

Alaska Statewide Climate Summary

August 2019

AUGUST 2019 HIGHLIGHTS:

- **THE SOUTHERN PART OF ALASKA EXPERIENCED WARMER THAN NORMAL TEMPERATURES AND EXTREMELY DRY CONDITIONS; FROM ABNORMALLY DRY TO EXTREME DROUGHT WARNINGS WERE ISSUED; INTENSE WILDFIRE ACTIVITY EXTENDED ESPECIALLY SOUTH OF THE ALASKA RANGE AND THE KENAI THROUGHOUT THE ENTIRE MONTH DUE TO DRY AND WARM WEATHER. ANCHORAGE AND ITS SURROUNDINGS WERE CONTINUOUSLY DRY FOR THE WHOLE MONTH OF AUGUST, AND SMOKE FROM THE ‘SWAN LAKE’- AND OTHER FIRES MADE ANCHORAGE TO THE CITY WITH WORST AIR QUALITY THROUGHOUT THE U.S. THIS SUMMER.**
- **THE INTERIOR EXPERIENCED SUBSTANTIALLY WETTER AND COOLER THAN AVERAGE WEATHER; FLOODING WARNINGS WERE ISSUED IN FAIRBANKS; HEAVY RAIN CAUSED FLOODINGS, DAMAGES TO BUILDINGS AND LANDSLIDES ON THE NORTHERN SIDE OF THE ALASKA RANGE (DENALI BOROUGH).**
- **ARCTIC SEA ICE DECLINE HAS SLOWED DOWN THIS MONTH. HOWEVER, THE LEVEL OF SEA ICE EXTENT IS EXTREMELY LOW, WELL BELOW THE MEDIAN VALUE FOR THIS TIME OF THE YEAR; FISHING AND HUNTING ARE AFFECTED, COASTAL EROSION IS THREATENING LOCAL COMMUNITIES.**

The following report provides an overview of the August 2019 weather. The report is based on data from selected weather stations throughout the state of Alaska. “Departure from normal” refers to the climatological average over the 1981-2010 period.

Temperature

During August 2019, most of Alaska kept recording warmer than normal temperatures (Figure 1, Table 1). Only part of the Interior experienced negative temperature departures, breaking a period of mean monthly temperature values warmer than the 1981-2010 average, lasting since more than one year.

Fifteen stations out of the nineteen analyzed, measured positive temperature departures from normal (Figure 1, Table 1). The highest departures are recorded in the southern part of Alaska with Kodiak, Anchorage, and Cold Bay experiencing mean monthly values respectively equal to 61.7, 62.6, and 57.4°F, corresponding to 6.6, 5.9, and 5.3°F warmer than normal temperatures. Following are the northern stations of Kotzebue and Utqiagvik with 57.3 and 42.7°F, and St. Paul Island with 52.6°F, respectively 5.6, 3.7 and 3.8°F warmer than the average values for the period 1981-2010. Likewise, King Salmon and Homer in the South, Bethel in the West, and Yakutat in the East measured mean monthly temperatures more than 3°F warmer than normal. Also Juneau, Talkeetna, Gulkana and McGrath saw positive temperature departures equal respectively to 2.5, 2.0, 1.6, and 1.5°F. Ketchikan in the Panhandle and Nome along the west coast recorded close to normal temperatures, with mean monthly values respectively equal to 59.2 and 50.1 °F.

Conversely, negative temperature departures were recorded in the Interior with Fairbanks, Bettles and Delta Junctions, measuring average temperatures equal respectively to 55.6, 52.1, and 52.9°F, -0.5, -0.4, and -1.9 °F cooler than normal.

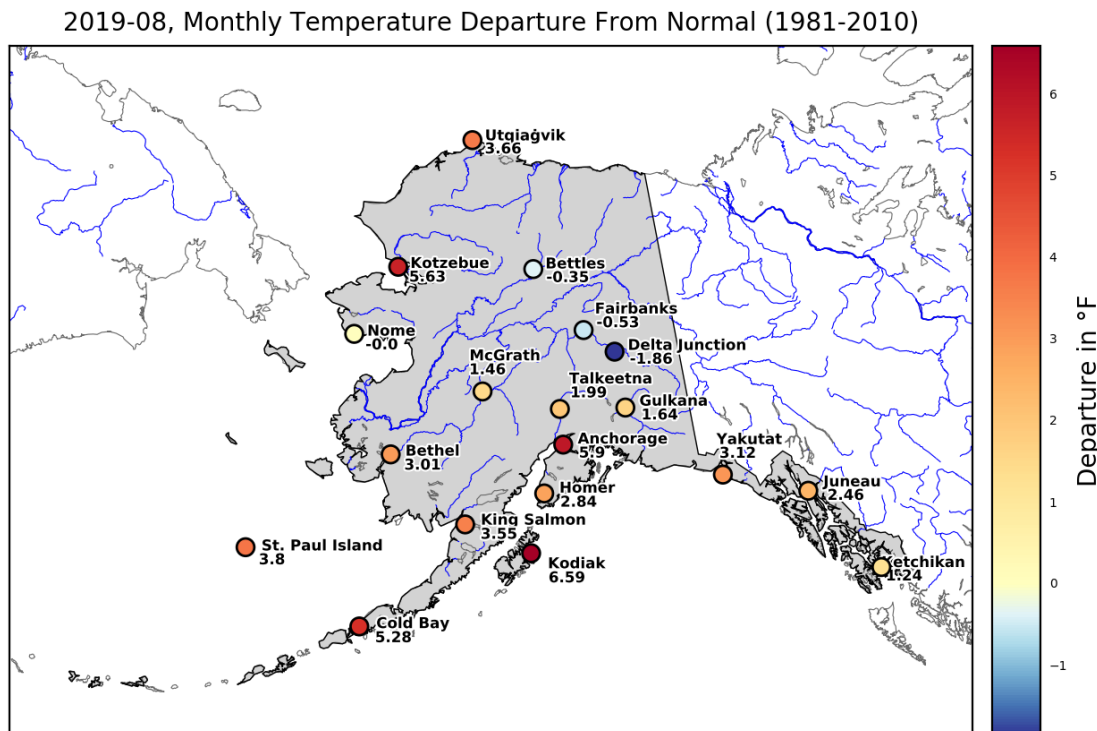


Figure 1: Monthly mean temperature departure from normal, August 2019.

