Summary of the 2022 Fire Weather Season in Alaska

Overview: A Tale of Two Seasons

It was the driest of times, it was the wettest of times. After a very dry and dramatic start to the season in Southwest Alaska and later across the Interior with three million acres burned, the weather turned sharply wetter and colder statewide during the second half of July, effectively ending the wildfire season by the end of that month.

Figure 1 illustrates how unusual the season was. It shows the ratio of precipitation in July and August compared to the precipitation in May and June for each wildfire season since 1925. The second half of the summer is generally wetter than the first half of the summer in Alaska, thus almost all values on this graph are above one even despite the considerable interannual variability. But 2022 brough something completely different: precipitation in July and August was ***more than four times(!)*** the precipitation in May and June. Never in recorded history had a season undergone such a radical flip from one extreme to the other.

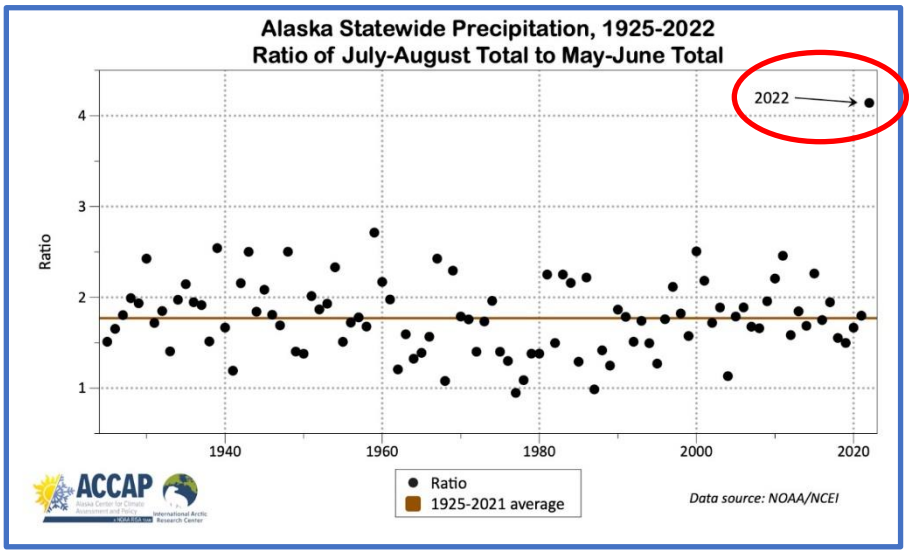

Figure 1: A Tale of Two Seasons, 2022 is the most extreme outlier yet observed.

NOAA has divided Alaska into several climate regions, and the precipitation over all regions was remarkably dry from April through June, then remarkably wet from July through September. In fact, South-Central Alaska dropped to its driest ranking on record during the first half of the season, only to rocket into the highest precipitation ranking ever observed during the second half of the season.

