

# Alaska Statewide Climate Summary

## July 2019

**JULY HIGHLIGHTS: ALASKA EXPERIENCED EXTREME WARMTH, MOSTLY TOO DRY CONDITIONS. EXTREME DROUGHT WARNINGS WERE ISSUED LOCALLY IN THE SOUTHEAST, AND WIDESPREAD WILDFIRE ACTIVITY OCCURRED IN THE INTERIOR AND THE KENAI PENINSULA. SEA ICE DECLINE IS EXTREME WITH A HIGH POSSIBILITY FOR A NEW ALL-TIME ARCTIC SEA ICE MINIMUM.**

The following report provides an overview of the July 2019 weather in reference to long term climate normals. The report is based on data from selected weather stations throughout the state of Alaska. The “normal” reference refers to the climatological average over the 1981-2010 period.

### Temperature

Alaska continues to experience extremely warm temperatures. As for last months, in July 2019 all the analyzed stations recorded above normal temperatures (Figure 1, Table 1). Temperature departures from normal are on average larger than in June 2019, and so, July 2019 ranks as the second month of this year with the highest temperature departures, only after March.

Out of the nineteen stations analyzed, seven stations recorded temperature departures from normal equal or larger than 5°F, and ten of the remaining stations recorded mean monthly temperatures more than 3°F warmer than normal. Nome and Ketchikan recorded the lowest temperature departures with respectively 2.2 and 2.4°F warmer than normal temperatures.

The highest temperature departures are recorded once again in the Arctic region. The most extreme station is Kotzebue, with an impressive mean monthly temperature of 63.8°F, 9.2°F warmer than the normal for the period 1981-2010. The mean temperatures at Utqiagvik were 48.3°F, which was 7.5°F warmer than normal. Much warmer temperatures are recorded also in Southern Alaska: The observed mean monthly temperatures at Anchorage, Kodiak, King Salmon and Yakutat were 65.3°F, 60.4°F, 61.2°F, and 59.6°F, respectively 6.5°F, 5.9°F, 5.7°F, and 5.2°F warmer than normal. Likewise, St. Paul Island, Cold Bay and Juneau experienced average temperatures respectively 4.4°F, 4.2°F and 3.8°F warmer than normal values. Also the Interior was extremely warm during July 2019. Talkeetna and Gulkana recorded 5.0 and 4.9°F warmer than normal temperatures, while McGrath and Bettles measured 4°F warmer than normal temperatures. With 66.0, 63.5, and 59.0°F, Fairbanks, Delta Junction and Bethel experienced mean monthly temperatures respectively 3.5, 3.4, and 3°F above average values of the period 1981-2020.

2019-07, Monthly Temperature Departure From Normal (1981-2010)

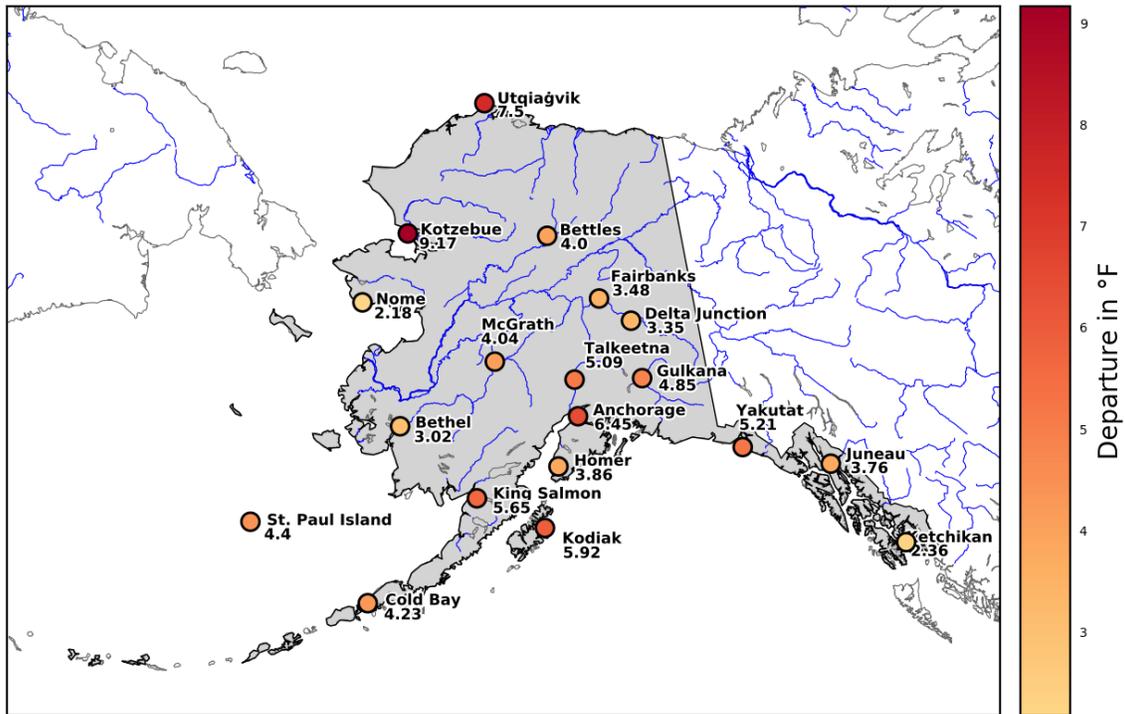


Figure 1: Monthly mean temperature departure from normal, July 2019.

Table 1: Mean monthly air temperature, normal (1981-2010) and departure for selected stations throughout the state, July 2019.

Station	Observed (°F)	Normal (°F)	Departure (°F)
Anchorage	65.3	58.8	6.5
Bethel	59.0	56.1	3.0
Bettles	63.7	59.7	4.0
Cold Bay	55.1	50.9	4.2
Delta Junction	63.5	60.2	3.4
Fairbanks	66.0	62.5	3.5
Gulkana	62.4	57.6	4.8
Homer	58.5	54.6	3.9
Juneau	60.7	56.9	3.8
Ketchikan	60.1	57.7	2.4
King Salmon	61.2	55.6	5.7
Kodiak	60.4	54.5	5.9
Kotzebue	63.8	54.6	9.2
McGrath	64.0	60.0	4.0
Nome	54.4	52.2	2.2
St. Paul Island	51.6	47.2	4.4
Talkeetna	65.2	60.2	5.1
Utqiagvik	48.3	40.8	7.5
Yakutat	59.6	54.4	5.2

As much as **ten stations out of the nineteen** analyzed stations set **new monthly temperature records** for the month of July (Table 2). For the sixth month in a row, Kotzebue set a new record, with mean temperature 3.8°F warmer than in 2009, second warmest June on record. Anchorage and Utqiagvik recorded mean monthly temperatures respectively 2.6 and 2.4°F warmer than the previous records of 2016 and 2017. In King Salmon and Talkeetna, this July was more than 1°F warmer than the second warmest July on record respectively in 1936 and 2003.