Three stations set new records of mean monthly temperature for the month of August (Table 2). With 62.7°F, Anchorage recorded a mean monthly temperature respectively 1.5 and 2.2°F warmer than in 2004 and 2016, second and third warmest Augusts on record. Also Kodiak set a new temperature record, as much as 2.9 °F warmer than the previous one of 2016. In Cold Bay, this August was almost 1°F warmer than the second warmest August on record occurred in 2016.

During August 2019, multiple stations set new temperature records for mean, minimum and maximum daily temperatures on specific days. A few stations set also new lowest temperature records on specific days. All values and dates are listed in Table A1, A2 and A3 in the appendix.

Figures 2 and 3 show mean daily temperature departures from normal for 2019 in Anchorage and in Kodiak. 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, in Anchorage, on 07, 08, 10, 13, 14, 15, 16, and 17 August 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). Likewise, on 07, 09, 15

and 16 August 2019, Kodiak saw the highest mean daily temperatures ever recorded in these days (Figure 3, Table A1). Conversely, in Delta Junction and Gulkana, the mean daily temperature was never recorded as low as this year on August 19 (Table A1).

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

Station	Observed (°F)	Normal (°F)	Departure (°F)
Anchorage	62.6	56.7	5.9
Bethel	56.5	53.5	3.0
Bettles	52.1	52.5	-0.4
Cold Bay	57.4	52.1	5.3
Delta Junction	52.9	54.8	-1.9
Fairbanks	55.6	56.1	-0.5
Gulkana	55.4	53.5	1.6
Homer	56.7	53.9	2.8
Juneau	58.3	55.8	2.5
Ketchikan	59.2	58.0	1.2
King Salmon	58.1	54.6	3.5
Kodiak	61.7	55.2	6.6
Kotzebue	57.3	51.7	5.6
McGrath	56.0	54.6	1.5
Nome	50.1	50.1	-0.0
St. Paul Island	52.6	48.9	3.8
Talkeetna	58.6	56.7	2.0
Utqiagvik	42.7	39.0	3.7
Yakutat	57.0	53.9	3.1

Table 2: Mean monthly air temperature records set in August 2019, old records and years of old records.

Station	New Record (°F)	Year of old record	Old record (°F)
Anchorage	62.7	2004	61.2
Cold Bay	57.4	2016	56.5
Kodiak	61.7	2016	58.9

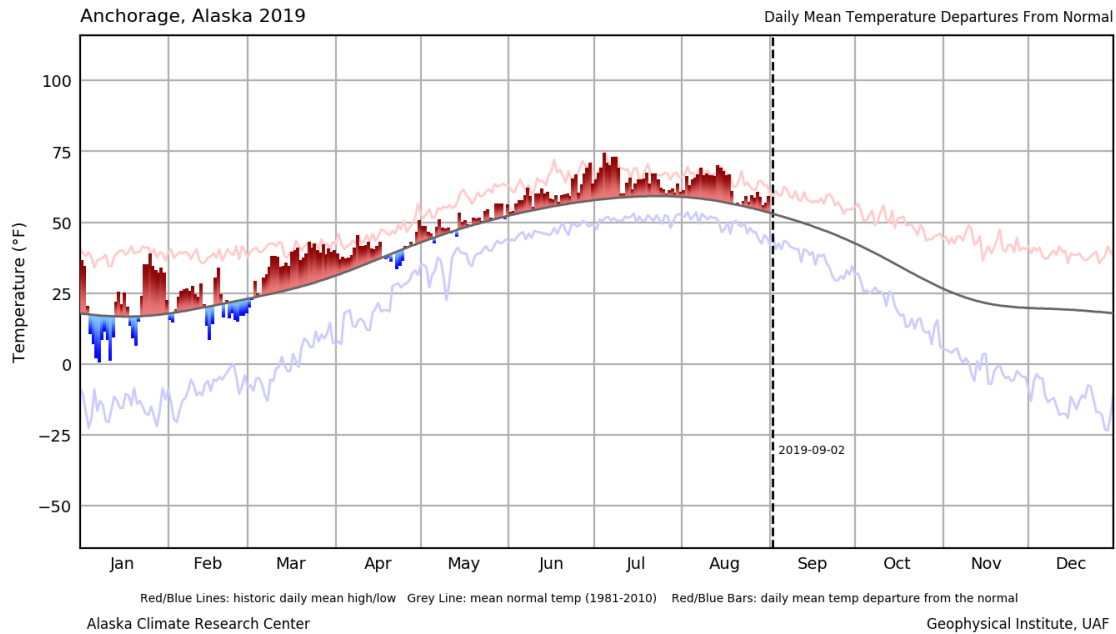


Figure 2: Anchorage daily mean temperature departures from normal (1981-2010) for 2019. Red and blue bars represent positive and negative temperature departures. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean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