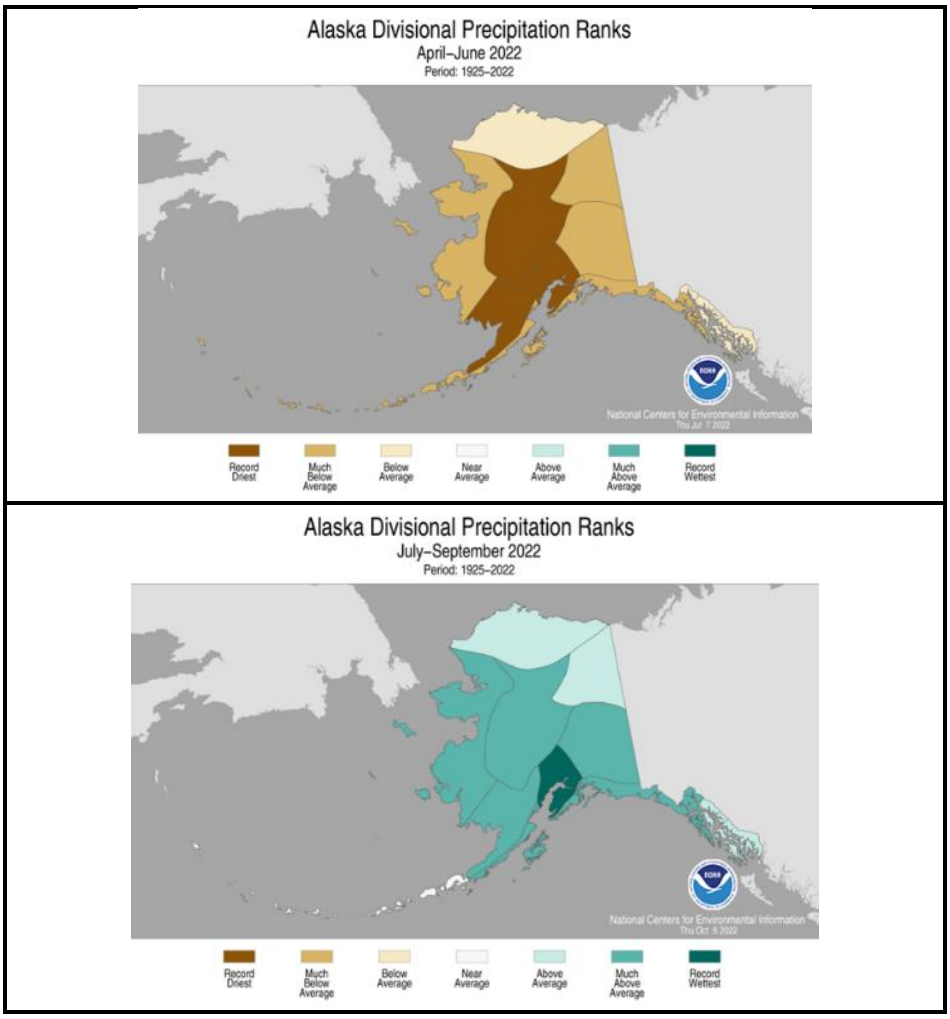

Figure 2 Precipitation rankings across Alaska for the first half of the wildfire season (above) and the second half (below).

Analyses produced by the US Drought Monitor (https://droughtmonitor.unl.edu) show the establishment of drought conditions early in the season followed by the elimination of the drought by season's end. As seen in Figure 3, after a winter of ample snowfall over portions of Alaska, particularly the Interior, Alaska entered the 2022 wildfire season with no areas in drought status. But by mid-July, after almost three months of dry and warm weather, much of Alaska found itself under drought conditions, with portions of South-Central and the western Alaska Range reaching the "severe drought" criteria. The trend reversed again during the second half of July as widespread rains and cooler temperatures moved into Alaska from the Bering Sea and Gulf of Alaska, and by early September only the upper reaches of the Tanana Valley retained any drought conditions, even in that area the magnitude of the drought had been reduced substantially.

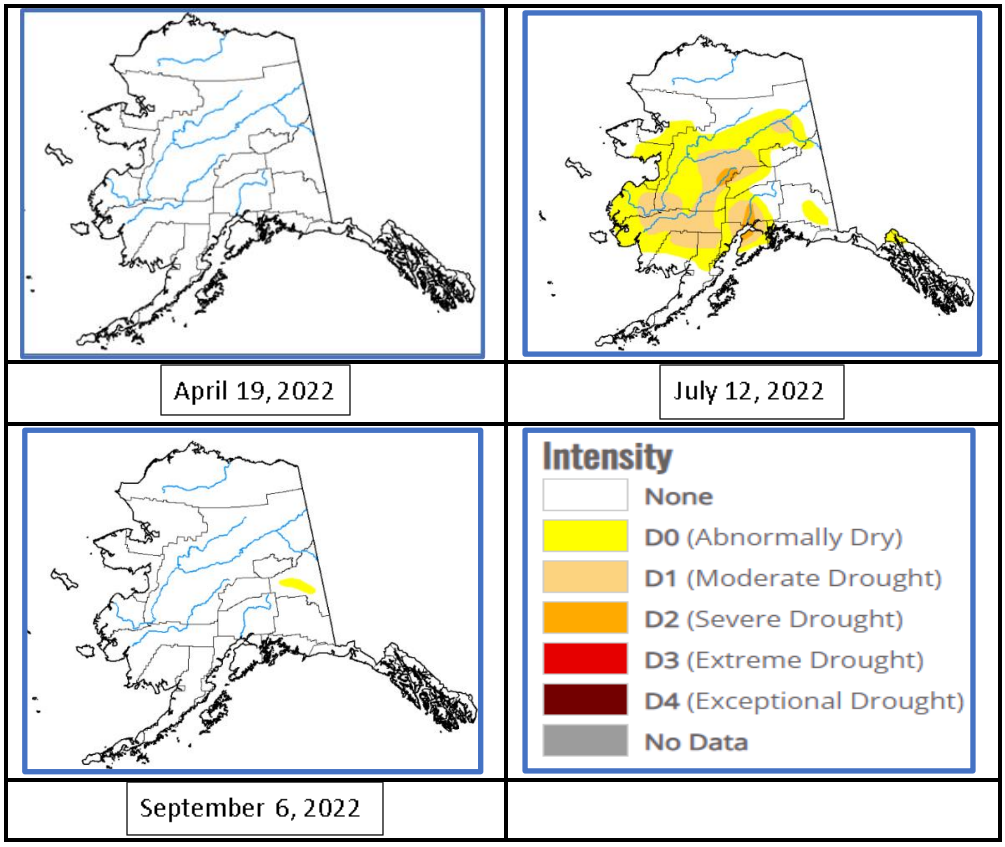

Figure 3: Snapshots of drought status at the beginning, middle, and end of Alaska's 2022 wildfire season.