Table 2: Mean monthly air temperature records set in July 2019 among the analyzed stations, old records and years of old records.

Station	New Record (°F)	Year of old record	Old record (°F)
Anchorage	65.3	2016	62.7
Gulkana	62.4	1914	62.0
Homer	58.5	2016	57.9
King Salmon	61.2	1936	60.0
Kodiak	60.4	1936	60.3
Kotzebue	63.8	2009	60.0
McGrath	64.0	2017	63.4
Talkeetna	65.2	2003	64.2
Utqiagvik	48.3	2017	46.0
Yakutat	59.6	1930	58.9

Multiple stations set new highest temperature records for mean, minimum and maximum daily temperatures on specific days. In Cold Bay a new lowest temperature record for minimum daily temperature was set on July 29. All values and dates are listed in Table A1, A2 and A3 in the appendix. Figures 2 and 3 show daily mean temperature departures from normal for 2019 in Anchorage and in Gulkana. While red and blue bars represent positive and negative departures from normal, red and blue lines represent the highest and lowest values of mean daily temperature on record for each day of the year. Days in which red bars (positive departures) are higher than the red line indicate mean daily temperature records. As an example, the July temperature observations in Anchorage were extreme: on July 03<sup>th</sup>, 04<sup>th</sup>, 05<sup>th</sup>, 07<sup>th</sup>, 08<sup>th</sup>, 09<sup>th</sup>, and 16<sup>th</sup> 2019, the mean daily temperatures were the highest ever recorded on these specific days since the beginning of the time series (Figure 2, Table A1). On July 04<sup>th</sup>, 05<sup>th</sup>, 07<sup>th</sup> and 08<sup>th</sup>, 2019, records of maximum daily temperature were set in Anchorage (Table A2). Also the Anchorage minimum daily temperatures were the highest ever measured on the days of July 05<sup>th</sup>, 08<sup>th</sup>, 09<sup>th</sup>, 12<sup>th</sup> and 20<sup>th</sup> 2019 in these specific days (Table A3).

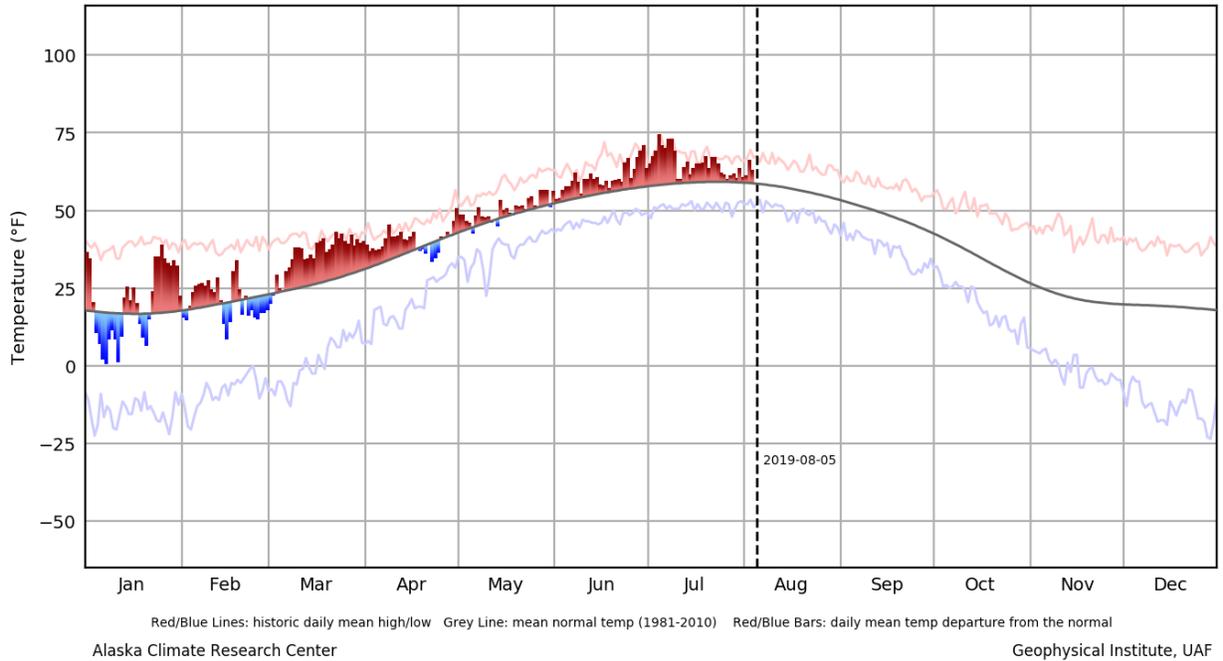


Figure 2: Anchorage daily mean temperature departures from normal (1981-2010) for 2019. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean daily temperature.

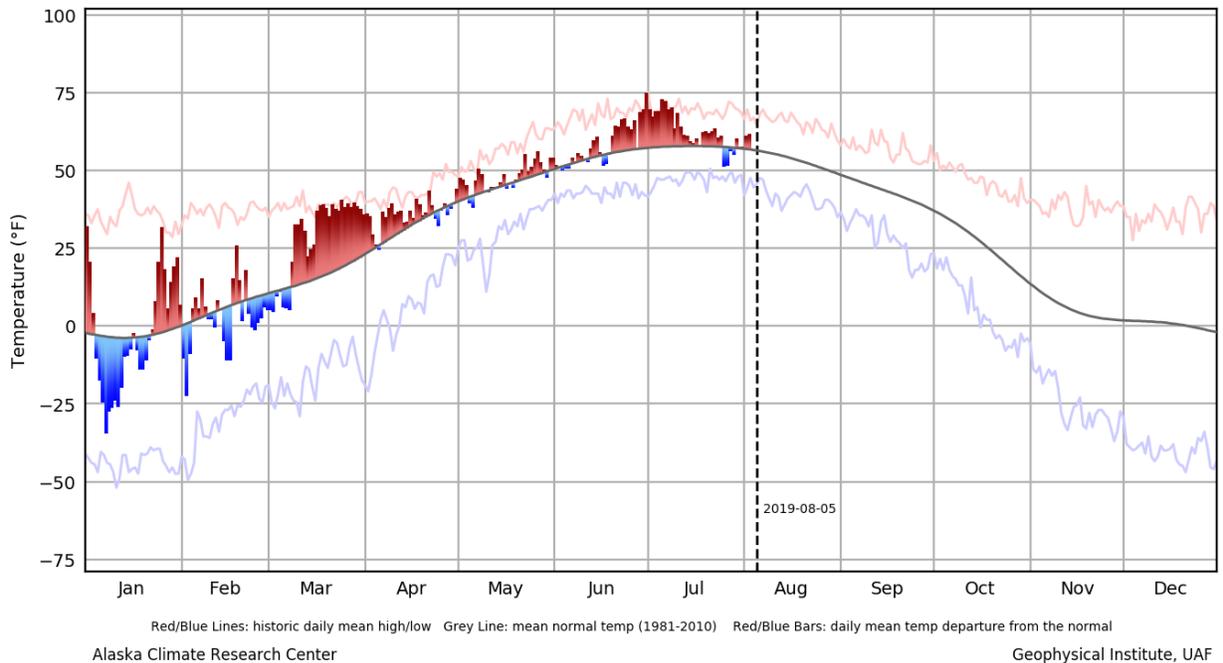


Figure 3: Gulkana daily mean temperature departures from normal (1981-2010) for 2019. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean daily temperature.