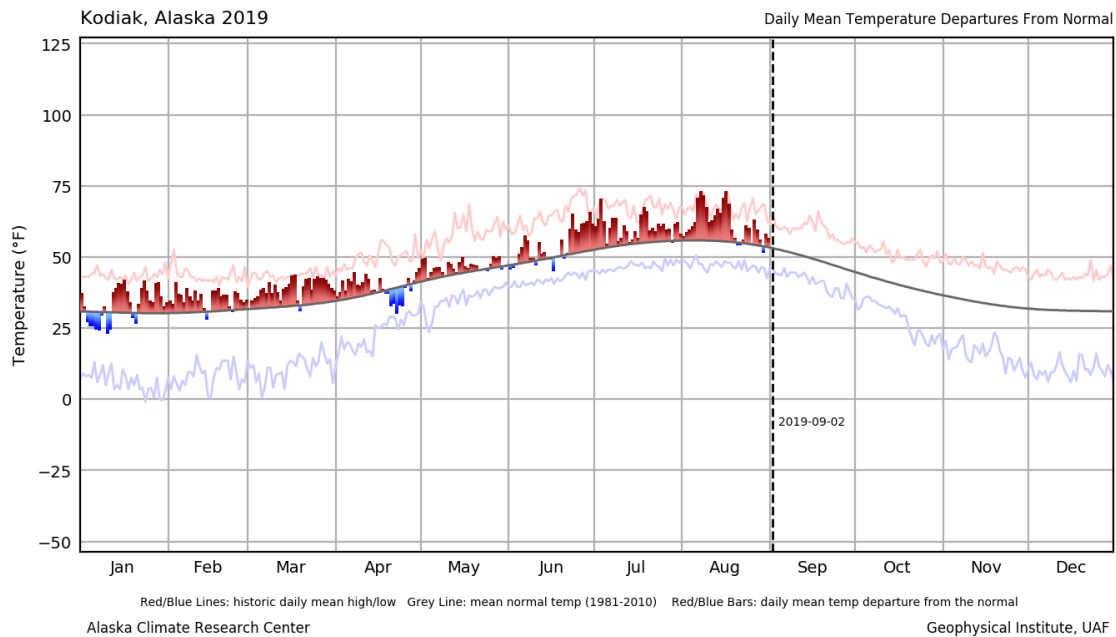


Figure 3: Kodiak daily mean temperature departures from normal (1981-2010) for 2019. Red and blue bars represent positive and negative temperature departures. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean daily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

Daily mean temperature, departure from normal (1981-2010), 2019-08

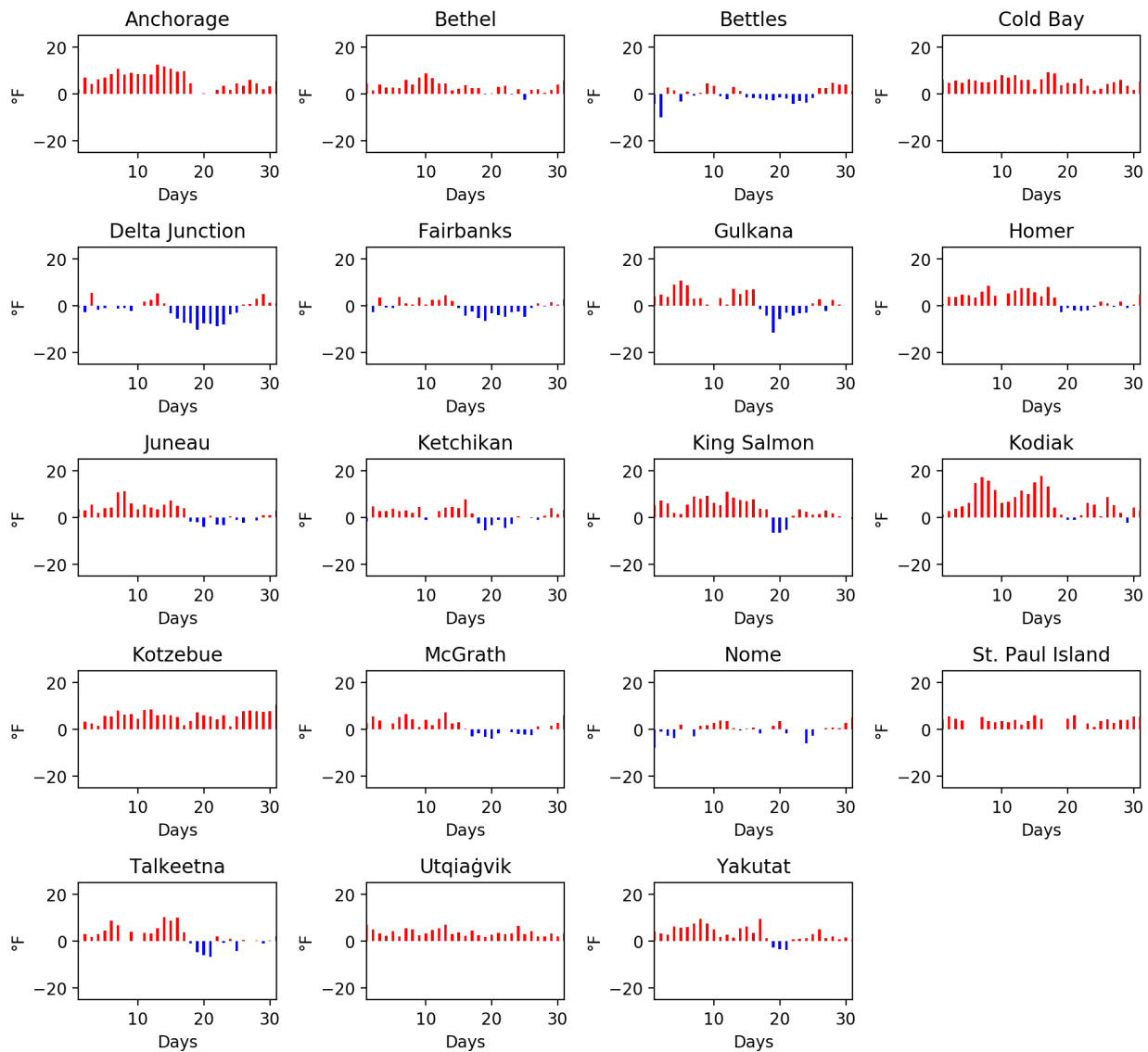


Figure 4: Daily mean temperature departures for each day in August 2019, at the selected stations.

Precipitation

This month, precipitation shows a fairly clear separation between the southern and the central-northern part of Alaska (Figure 5, Table 3).

The south recorded extremely low precipitation (Figure 5, Table 3). In Anchorage no precipitation at all was measured during the entire month. Talkeetna and Yakutat saw respectively only 6% and 7% of normal precipitation. Less than 30% of normal precipitation was observed also in Kodiak, King Salmon, Homer, and Gulkana. Slightly more precipitation, in relative terms, was measured in Cold Bay with 57% of normal rainfall.