Details Month by Month

Late April

The wildfire season began aggressively in an unusual location: southwest Alaska. While southwest Alaska received ample precipitation over the winter, an unusually large portion of this precipitation fell as rain instead of snow, meaning that the snowpack there was comparatively thin by spring. By late April the snowpack had completely melted, and the tundra was quite dry. Several wildfires were active by the end of the month, most notably the Kwethluk Fire which had topped 10,000 acres by April's conclusion, being the largest wildfire to occur in Alaska during April in the last 25 years.

Figure 4 Aerial view of portions of the burn scar left by the Kwethluk Fire

May

Much of Alaska, including Juneau and Anchorage, had their wettest year on record in 2022. Despite this broad trend for the year, May was an outlier, with some portions of South-Central (see Figure 3 below) receiving literally zero rainfall during the entire month and establishing the drought that would peak by mid-July.

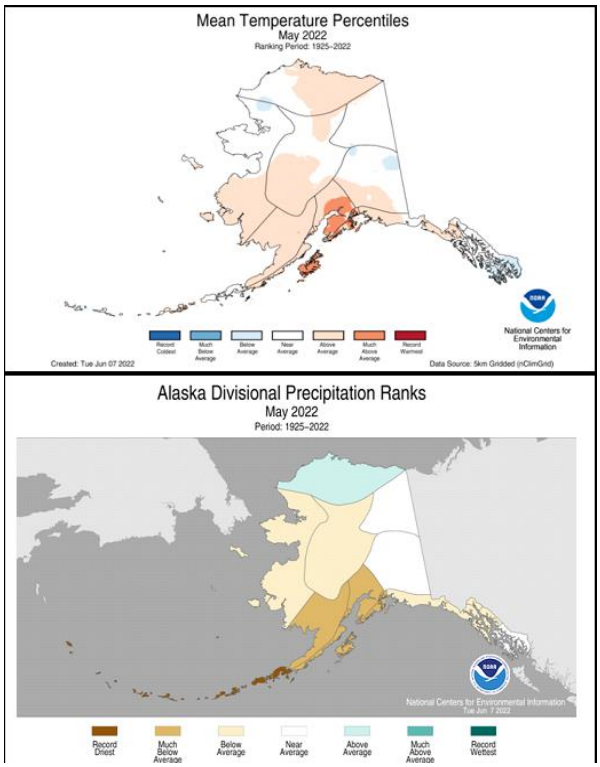

Figure 5: Temperature and precipitation rankings for May.

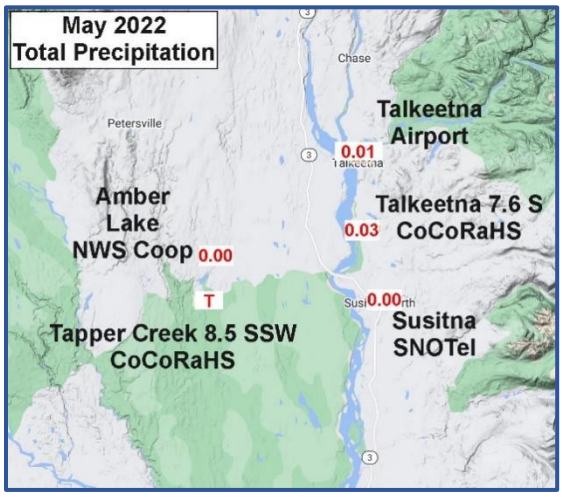

Figure 6: Precipitation across Mat-Su in May 2022.

The first thunderstorms of the season began in May, but there were no major lightning events, and the fuels, especially below the surface, were still somewhat moist and cool. Thus, no significant wildfire behavior was noted in May, and the seasonal total of acres burned increased by only 1200 acres through the month.

June

Consistently hot and dry weather prevailed over mainland Alaska through June. As per Figure 7 below, a broad swath of the State from the southern slopes of the central Brooks Range down through Southwest and South-Central Alaska set new records for the driest June in nearly a century. Temperatures were unusually warm, but not to the extreme degree seen with precipitation.