Figure 4 shows temperature deviations at all of the selected stations for each day of the month. Most of the stations show consistent positive deviations from normal throughout the entire month. Most of the stations recorded significantly warmer than normal temperatures especially during the first half of the month. Conversely, temperature departures from normal are relatively lower towards the end of the month, with some stations recording close to or cooler than normal mean daily temperatures.

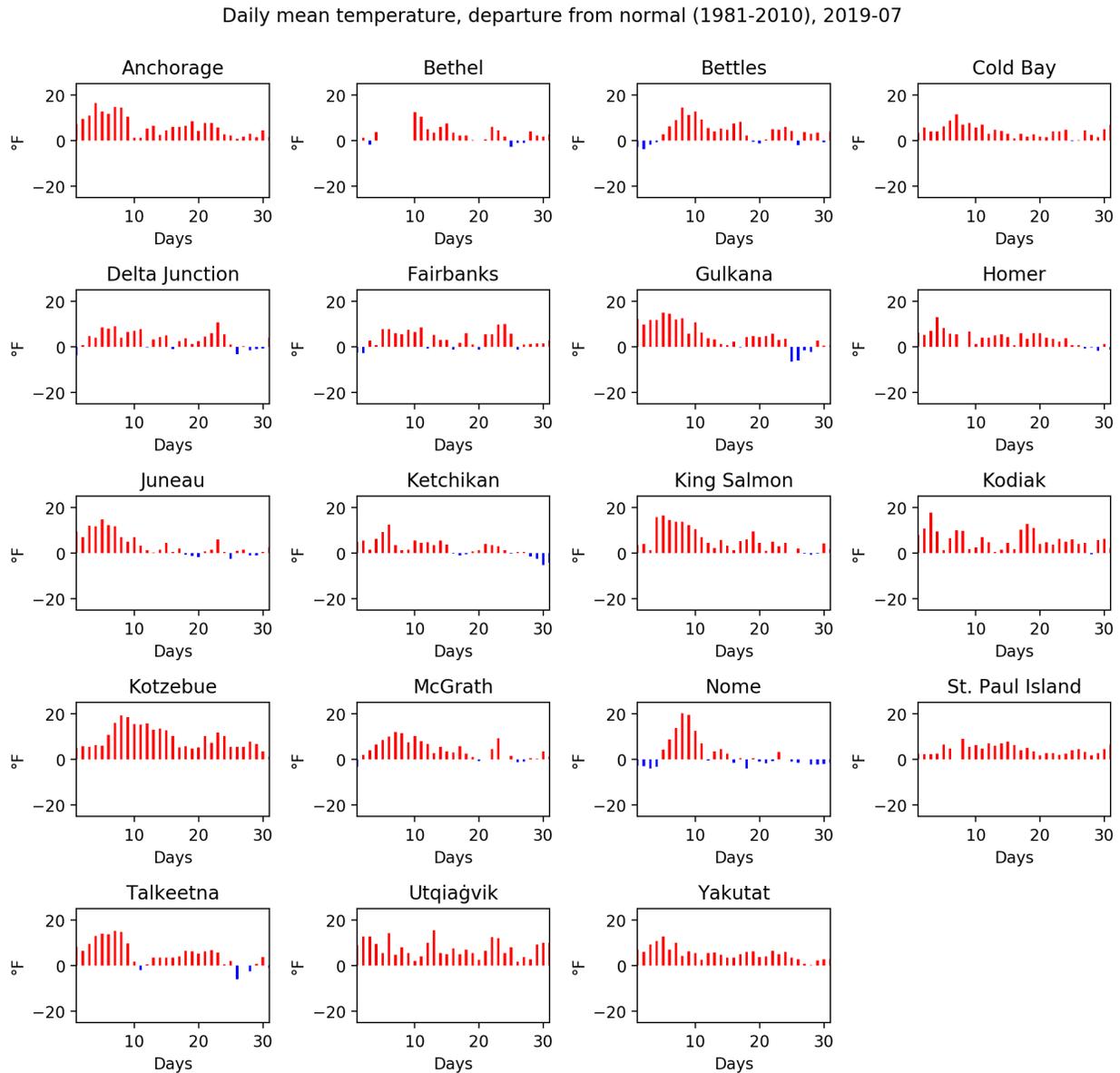


Figure 4: Daily mean temperature departures for each day in July 2019, at the selected stations.

## Precipitation

Following the trend of June 2019, in many locations, precipitation was significantly lower than normal in July 2019 (Figure 5, Table 3). While the western part of Alaska experienced more than normal precipitation, the eastern part saw drier than normal conditions. However, precipitation departures are quite variable in space and it is not straightforward to identify a clear spatial pattern (Figure 5, Table 3).