The western and southeastern part of Alaska recorded closer to normal precipitation than the South (Figure 5, Table 3). While Bethel measured normal values of rainfall, in McGrath and Kotzebue in the west, and in Juneau in the southeast, precipitation was between 84 and 90% of normal. Ketchikan recorded 117% of normal rainfall and St. Paul Island 128%.

Conversely, August 2019 was significantly wetter than normal in the Interior and along the North Slope (Figure 5, Table 3). In particular, Fairbanks recorded the highest departure with almost 300% of normal rainfall, in Delta Junction and Utqiagvik precipitation was more than 200% of average values for the period 1981-2010. Also Bettles and Nome experienced positive precipitation deviations with respectively 134% and 143% of normal precipitation.

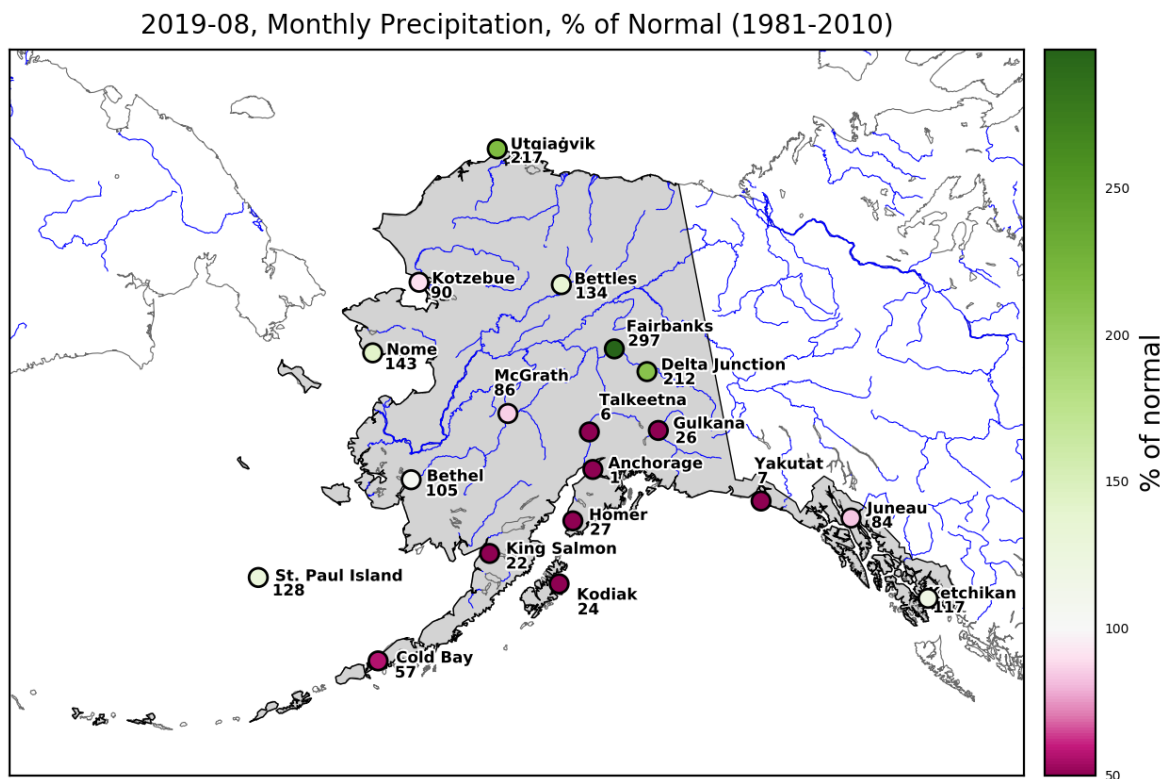


Figure 5: Monthly precipitation sums expressed as percent of normal (1981-2010), August 2019.

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, August 2019.

Station	Precipitation (in)	Normal (in)	% of normal
Anchorage	0.0	3.2	0.0
Bethel	3.4	3.3	104.6
Bettles	3.5	2.6	134.5
Cold Bay	2.1	3.7	57.1
Delta Junction	4.0	1.9	212.2
Fairbanks	5.6	1.9	296.8
Gulkana	0.5	1.8	25.6
Homer	0.6	2.3	27.4
Juneau	4.8	5.7	83.9
Ketchikan	11.5	9.8	116.8
King Salmon	0.6	3.0	22.0
Kodiak	1.1	4.6	24.1
Kotzebue	2.0	2.2	89.9
McGrath	2.4	2.8	86.4
Nome	4.6	3.2	143.2
St. Paul Island	3.9	3.1	128.3
Talkeetna	0.3	5.1	6.5
Utqiagvik	2.3	1.1	217.1
Yakutat	1.0	14.1	7.5

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.

Besides Anchorage, in which no precipitation at all was measured during this month, in Gulkana, Homer, King Salmon, Talkeetna, and Yakutat precipitation was extremely low in absolute terms with values equal or below 1 inch. Similarly, Kodiak recorded only 1.1 inches of rainfall. Yakutat shows the highest reduction of rainfall in absolute terms with 13.1 inches less than the normal amount equal to 14.1 inches (Table 3, Figure 6).

With respectively 5.6 and 4.0 inches, Fairbanks and Delta Junction in the Interior, showed the highest positive departures in absolute terms, measuring 3.7 and 2.1 inches more than normal precipitation values for the month of August. This is the third wettest August on record both in Fairbanks and in Delta Junction. Ketchikan, which recorded the highest precipitation amount in absolute terms among the analyzed stations, saw 11.5 inches of rain, 1.7 inches more than the normal value of 9.8 inches. Follow Nome, Utqiagvik, Bettles, and St. Paul Island with respectively 4.6, 2.3, 3.5, and 3.9 inches, roughly 1 inch more than normal.