As shown in Figure 3 above, this stretch of dry and warm weather began pushing Alaska into drought status, a process that would peak in mid-July.

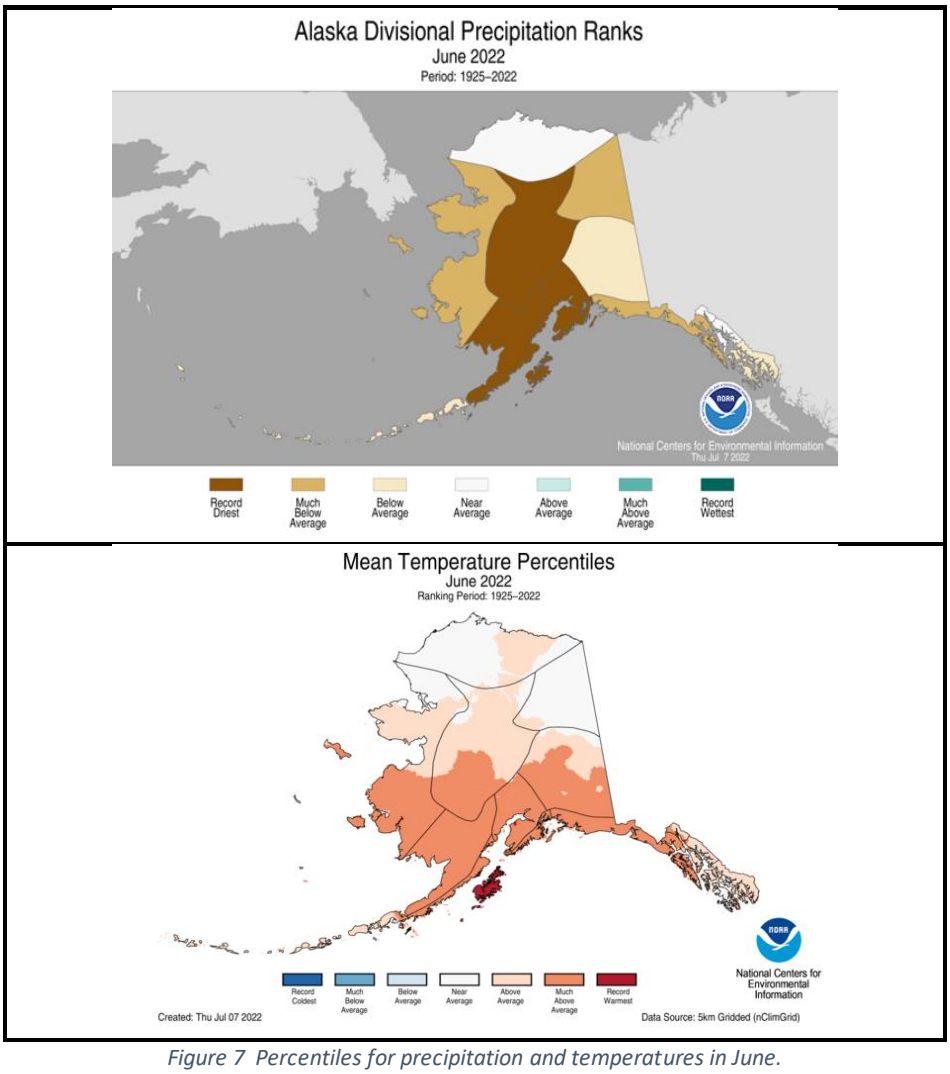

Figure 7 Percentiles for precipitation and temperatures in June.

The first significant outbreak of thunderstorms occurred on June 5th and 6th when nearly 5,000 cloud-to-ground strikes were recorded.