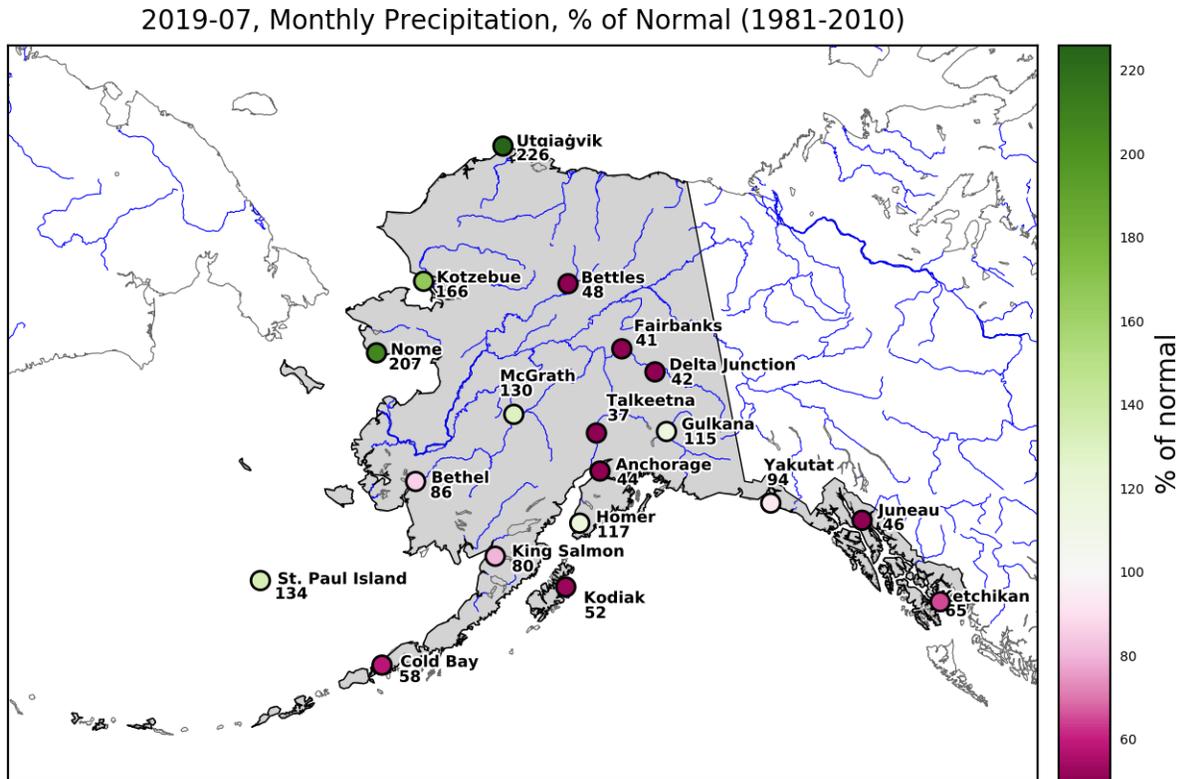


Figure 5: Monthly precipitation sums expressed as percent of normal (1981-2010), July 2019.

Many stations in the Interior, such as Bettles, Delta Junction, Fairbanks, Talkeetna recorded less than 50% of the normal precipitation for the month of July. Likewise, Anchorage, Cold Bay, and Kodiak in the South and Ketchikan and Juneau in the Southeast measured close to half of the normal amount of precipitation. Conversely, Gulkana, Homer, Yakutat, Bethel, and King Salmon saw close to normal precipitation during this month. In McGrath and St. Paul Island precipitation was roughly 130% of the normal value. Kotzebue recorded 165% of normal precipitation, while the highest departures from normal were measured in Nome and Utqiagvik with respectively 207 and 225% of normal precipitation.

Table 3: Monthly precipitation sum, normal (1981-2010) and departure expressed as a percentage of the normal (1981-2010) for selected stations throughout the state, July 2019.

<b>Station</b>	<b>Precipitation (in)</b>	<b>Normal (in)</b>	<b>% of normal</b>
Anchorage	0.8	1.8	43.7
Bethel	2.0	2.4	85.6
Bettles	1.1	2.4	47.9
Cold Bay	1.4	2.5	57.7
Delta Junction	1.1	2.7	42.2
Fairbanks	0.9	2.2	41.2
Gulkana	2.1	1.8	115.5
Homer	1.8	1.6	116.8
Juneau	2.1	4.6	46.3
Ketchikan	4.3	6.6	65.4
King Salmon	1.8	2.3	79.6
Kodiak	2.6	4.9	52.1
Kotzebue	2.4	1.5	165.5
McGrath	3.1	2.4	130.3
Nome	4.4	2.1	207.1
St. Paul Island	2.5	1.9	134.1
Talkeetna	1.3	3.4	37.2
Utqiagvik	2.2	1.0	225.5
Yakutat	7.4	7.9	94.0

Figure 6 shows the monthly precipitation sums at each station in inches. It can be seen how strongly precipitation varies between stations not only during the past month but also in the climatological mean, due to the diverse climatological conditions that can be found in Alaska. Juneau and Ketchikan in the Panhandle, as well as Kodiak and Talkeetna recorded significantly less than normal precipitation in absolute terms, with respectively 2.5, 2.3 2.3, and 2.1 inches less than the normal values for the month of July. Bettles, Cold Bay, Delta Junction and Fairbanks saw roughly 1 inch less rain than the average value for the period 1981-2010. Conversely, the two stations along the Arctic coast, Utqiagvik and Kotzebue recorded around 1 inch more than normal rain. In absolute terms, Nome measured the highest positive departure from normal, with 2.3 inches of more precipitation.