Heavy rain between the end of July and the beginning of August caused flooding on the Dalton Highway from Mile 142 to 145. In Healy, the Dry Creek flooded causing landslides and damages to properties. The Denali Park Road was temporarily closed. A disaster declaration was signed

by the Denali Borough. Flood warnings have been issued in the Interior, especially for the upper Chena and the Salcha River.

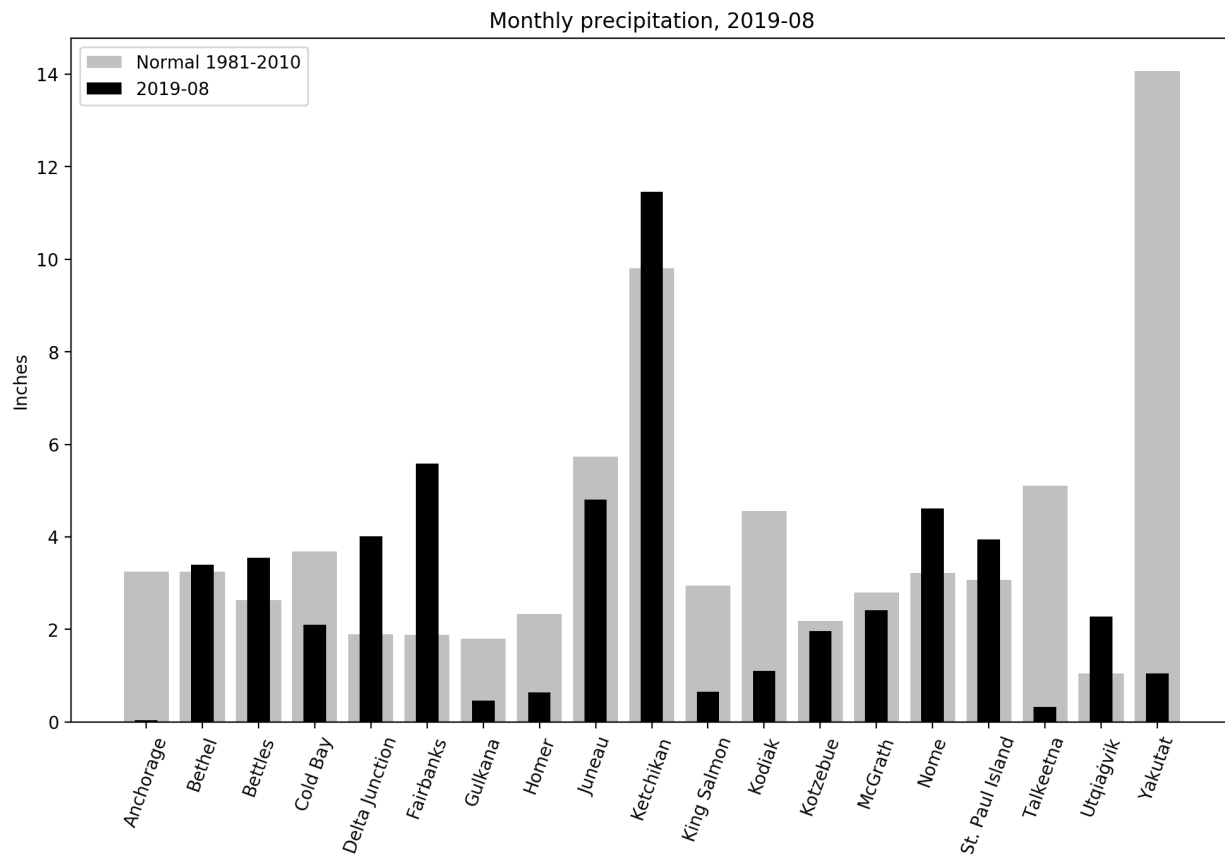


Figure 6: Monthly precipitation sums for August 2019 at the selected stations compared to the normal (1981-2010), in inches.

Drought Conditions

The spatial pattern of precipitation observed this month in Alaska, with exceptionally wet weather in the Interior and in the North Slope and extremely dry weather in the south (Figure 5, Figure 6), has substantially impacted the spatial distribution and intensity of drought conditions (source: <https://droughtmonitor.unl.edu>).

By the one hand, thanks to significantly higher than normal precipitation occurred this August, the Interior almost fully recovered from the drought conditions experienced during the previous month. Only a relatively small area close to the Canadian border, where last month severe drought was recorded, is still under abnormally dry conditions (Figure 7).

By the other hand, due to extremely low precipitation, drought has gotten substantially worse in the south. The area affected by abnormally dry conditions increased significantly during this month, and currently involve large part of the Aleutian (Figure 7). Anchorage, the Kenai Peninsula and Kodiak Island are now experiencing from severe to extreme drought (Figure 7).

Although in Juneau and Ketchikan precipitation in August was relatively close to normal (Figure 5), the Panhandle is still subject to drought with intensity ranging from moderate to severe and extreme towards southeast (Figure 7).

Extreme dry conditions have fueled wildfires during the month of August, especially in the region of Anchorage and in the Kenai Peninsula (for more details see chapter on page 14). Due to the prolonged and intense drought, the rainforest in southeast Alaska is weakened and currently under the threat of spruce bark beetles and hemlock saw flies. In some areas of the Panhandle, cuts in hydropower production have been forced, pushing local communities to switch to more expensive diesel power generation.