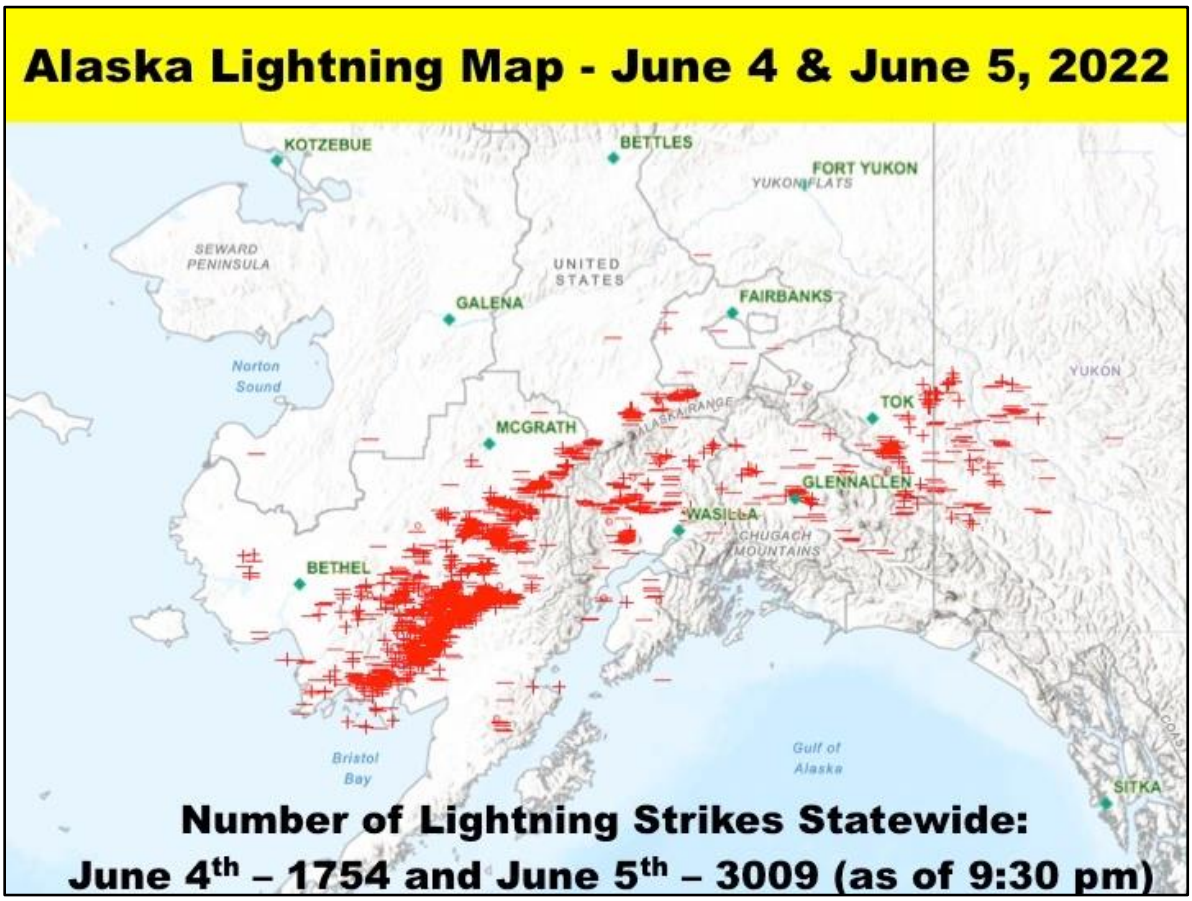

Figure 8: The lightning outbreak of early June, 2022.

With ample fire on the ground facilitated by lightning and dry fuels, the number of acres burned rocketed upward. Figure 9 indicates the that by end of June, over 1,850,000 acres had been burned, with the 2022 season seeing the highest total of accumulated acres burned every observed for much June, eclipsing even the extreme seasons of 2004, 2005, and 2015.

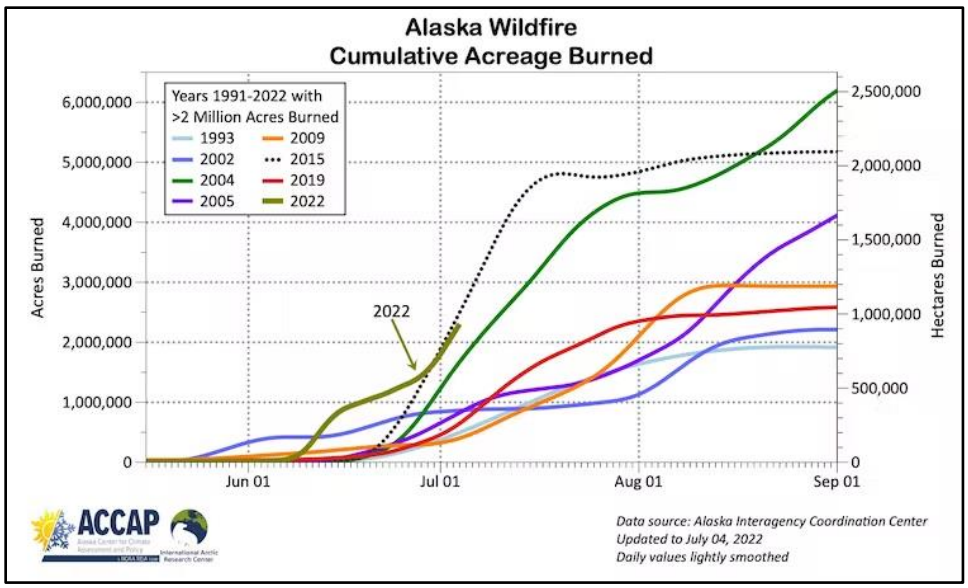

Figure 9: Accumulated acres burned in 2022 through early July compared to other significant seasons.