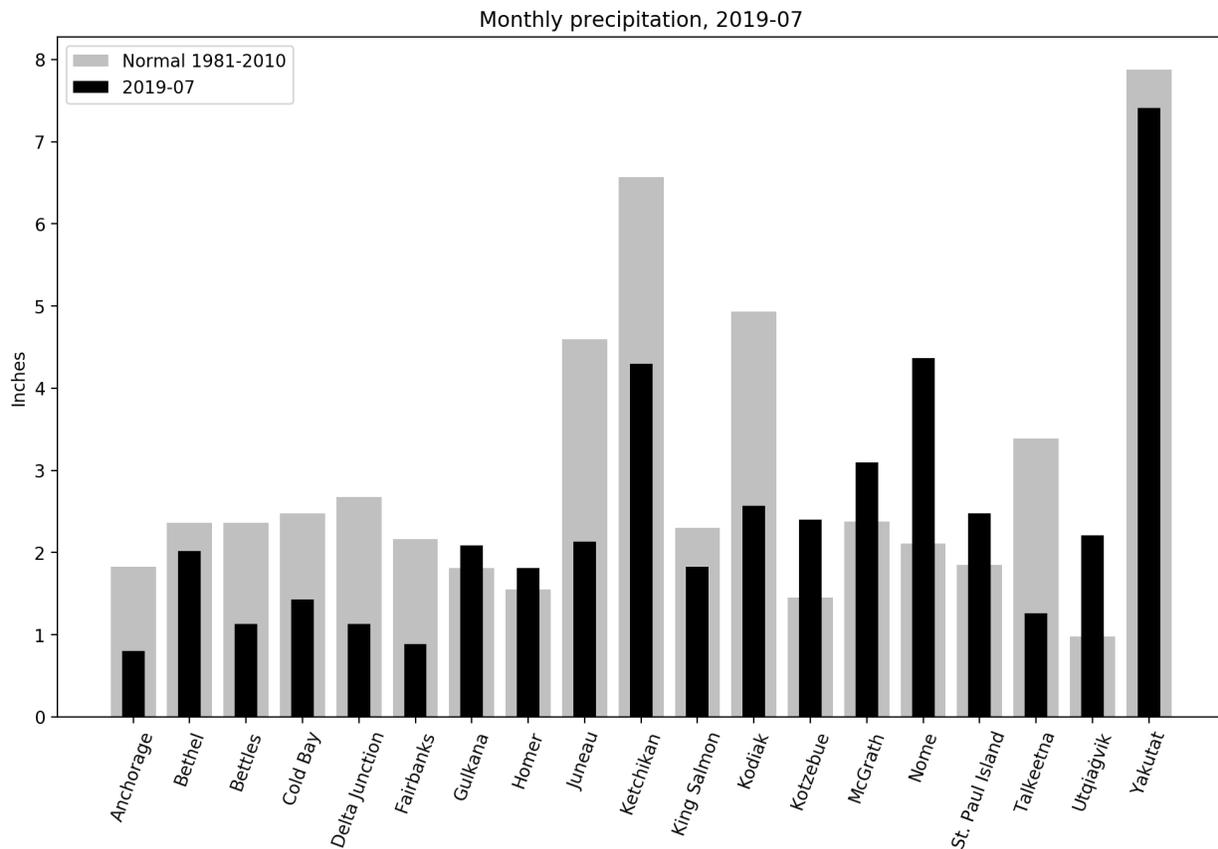


Figure 6: Monthly precipitation sums for July 2019 at the selected stations compared to the normal (1981-2010), in inches.

**DROUGHT WARNING:** Below normal precipitation along the southeastern Panhandle prolongs and intensifies the drought conditions experienced since more than one year (Figure 7). While the southern part of the Panhandle is still subject to severe and extreme drought, in Juneau the situation got worse during last month, by going from abnormally dry to moderate drought (Figure 7). In addition, compared to previous months, most of Alaska territory started to suffer abnormally dry conditions (Figure 7). From moderate to severe drought is observed in parts of the northeast Interior, fueling current wildfires (source: <https://droughtmonitor.unl.edu>).

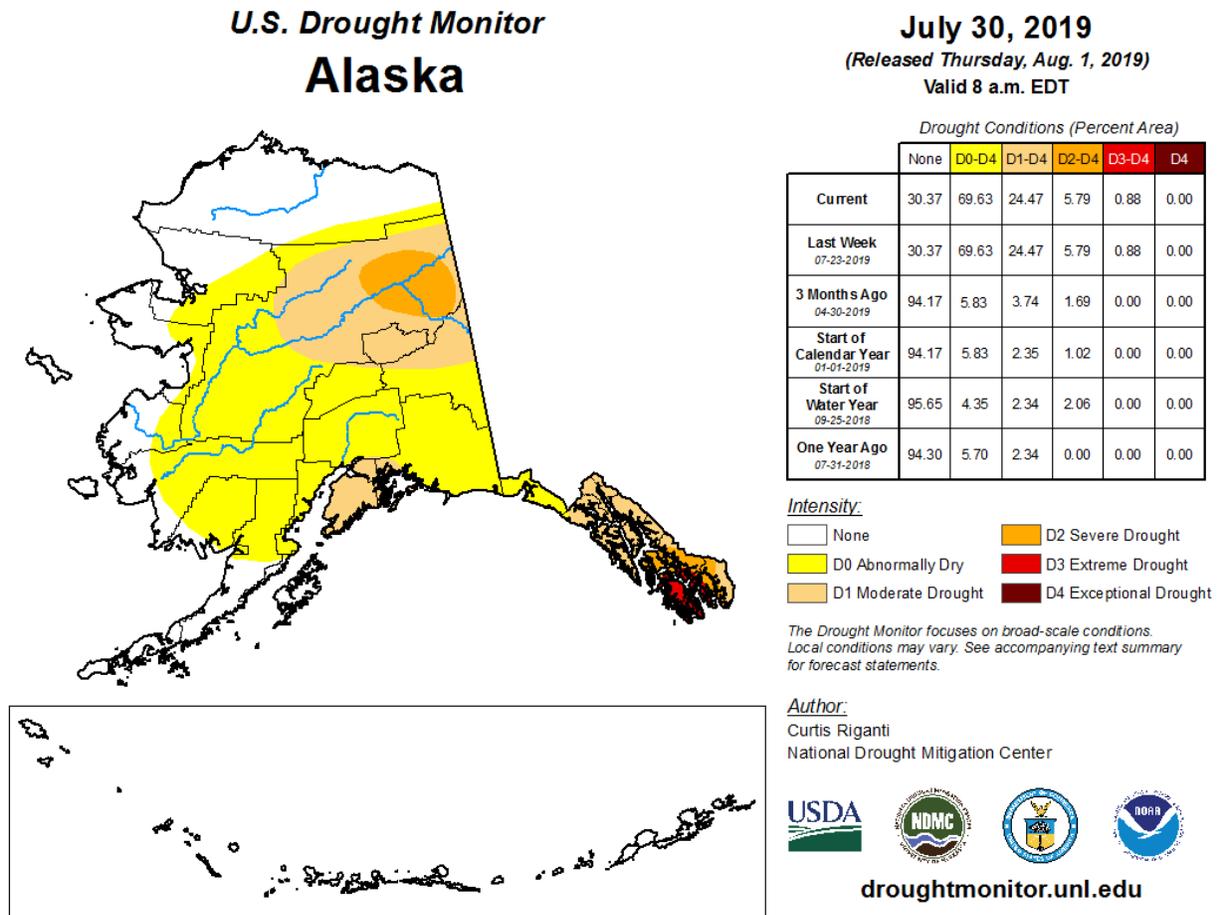


Figure 7: U.S. Drought Monitor map for Alaska, updated on 30 July 2019. Table on the right shows the percent area affected by different categories of drought intensity. Figures and data produced and released by the U.S. Drought Monitor, a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration (<https://droughtmonitor.unl.edu>).

## Arctic Sea Ice

Figure 8 and Figure 9 show respectively the time series of daily Arctic sea ice extent and the ice concentration updated until August 01, 2019.

This month the sea ice extent has decreased by more than 37%, from the level of roughly 9.6 M km<sup>2</sup> measured on 27 June 2019 to the level of 6.0 M km<sup>2</sup> of 01 August 2019 (yellow line in Figure 8). The current level of sea ice extent is well below the 1981-2010 median value and it is also below the previous all-time low level in 2012 (green line in Figure 8), and so we are currently observing the all-time low for this time of the year.

Warmer temperatures together with clear skies associated to persistent high pressure over the Arctic Ocean, enhanced surface melt and sea ice loss.

Generally, during the first half of July, ice loss is at its highest rates. The average daily loss rate for the period 1981-2010 is equal to 80.000 km<sup>2</sup>. However, in recent years, daily loss rates have been usually higher. In particular, this year, loss rates exceeding 100.000 km<sup>2</sup> per day have been measured during several days during the first half of July. These values match loss rates observed in 2012, the year characterized by the lowest September Arctic sea ice extent on record (green line in Figure 8).

