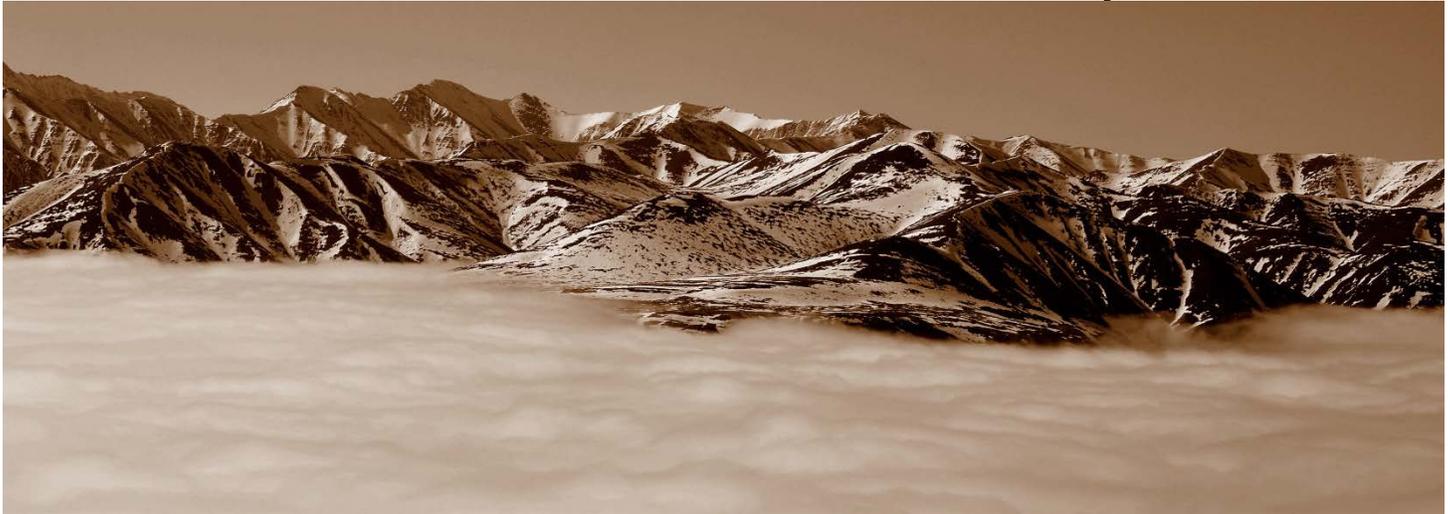




Weather and Climate

Gates of the Arctic Fall 2014 Weather Summary



Bettles Fall Weather 2014

It was a warm and very dry fall in Bettles. The average fall temperature for 2014 was 22.9°F, the 13th warmest fall on record and 3.4°F warmer than the long-term average. September was just about normal, while October and especially November were above normal. September precipitation was about 71% of normal with some rain falling in the beginning of the month and about half the expected snowfall. Both October and November were well below average for snowfall; a total of 1.8 inches of snow was recorded, normal is 28.5 inches for October and November. The total precipitation for the fall season was only 51% of normal.

September 2014 was just about normal in terms of temperature, but dry. The average temperature for September in Bettles was 40.5°F, compared to a normal of 40.6°F. The monthly precipitation total was 1.35 inches, compared to the long-term average of 1.91 inches. A total of 1.4 inches of snow was recorded for the month, 56% of normal.

October was warmer and much drier than normal. October 2014 averaged 21.7°F, 2.8°F warmer than the 1981-2010 normal. Precipitation totals were low, only 38% of normal with a total of 0.39 inches for the month.

November was much warmer and much drier than normal. The mean monthly temperature was 6.6°F, 7.6°F warmer than normal. Precipitation was below normal with 0.23 inches in November compared to a normal monthly total of 0.91 inches. On average 16.1 inches of snow falls during

November; in 2014 only 4.8 inches of snow fell during the month (Figures 1 and 2; Tables 1, 2, and 3).

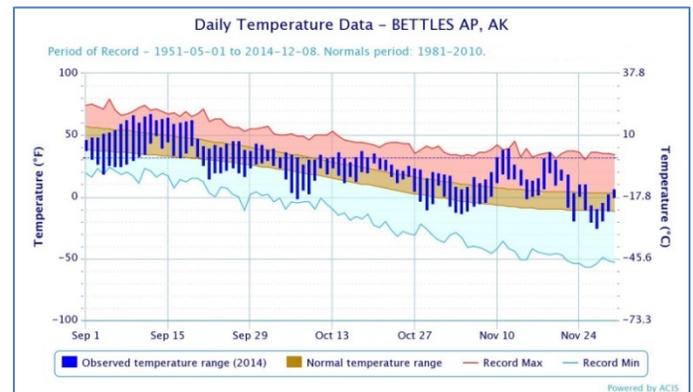


Figure 1. Fall 2014 daily temperatures at Bettles showing **record maximum** (red), **record minimum** (blue), **normal** (brown) and **2014 observed** range (blue bars).