July

Alaska's streak of warm and very dry weather continued into mid-July. There was also a major thunderstorm outbreak (*over 17,000 strikes!*) in early July over a very broad footprint that started even more wildfires.

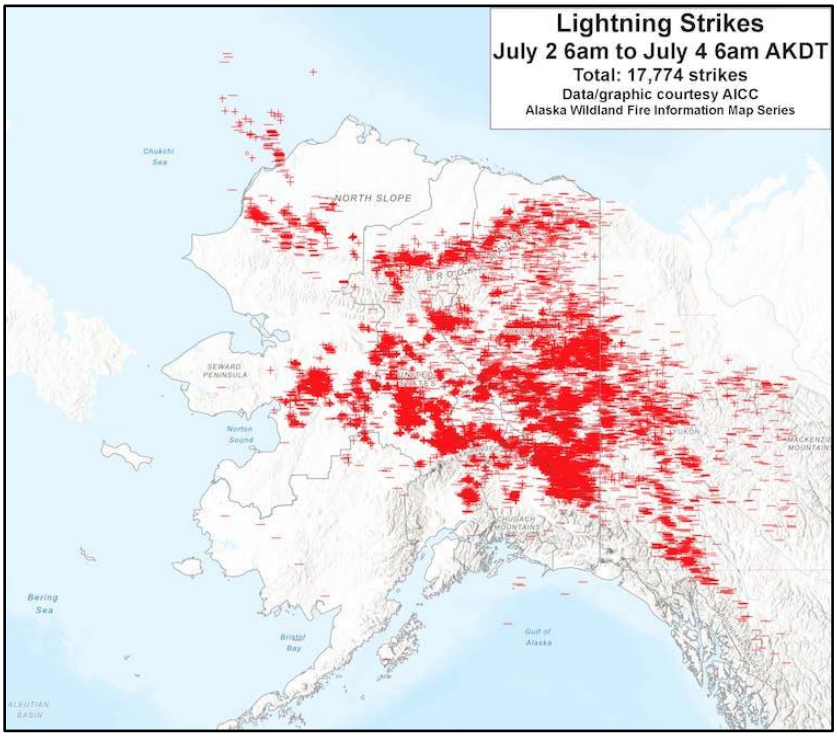

Figure 10 Most significant lightning outbreak of the 2022 wildfire season in Alaska.

But in mid-July Alaska's weather suddenly changed to a colder and wetter regime as a broad area of low pressure persisted over the Bering Sea and Gulf of Alaska. These large-scale features then injected repeated shots of cool and moist ocean air into the State through the remainder of July and, in fact, until the end of the wildfire season.

