54.1	56.8	-2.7	3.80	2.16	176
SeaTac AP	52.6	57.5	-4.9	3.82	1.88	203
Quillayute	49.1	51.7	-2.6	9.09	4.25	214
Hoquiam	51.9	53.4	-1.5	6.41	2.99	214
Bellingham AP	52.8	55.5	-2.7	3.03	2.23	136
Vancouver AP	55.7	58.3	-2.6	4.06	2.51	162
Eastern Washington						
Spokane AP	51.1	56.0	-4.9	1.50	1.55	97
Wenatchee	54.6	60.1	-5.5	0.91	0.77	118
Omak	55.0	58.8	-3.8	1.14	1.19	96
Pullman AP	49.3	54.5	-5.2	2.40	1.41	170
Ephrata	55.0	60.4	-5.4	0.36	0.75	48
Pasco AP	60.0	61.4	-1.4	0.96	0.71	135
Hanford	58.0	62.9	-4.9	0.90	0.61	148

Table 2: May 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. Over the last 4 weeks, below average sea surface temperatures (SSTs) have persisted throughout the equatorial Pacific Ocean though there has been some weakening of the SST anomalies in the eastern equatorial Pacific. According to ENSO models, La Niña conditions are expected over the June-August season. The chances of continuing La Niña conditions during summer are at 69% compared to 31% for neutral conditions. At this point, it is more likely than not that La Niña will occur again next fall; there will be more confidence in this forecast in about another month.

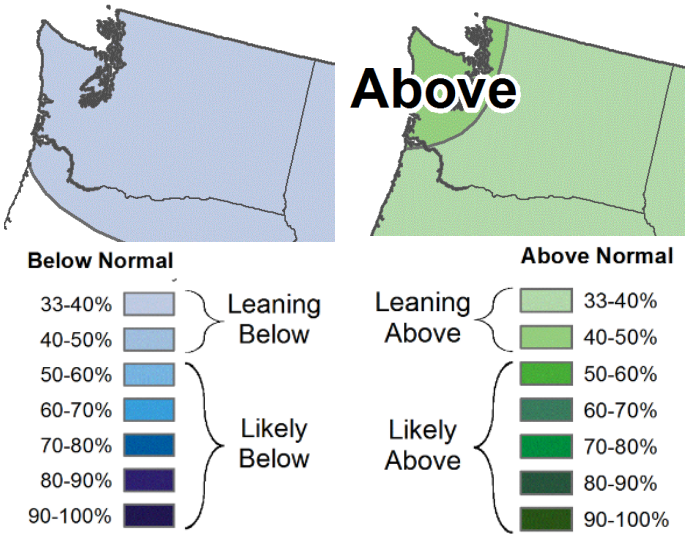


Figure 9: June outlook for temperature (left) and precipitation (right).

The CPC outlook for June (Figure 9) shows a continuation of the cooler and wetter than normal conditions seen this spring. There are increased chances of below normal temperatures statewide. Increased chances of above normal June precipitation are highest for the Olympic Peninsula and Puget Sound region (40-50% on the three tier scale) but there are also higher chances of above normal June precipitation for the rest of the state.

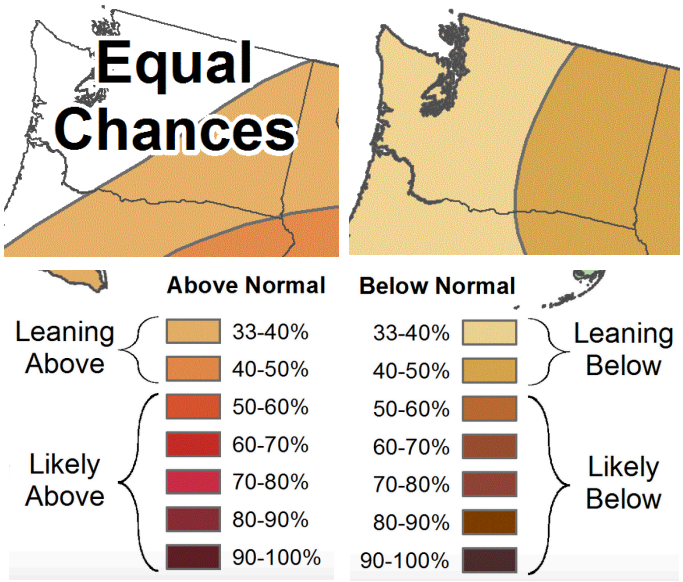


Figure 10: June-July-August outlook for temperature (left) and precipitation (right) (Climate Prediction Center).

The three-month outlook for June-July-August (JJA) temperature is shown in Figure 10. 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 higher chances of below normal precipitation statewide, and those chances are higher in eastern WA.