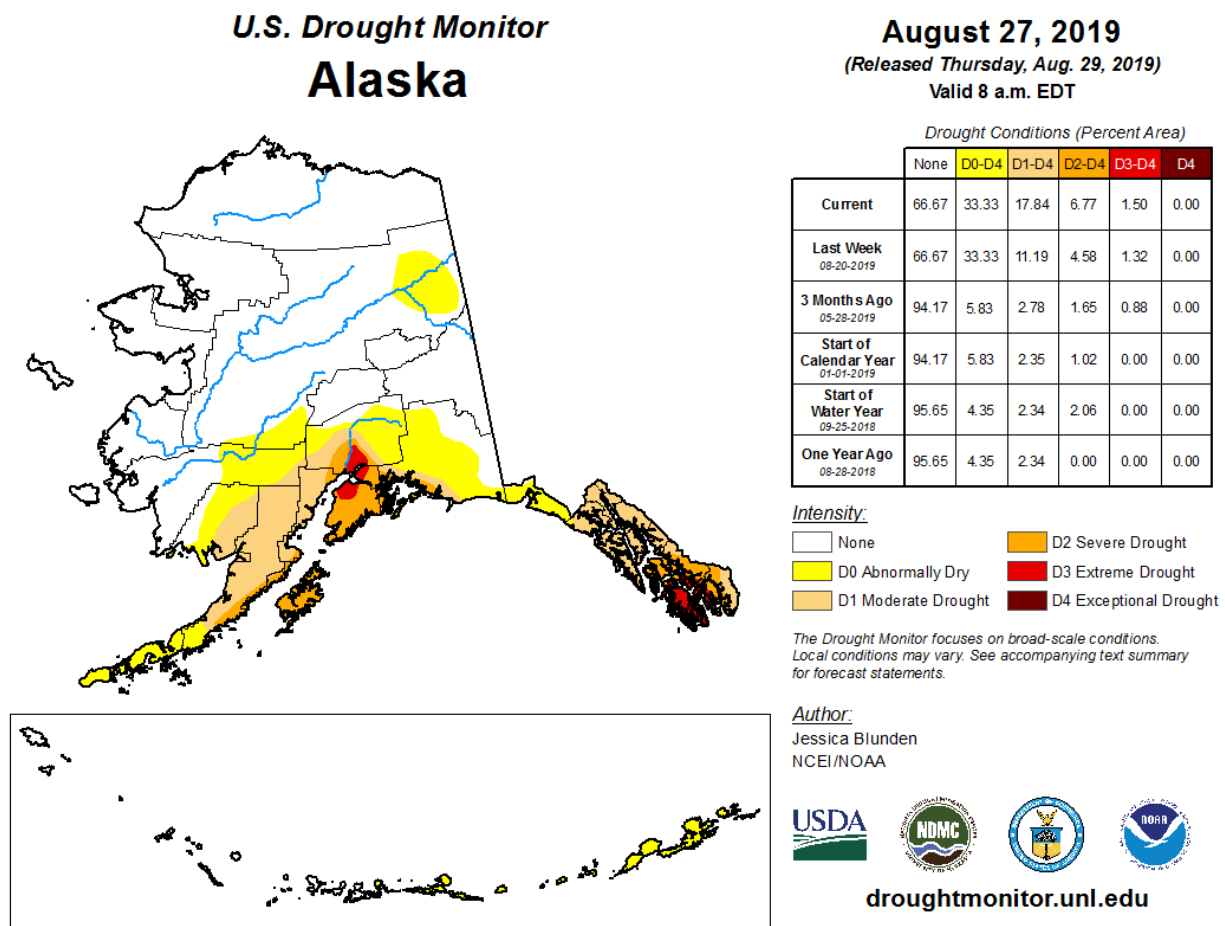


Figure 7: U.S. Drought Monitor map for Alaska, updated on 27 August 2019. Table on the right shows the percent area affected by different categories of drought intensity. Figures and data produced and released by the U.S. Drought Monitor, a partnership between the National Drought Mitigation Center at 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 the time series of daily Arctic sea ice extent and the ice concentration updated respectively until August 29 and 30, 2019.

This month the sea ice extent has decreased by more than 22.5%, from roughly 6.0 M km² measured on August 01, 2019, to 4.6 M km² measured on August 29, 2019 (yellow line in Figure 8). Arctic sea ice loss has slowed down during this month, and the current sea ice extent level is diverging above the all-time low level in 2012 (green line in Figure 8) and is now headed up a bit past the 2016 level (red line in Figure 8). However, the current level of sea ice extent keeps being well below the 1981-2010 median value (Figure 8).

Extreme sea ice decline keeps threatening the Arctic ecosystem and indigenous communities. Limited sea ice extent and longer sea ice-free season expose local residents to coastal erosion and flooding associated to fall and winter storms. The absence of sea ice has heavy impacts on wildlife, such as the massive walrus haul out observed this summer in the Arctic coasts. Hunting and fishing are substantially affected.

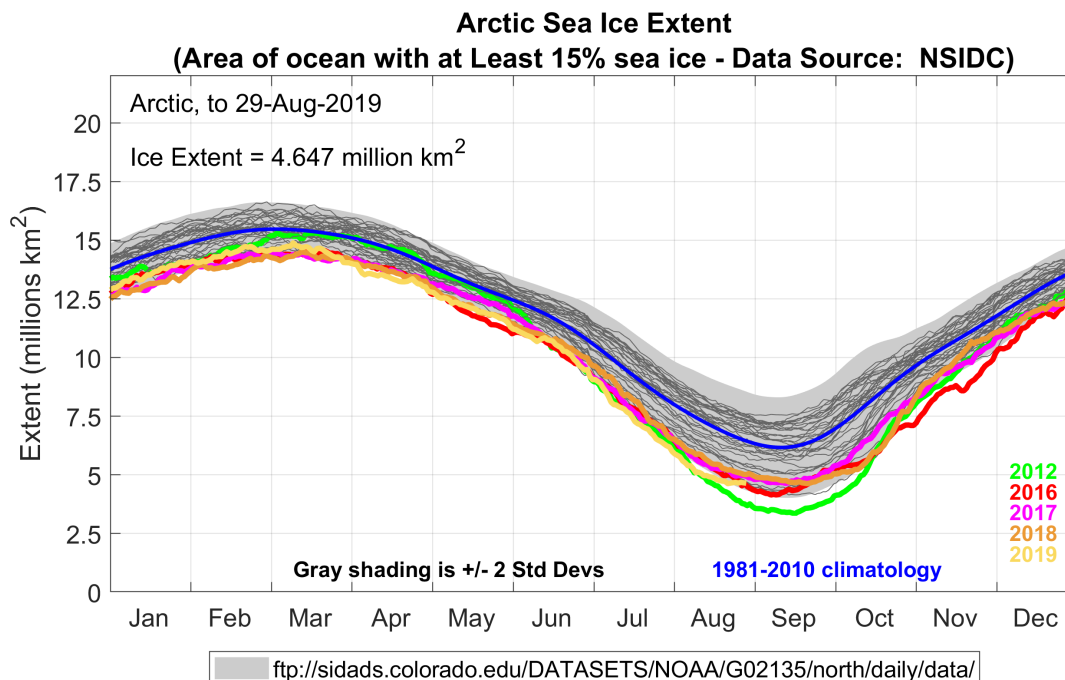


Figure 8: Time series of daily Arctic sea ice extent. This year's data (yellow) are updated until August 29, 2019. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (NSIDC; <https://nsidc.org/>).