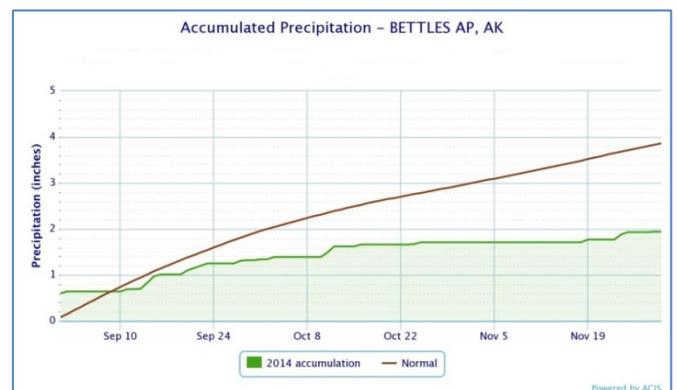


Figure 2. Fall **2014** accumulated precipitation at Bettles (green) compared to **normal** (brown line).

Table 1. Temperature: Fall 2014 average monthly temperatures compared to the 1981-2010 normal.

Fall 2014	Average Monthly Temp °F	1981-2010 Normal °F	Departure from Normal °F	Monthly High °F / Date	Monthly Low °F / Date
September	40.5	40.6	-0.1	67 / Sep 12	14 / Sep 22
October	21.7	18.9	+2.8	42 / Oct 1	-11 / Oct 29
November	6.6	-1.0	+7.6	39 / Nov 12	-26 / Nov 27

Fall Season Temperature Departure from Normal: +3.4°F

Table 2. Precipitation: Fall 2014 monthly precipitation totals compared to normal.

Fall 2014	Total Monthly Precip. in.	1981-2010 Normal in.	% of Normal in.	Greatest 24-hr. total in. / Date	# Days with >=0.01 in. water
September	1.35	1.91	71	0.62 / Sep 1	13
October	0.39	1.04	38	0.13 / Oct 12	6
November	0.23	0.91	25	0.11 / Nov 24	5

Fall Season Precipitation Departure from Normal: -1.89 inches (51% of normal).

Table 3. Snowfall: Fall 2014 monthly snowfall totals compared to normal

Fall 2014	Total Monthly Snowfall in.	1981-2010 Normal in.	% of Normal in.	Greatest 24-hr snowfall total in. / Date	Cumulative since 1-July in.	Normal Snowfall from July 1 in.
September	1.4	2.5	56	1.0 / Sep 28	1.4	2.5
October	7.0	12.4	56	1.8 / Oct 12	8.3	14.9
November	4.8	16.1	30	2.6 / Nov 24	13.1	31

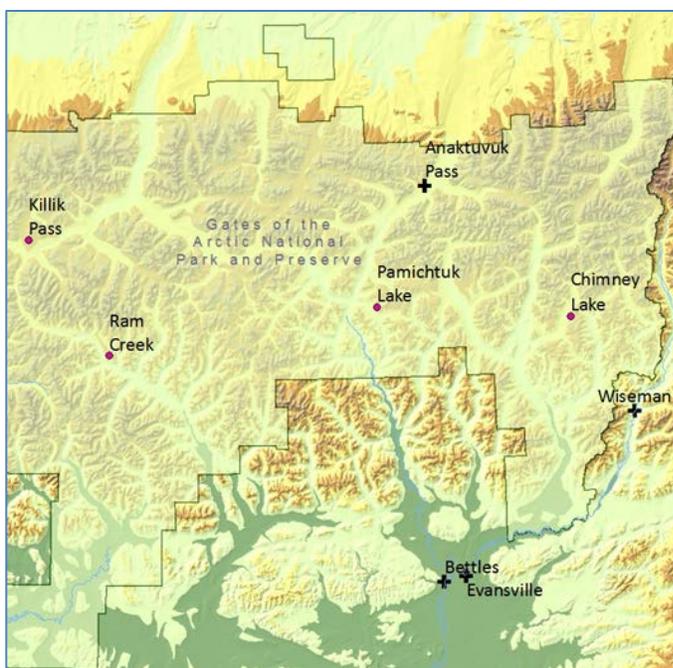


Figure 3. NPS Climate Stations in Gates of the Arctic National Park and Preserve

We now have additional NPS climate stations in Gates of the Arctic that complement existing National Weather Service stations at Bettles (Figure 3). These new NPS stations will provide critical data on high elevation sites in the Arctic and will help characterize the climate gradients and patterns affecting resources in the Gates of the Arctic parklands.

Table 4. Summary of weather statistics from climate stations in and near Gates of the Arctic. All data are preliminary and subject to review. Sites in **bold** font are NPS stations installed in 2012.