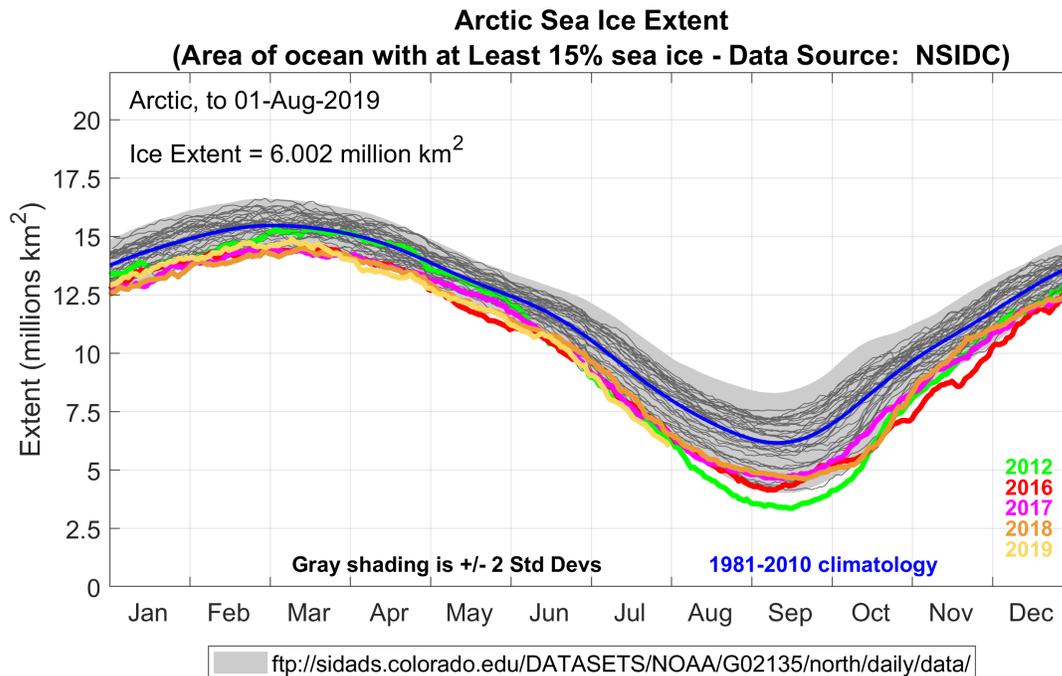


Figure 8: Time series of daily Arctic sea ice extent. This year's data (yellow) are updated until August 1, 2019. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (NSIDC; <https://nsidc.org/>).

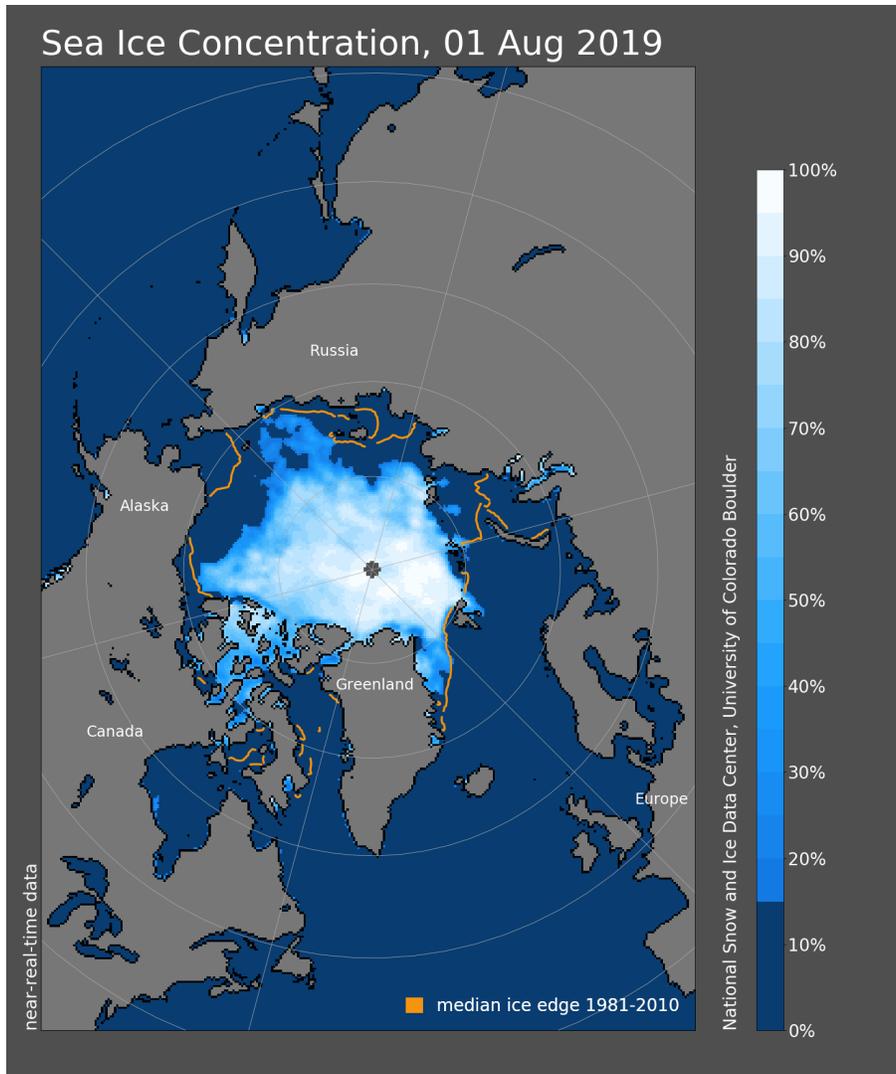


Figure 9: Daily Arctic Sea Ice concentration on August 1, 2019. Median ice edge for the 1981-2010 reference period is depicted in yellow. Very low and equal to zero sea ice concentration are observed in the Bering, Chukchi and Beaufort Sea. Image: NSIDC (nsidc.org)

Fast decline in sea ice extent is substantially affecting arctic ecosystem and local population which are experiencing changes in hunting and fishing, as well as problems related to coastal erosion. Due to very low sea ice extent, several thousand Pacific walrus moved to a barrier island off the coast of Point Lay in the Chukchi Sea, about 1100 km northwest of Anchorage. Usually walrus move on shore when there is not enough sea ice for the youngest to rest. This is the earliest such a large number of walrus gathered ashore since 2007.

## Wildfire Activity

During last month, wildfire season exploded, reaching a total burnt area of almost 1 M km<sup>2</sup> (2.37 M acres), roughly 80% of which during the last month of July 2019 (0.78 M km<sup>2</sup>, 1.93 M acres). Persistent warm and dry weather conditions, together with extreme lightning activity, fueled wildfires across the entire state. Data of the Alaska Interagency Coordination Center (<https://fire.ak.blm.gov/predsvcs/maps.php>), updated on 2 August 2019 report a total of 250 fires currently in Alaska (Figure 10). More damp weather and precipitation occurred the end of the month, which greatly reduced the fire activity, and thus the amount of smoke being produced across the central interior.