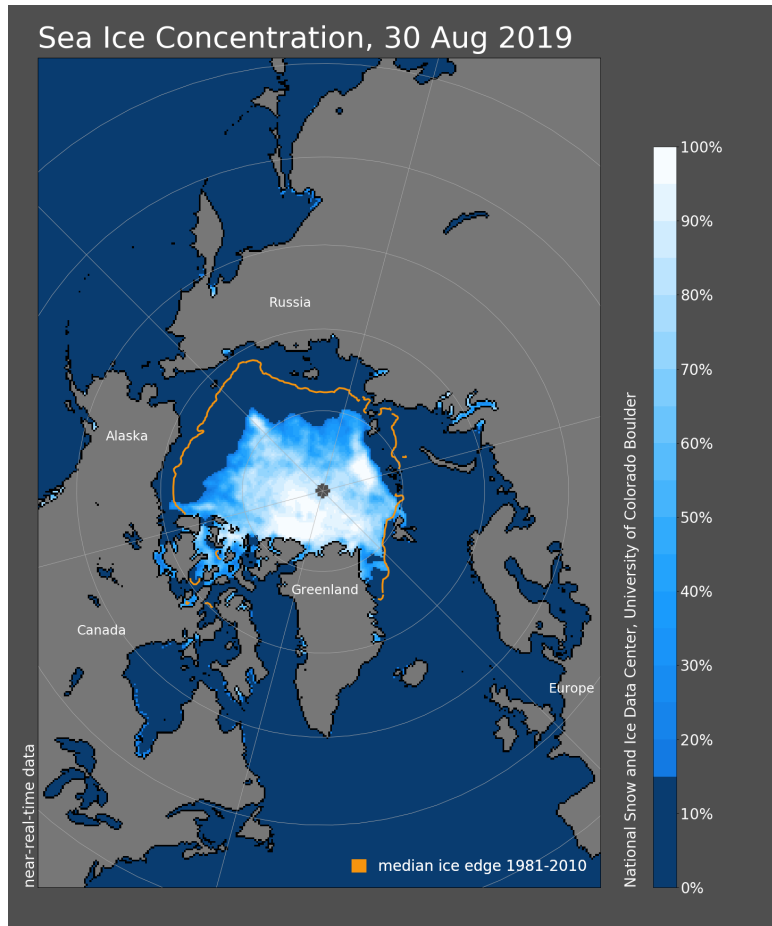


Figure 9: Daily Arctic Sea Ice concentration on August 30, 2019. Median ice edge for the 1981-2010 reference period is depicted in yellow. Very low and equal to zero sea ice concentration are observed in the Bering, Chukchi and Beaufort Sea. Image: NSIDC (nsidc.org)

Wildfire Activity

Wildfire season in Alaska ended sometimes in the past years with the onset of August precipitation. However, this year extremely warm and dry weather, combined with high speed winds, have prolonged and intensified wildfire activities in the state throughout the entire month of August.

McKinley fire, located 80 miles north of Anchorage along the Parks Highway, has started in the middle of August and covers currently 13.3 km² (3288 acres). As much as 50 homes, 3 businesses and 80 outbuildings, between Willow and Talkeetna, have been destroyed by the fire. Residents have been evacuated and hosted in RV's, trucks and at the Wasilla shelter. The Alaska Red Cross is working to secure funds for people who lost their residence and to figure out a future place for them to stay for the winter. While the Parks Highway remains open through the burned area, car stops are expected in the fire zone where crews continue working to tame the fire.

Due to the extremely dry and warm weather conditions, the Swan Lake fire, which was discovered at the beginning of June and was almost contained by the end of July, has flared up once again in August. The fire currently covers more than 650 km² (162179 acres). In Sterling and in Cooper Landing, Schools are closed and residents are ready to evacuate. The practicability of Sterling Highway has been limited, leading to delayed grocery deliveries and canceled hotel reservations in the Kenai Peninsula. Although the highway is currently open on both ways, delays are still expected between Sterling and the junction with the Seward Highway.

UAFSMOKE Wildfire Smoke Prediction for Alaska

PM-2.5: Particulate Matter (smoke particles 2.5 micrometers or less in diameter) near surface level.
 (Loading slowly? [Click here for a simpler animation.](#))

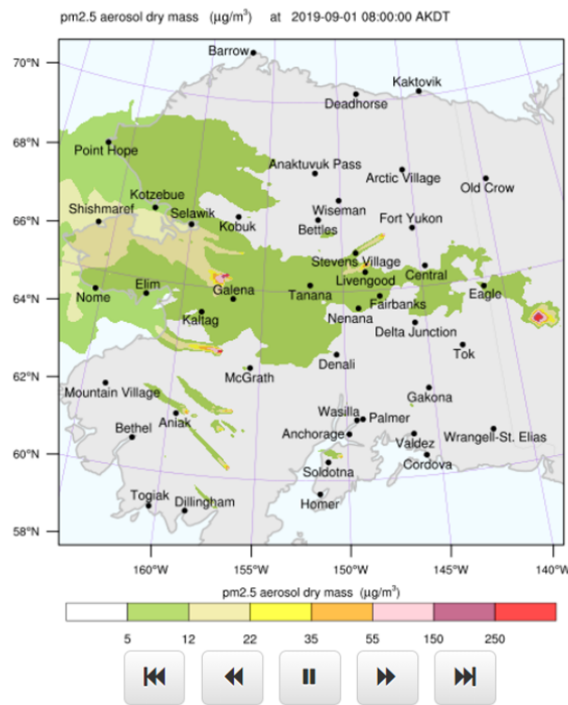


Figure 10: Screenshot of the map showing the 72-hour forecast of particulate matter (2.5 micrometers) emission from wildfires. Information about current fires is updated by the Alaska Interagency Coordination Center (AICC). The smoke forecasts are provided by the Alaska Climate Research Center of the Geophysical Institute, University of Alaska Fairbanks.