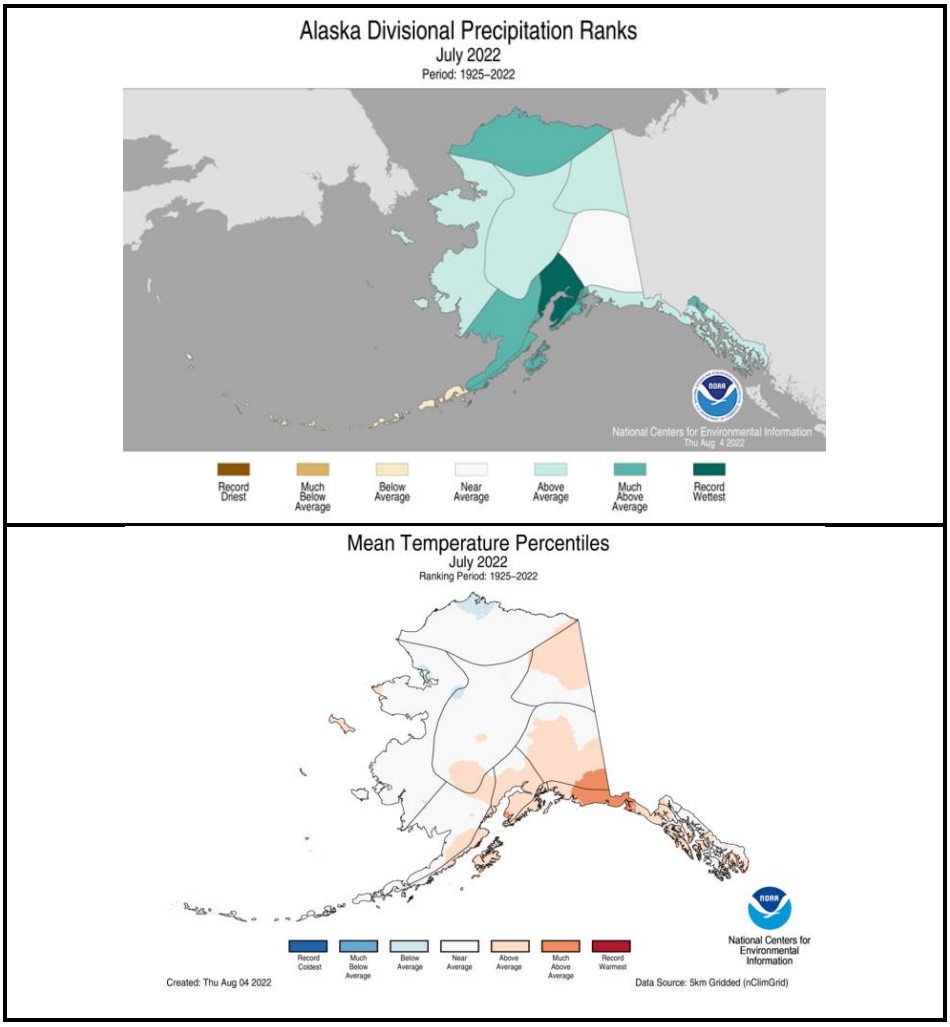

Figure 11 Percentiles for precipitation and temperatures in July.

The radical change toward wet cold weather impacted the fire weather indices strongly. As an example, Figure 12 shows seasonal traces of Build-Up Index (BUI) values observed in Alaska during several of the biggest wildfire seasons of recent decades. The BUI in 2022 (the red trace) collapsed from record high values to below average over the span of just one week, and the BUI never bounced back again over the remainder of the season. In fact, by early August the BUI was threatening to set record ***low*** values.

Note the similarity in the BUI's behavior over the Interior in 2019 and 2022. Interestingly, the moisture that arrived over the Interior in late July and August did not reach South-Central Alaska back in 2019, while the surge of moisture affected the entire State in July of 2022. Interestingly, Anchorage and Juneau both experienced their wettest calendar year ever in 2022. The dry spell from May through mid-July was the only meaningful span of time when in 2022 when much of Alaska was not receiving consistent precipitation.

Referring to Figure 3 above again shows how Alaska's drought status fell back to nearly nothing by early September after peaking in mid-July.

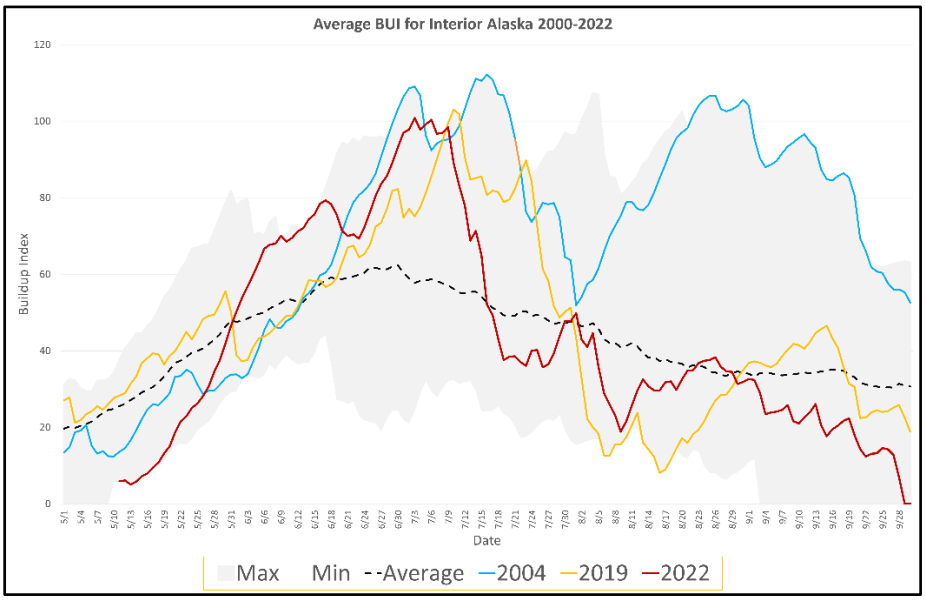

Figure 12: BUI across Interior Alaska through the 2022 season compared to other significant seasons and the long-term average values.