In Anchorage and Fairbanks, Alaska most populous cities, this is, so far, the smokiest summer of record with 15 days of restricting visibility. Air quality has been harmfully low in many areas of Alaska. Concentrations of particulate matter have surged to dangerous levels around Fairbanks and surrounding communities.

Spread wildfires led to evacuation of population in many areas across the state.

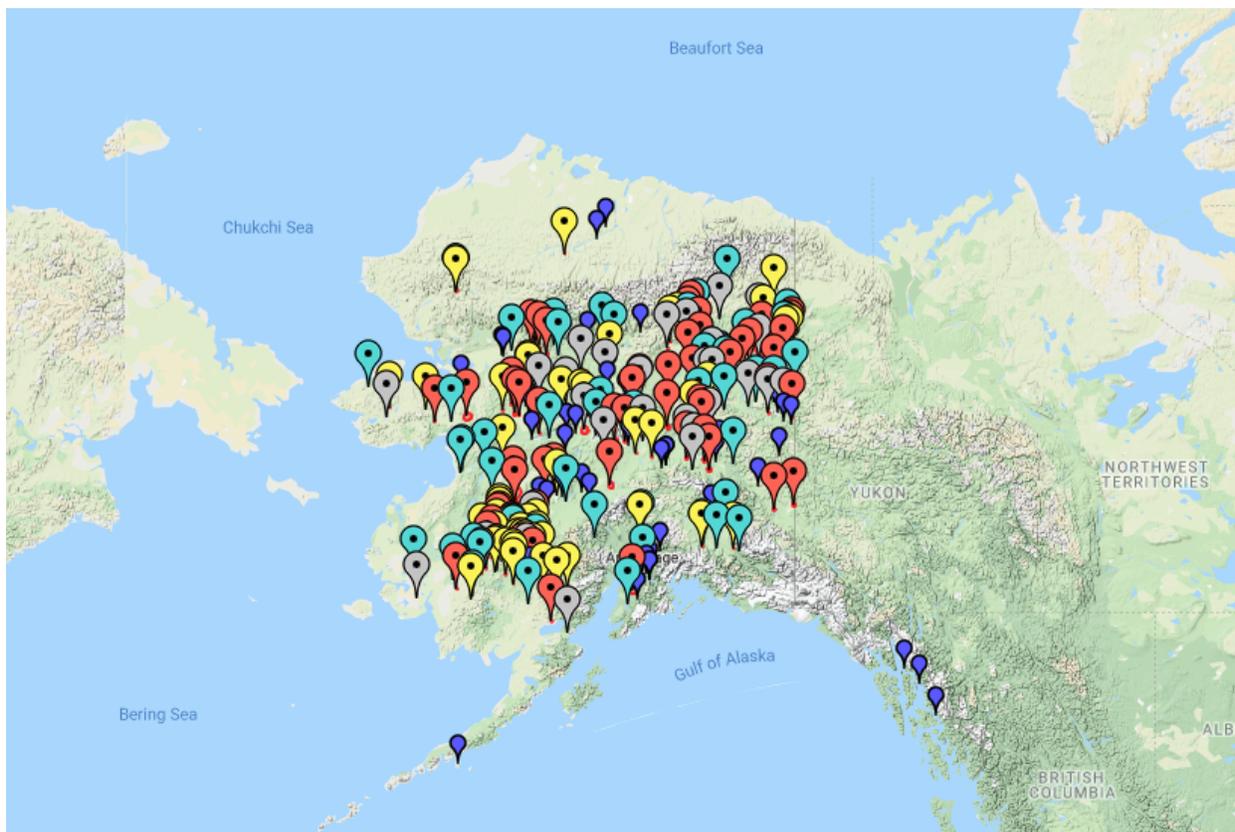


Figure 10: Map of current wildfires updated on 05 August 2019, from the UAFsmoke website (<http://smoke.alaska.edu>). Data are from the Alaska Interagency Coordination Center. Circles represent the size, but not the shape, of the fire. Fires that have not been updated in more than a week are shown with grey markers.

Please check our UAFSmoke webpage at <http://smoke.alaska.edu> for updated fire information. UAFSmoke shows current wildfire status information (Figure 10) and up to 72 hours forecast of concentrations of black carbon and particulate matter included in wildfire smoke.

*This information consists of preliminary climatological data compiled by the Alaska Climate Research Center, Geophysical Institute, University of Alaska Fairbanks. For more information on weather and climatology, visit the center web site at <http://akclimate.org>. Please report any errors to [webmaster@akclimate.org](mailto:webmaster@akclimate.org).*

## Appendix

Table A1: June 2019 daily records of mean daily temperature (avgt), i.e. highest/lowest values of mean daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. Only maximum records are set this month.

<b>Highest Mean Daily Temperature (avgt) on record</b>				
<b>Station</b>	<b>Date</b>	<b>New Record (°F)</b>	<b>Year of old record</b>	<b>Old record (°F)</b>
Anchorage	2019-07-03	69	1979	68.5
Anchorage	2019-07-04	74.5	1999	67
Anchorage	2019-07-05	71	1999	68
Anchorage	2019-07-07	73	2018	69
Anchorage	2019-07-08	73	2003	71.5
Anchorage	2019-07-09	69	1976	67.5
Anchorage	2019-07-16	65	2016	64.5
Bettles	2019-07-08	75.5	1982	74
Bettles	2019-07-10	73.5	1972	71
Cold Bay	2019-07-06	58.5	2014	56.5
Cold Bay	2019-07-07	61.5	2007	57
Cold Bay	2019-07-09	58	1971	56
Delta Junction	2019-07-07	70	2009	69.5
Gulkana	2019-07-01	69.5	1997	66.5
Gulkana	2019-07-03	69	1958	68.5
Gulkana	2019-07-05	72.5	1951	67.5
Gulkana	2019-07-06	72	1914	67
Gulkana	2019-07-07	69.5	1976	67.5
Homer	2019-07-01	59.5	1974	58.5
Homer	2019-07-03	60.5	1936	59.5
Homer	2019-07-04	66.5	2018	61
Juneau	2019-07-01	65.5	1992	65
Juneau	2019-07-03	68	1999	66
Juneau	2019-07-04	68	2018	67
Juneau	2019-07-05	71	2018	66.5
King Salmon	2019-07-04	70.5	1997	67.5
King Salmon	2019-07-05	71.5	1997	64
King Salmon	2019-07-06	69.5	1944	64.5
King Salmon	2019-07-07	69	1972	64