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

Once again in August, Anchorage experienced the worst air quality conditions ever recorded, ranking as the city with poorest air quality in the United States this summer. The Anchorage School District cancelled after school activities and Anchorage citizens are strongly advised to avoid strenuous outdoor activities.

Falling trees are currently representing one of the major hazards faced by firefighters. Lack of rain and warm temperatures have dried out a much thicker layer of soil than normally happens in summer in Alaska. Tree's root systems are weaker and falling tree rate is higher than usual.

Although summer 2019 is not a record fire season, wildfire activity has been intense with more than 2 million acres burned.

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.

Appendix

Table A1: August 2019 daily records of mean daily temperature, 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. Two lowest records were set this month.

Lowest Mean Daily Temperature on record

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Delta Junction	2019-08-19	44.0	2009	45.5
Gulkana	2019-08-19	41.5	1998	44.0

Highest Mean Daily Temperature on record

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Anchorage	2019-08-07	69.0	2015	66.0
Anchorage	2019-08-08	66.5	1978	65.0
Anchorage	2019-08-10	66.5	2003	65.0
Anchorage	2019-08-13	70.0	1977	65.0
Anchorage	2019-08-14	69.0	1990	63.0
Anchorage	2019-08-15	68.0	1957	64.5
Anchorage	2019-08-16	66.5	2004	66.0
Anchorage	2019-08-17	66.5	2004	65.0
Cold Bay	2019-08-16	58.5	2011	58.0
Cold Bay	2019-08-17	61.5	2016	60.0
Cold Bay	2019-08-18	61.0	2016	59.0
Gulkana	2019-08-04	65.5	1976	64.5
Homer	2019-08-07	61.0	1989	60.5
Homer	2019-08-08	63.5	2003	62.0
Homer	2019-08-12	61.0	1990	60.0
Homer	2019-08-13	62.0	2014	61.0
Homer	2019-08-14	62.0	2001	60.0
Homer	2019-08-17	62.0	1977	61.5
Juneau	2019-08-07	68.0	1942	65.0
Juneau	2019-08-08	68.5	1957	63.5
Kodiak	2019-08-07	73.0	1957	67.5
Kodiak	2019-08-09	67.5	1971	67.0
Kodiak	2019-08-15	70.5	1948	63.0
Kodiak	2019-08-16	73.0	1959	67.0
St. Paul Island	2019-08-30	54.0	2016	53.5
Talkeetna	2019-08-06	67.5	1968	67.0
Talkeetna	2019-08-15	66.0	1926	65.0
Talkeetna	2019-08-16	67.0	2004	66.5
Yakutat	2019-08-07	62.5	1957	61.0
Yakutat	2019-08-09	62.5	1957	62.0
Yakutat	2019-08-14	60.0	1950	59.5
Yakutat	2019-08-17	63.5	2004	61

Table A2: August 2019 daily records of minimum daily temperature, 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. Two lowest records were set this month.

Lowest Minimum Daily Temperature on record

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Gulkana	2019-08-19	24	1998	25
Yakutat	2019-08-20	33	1969	35

Highest Minimum Daily Temperature on record

Station	Date	New Record (°F)	Year of old record	Old record (°F)
Anchorage	2019-08-07	61	1979	58
Anchorage	2019-08-13	63	2003	57
Anchorage	2019-08-14	63	2001	58
Anchorage	2019-08-17	57	1977	56
Bethel	2019-08-10	57	1950	56
Cold Bay	2019-08-12	56	2007	54
Gulkana	2019-08-05	58	1984	56
Gulkana	2019-08-06	56	1954	53
Homer	2019-08-14	58	1977	55
Juneau	2019-08-08	57	2013	56
Juneau	2019-08-15	57	1994	55
Ketchikan	2019-08-16	60	1989	59
King Salmon	2019-08-07	58	1919	56
Kodiak	2019-08-07	65	1957	60
Kodiak	2019-08-15	61	1944	58
Kotzebue	2019-08-27	56	1935	55
Kotzebue	2019-08-28	55	1978	53
McGrath	2019-08-06	58	1994	56
St. Paul Island	2019-08-15	52	2005	50
St. Paul Island	2019-08-30	51	1979	50
St. Paul Island	2019-08-31	52	2016	51
Talkeetna	2019-08-05	59	1984	57
Talkeetna	2019-08-13	59	2005	58
Talkeetna	2019-08-14	60	2001	58
Talkeetna	2019-08-15	58	2003	57
Yakutat	2019-08-14	57	1991	55

Table A3: August 2019 daily records of maximum daily temperature, 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 highest records are set this month.

Highest Maximum Daily Temperature on record				
Station	Date	New Record (°F)	Year of old record	Old record (°F)
Anchorage	2019-08-10	77	1960	75
Anchorage	2019-08-13	77	1963	75
Anchorage	2019-08-14	75	1990	74
Anchorage	2019-08-15	77	1984	76
Cold Bay	2019-08-10	67	1950	66
Cold Bay	2019-08-17	68	2016	66
Cold Bay	2019-08-18	72	2014	64
Cold Bay	2019-08-19	72	2014	66
Homer	2019-08-08	77	1968	74
Homer	2019-08-17	73	1963	68
Juneau	2019-08-07	83	1942	80
Kodiak	2019-08-06	83	2018	78
Kodiak	2019-08-07	81	1957	75
Kodiak	2019-08-15	80	2004	74
Kodiak	2019-08-16	86	2004	78
St. Paul Island	2019-08-21	60	2014	59