August and September

Alaska's active wildfire season had effectively ended by the time August began. The exception in the trend for extreme weather was bucked over the eastern Interior in August, where precipitation was near normal, and temperatures were slightly above normal. However, one should keep in mind that climate statistics indicate August is the wettest month of the year across Interior Alaska, so even normal precipitation there includes a number of wetting rain events. A meager total of roughly 40,000 acres burned statewide over the month as Alaska limped into September and achieved the formal end of the active wildfire season.

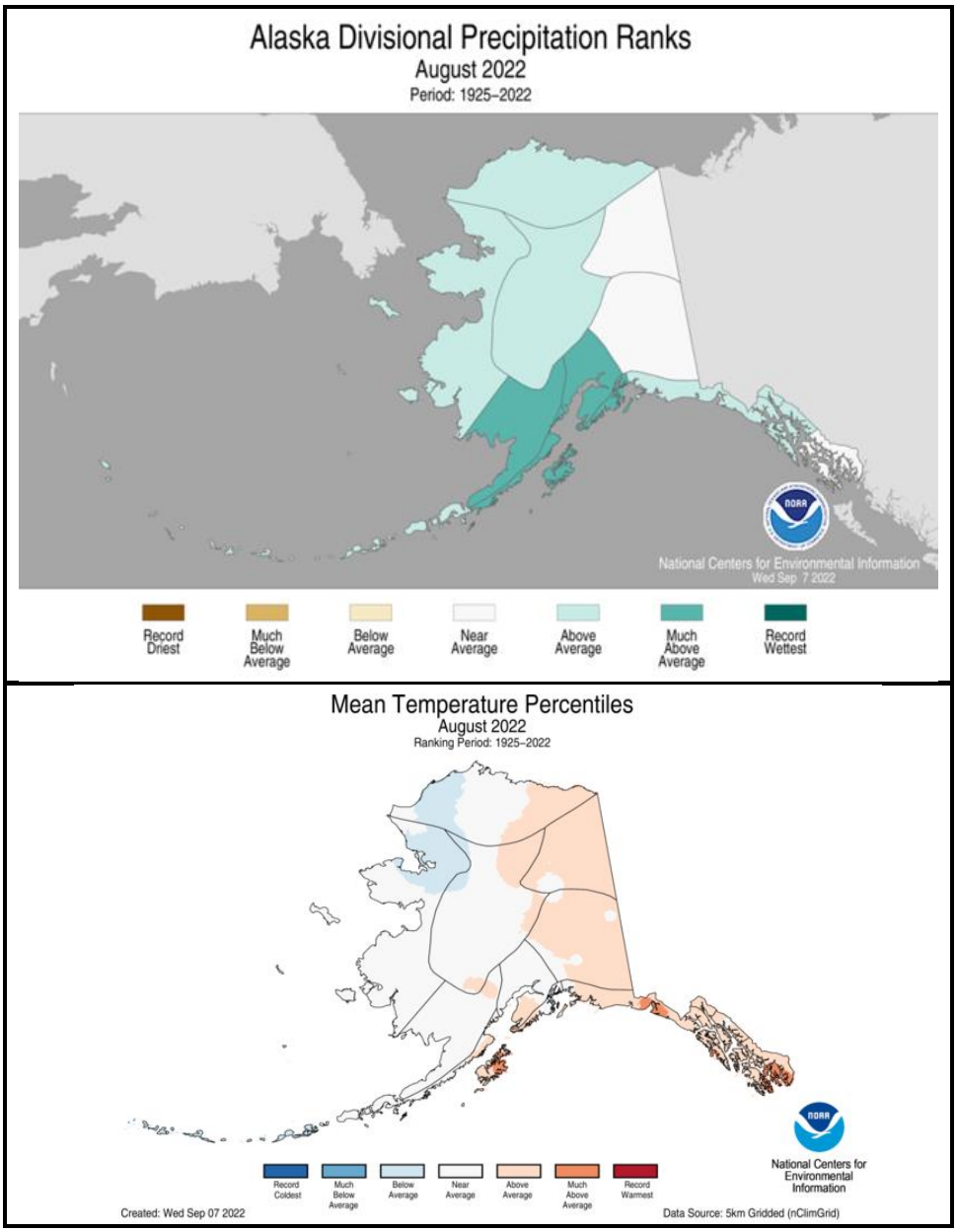

Figure 13 Percentiles for precipitation and temperatures in August.