King Salmon	2019-07-08	69	2003	66
King Salmon	2019-07-09	67.5	1951	65.5
King Salmon	2019-07-19	65.5	1939	65
Kodiak	2019-07-03	70.5	1979	67.5
Kotzebue	2019-07-08	73.5	1968	71.5
Kotzebue	2019-07-09	73	1968	70.5
Kotzebue	2019-07-10	70	1972	69.5
Kotzebue	2019-07-11	70	1957	69.5
Kotzebue	2019-07-14	68.5	1949	66.5
Kotzebue	2019-07-15	68	1978	65
Kotzebue	2019-07-16	65.5	1974	65
McGrath	2019-07-07	73	2009	72
McGrath	2019-07-08	72.5	1982	71.5
Nome	2019-07-08	72.5	1968	68.5
Nome	2019-07-09	72	1968	68
St. Paul Island	2019-07-05	52.5	2016	51
St. Paul Island	2019-07-06	51	1996	50.5
St. Paul Island	2019-07-08	55.5	2005	52
St. Paul Island	2019-07-09	52	2016	51
St. Paul Island	2019-07-10	53	2005	51.5
St. Paul Island	2019-07-12	54	2005	52.5
Talkeetna	2019-07-05	74	2014	68.5
Talkeetna	2019-07-06	74	2015	72
Talkeetna	2019-07-07	75.5	2009	71.5
Talkeetna	2019-07-08	75	2003	71.5
Talkeetna	2019-07-09	70	2003	69.5
Utqiagvik	2019-07-06	55	2015	54.5
Yakutat	2019-07-01	60	1926	58
Yakutat	2019-07-04	64	1951	61
Yakutat	2019-07-05	66	1972	63

Table A2: June 2019 daily records of maximum daily temperature (maxt), i.e. highest/lowest values of maximum daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. Only maximum records are set this month.

<b>Highest Maximum Daily Temperature (maxt) on record</b>				
<b>Station</b>	<b>Date</b>	<b>New Record (°F)</b>	<b>Year of old record</b>	<b>Old record (°F)</b>
Anchorage	2019-07-04	90	1999	77
Anchorage	2019-07-05	81	1999	77
Anchorage	2019-07-07	85	2009	79
Anchorage	2019-07-08	85	2003	84
Bettles	2019-07-08	89	2017	86
Bettles	2019-07-09	88	1972	85
Bettles	2019-07-10	90	1972	87
Cold Bay	2019-07-05	70	2014	65
Cold Bay	2019-07-06	69	2014	67
Cold Bay	2019-07-07	72	2007	66
Delta Junction	2019-07-07	83	1958	82
Fairbanks	2019-07-09	87	1946	85
Gulkana	2019-07-04	88	1958	86
Gulkana	2019-07-05	90	1972	84
Gulkana	2019-07-06	90	2015	86
Gulkana	2019-07-07	89	1944	83
Homer	2019-07-04	78	2018	71
King Salmon	2019-07-04	89	1997	84
King Salmon	2019-07-05	88	1949	80
King Salmon	2019-07-07	84	1951	81
King Salmon	2019-07-08	83	2003	82
Kodiak	2019-07-03	83	2018	77
McGrath	2019-07-05	86	1997	85
McGrath	2019-07-08	89	1982	88
McGrath	2019-07-10	85	1944	84
St. Paul Island	2019-07-08	59	1961	56
St. Paul Island	2019-07-10	57	2005	55
St. Paul Island	2019-07-14	62	1960	61
Talkeetna	2019-07-05	89	1972	86
Talkeetna	2019-07-06	90	1972	88
Talkeetna	2019-07-07	93	2009	89
Talkeetna	2019-07-08	91	2003	89

Table A3: June 2019 daily records of minimum daily temperature (mint), i.e. highest/lowest values of minimum daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. One minimum record was set this month.

**Lowest Minimum Daily Temperature (mint) on record**

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Cold Bay	2019-07-29	40	1954	41

**Highest Minimum Daily Temperature (mint) on record**

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Anchorage	2019-07-05	61	1984	60
Anchorage	2019-07-08	61	1968	59
Anchorage	2019-07-09	62	2003	59
Anchorage	2019-07-12	60	1977	59
Anchorage	2019-07-20	59	1973	58
Bethel	2019-07-10	60	1963	57
Bethel	2019-07-11	61	1951	58
Bethel	2019-07-18	55	1935	54
Cold Bay	2019-07-09	54	1992	50
Fairbanks	2019-07-24	63	1990	62
Fairbanks	2019-07-25	61	2013	59
Gulkana	2019-07-05	55	1958	54
Homer	2019-07-01	54	1974	53
Juneau	2019-07-03	57	1997	55
Juneau	2019-07-04	56	1992	54
Juneau	2019-07-05	59	1998	56
Juneau	2019-07-23	56	1950	55
King Salmon	2019-07-06	56	1989	53
King Salmon	2019-07-07	54	2017	53
King Salmon	2019-07-08	55	1928	54
King Salmon	2019-07-19	58	1939	56
Kodiak	2019-07-12	55	1953	54
Kotzebue	2019-07-07	64	2014	62
Kotzebue	2019-07-08	66	1982	62
Kotzebue	2019-07-09	69	1972	63
Kotzebue	2019-07-10	65	1972	63
Kotzebue	2019-07-11	66	1972	62
Kotzebue	2019-07-12	66	1977	64
Kotzebue	2019-07-13	63	2016	62
Kotzebue	2019-07-14	63	2007	61
Kotzebue	2019-07-15	63	2004	59
Kotzebue	2019-07-16	61	1898	60
Kotzebue	2019-07-23	61	2015	60
Kotzebue	2019-07-24	62	2005	61

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Nome	2019-07-08	63	1912	58
Nome	2019-07-09	61	1972	58
St. Paul Island	2019-07-03	47	1967	46
St. Paul Island	2019-07-08	52	2005	48
St. Paul Island	2019-07-10	49	2005	48
St. Paul Island	2019-07-12	49	1967	48
Talkeetna	2019-07-07	58	1997	57
Talkeetna	2019-07-08	59	2009	58
Talkeetna	2019-07-20	60	2001	58
Utqiagvik	2019-07-01	43	1996	42
Utqiagvik	2019-07-02	43	1984	42
Utqiagvik	2019-07-03	47	1982	45
Utqiagvik	2019-07-04	46	1903	42
Utqiagvik	2019-07-22	51	2000	45
Utqiagvik	2019-07-23	50	1981	47
Utqiagvik	2019-07-30	45	1921	44
Yakutat	2019-07-01	57	1926	54
Yakutat	2019-07-02	57	1931	55
Yakutat	2019-07-03	56	1930	54
Yakutat	2019-07-05	55	2016	54
Yakutat	2019-07-12	57	1931	54
Yakutat	2019-07-19	58	2016	57

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