Park	Site	Elev. (Ft.)	Average Temp °F			Season High Temp	Season Low Temp	Peak Wind	Nov 30. Snow Depth
			Sep	Oct	Nov	(°F)	(°F)	(mph)	(In.)
GAAR	Killik Pass	4355	30.8	11.9	15.8	49	-7	33	2
	Ram Creek	4100	32.0	13.9	18.2	49	0	40	0
	Pamichtuk	3135	35.2	15.9	17.9	56	-4	35	2
	Chimney Lake	3700	32.5	16.4	17.2	50	-1	38	<1
Other	Ivotuk CRN	1909	31.1	15.7	8.4	57	-24	30	--
	Wiseman	1147	38.2	m	3.9	63	-20	--	3
	Atigun Pass	4800	28.5	10.7	11.8	47	-10	39	17
	Norutak Lake RAWS	800	39.3	21.5	2.7	67	-26	30	--

-- wind or snow depth not measured at this site

Interesting notes from the ARCN climate stations:

- November was very warm. The average monthly temperatures for November were warmer than the average monthly temperatures for October for all of the higher elevation sites in the Brooks Range in Gates of the Arctic.
- Very little snow accumulates at the ridge top sites in Gates of the Arctic; the snow that falls near these stations is continuously redistributed by the wind.
- The Killik Pass site had the coldest average temperature at 19.5°F and Pamichtuk was the warmest site with an average fall season temperature of 22.0°F. The elevation difference is 1220 feet (Killik Pass is higher).

Bettles Fall Temperature Trend

The average fall temperature in Bettles for 2014 was 22.9°F, the 13th warmest fall on record and 3.4°F warmer than the 1981-2010 normal period. Fall 2014 was 1°F warmer than fall of 2013. This year November had the largest deviation from normal, in 2013 it was October.

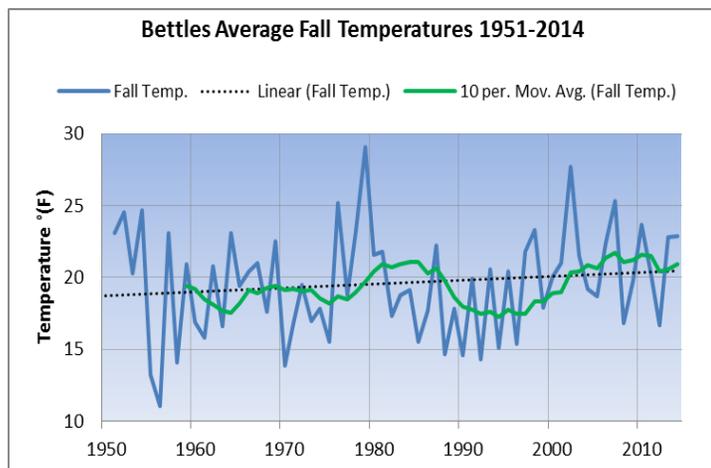


Figure 4. Average fall temperatures (September, October, November) at Bettles since 1951. The green line is a 10-year moving average. The dashed line is a simple linear regression.

We calculate the average fall temperature by simply taking the average of September, October, and November monthly temperatures. Average fall temperatures are variable with a range between 11.1°F in 1956 and 29.1° F in 1979.

The overall trend in fall temperatures is positive, but the temperature increase is non-linear, with multi-decadal variations. The 10-year moving average shows that the coolest period occurred in the early 1990s (Figure 5).

Bettles Fall Precipitation Trend

Fall 2014 was the third driest on record in Bettles. The total precipitation for September, October, and November combined was 1.94 inches, including the water equivalent of 13.2 inches of snow that fell during the three month period. This is in stark contrast to last year, when 7.7 inches of precipitation was recorded making the fall of 2013 the 2nd wettest on record.

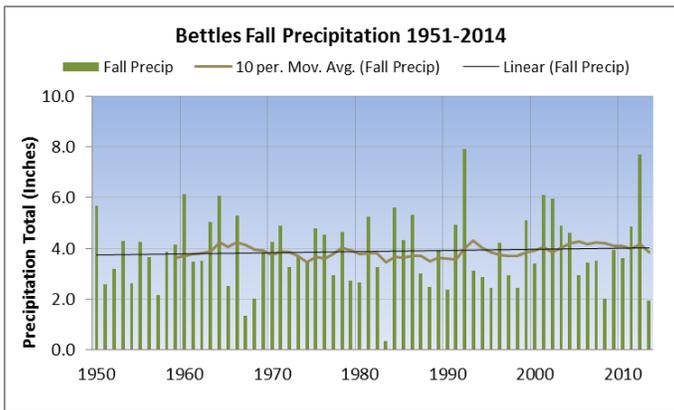


Figure 5. The green bars show the fall precipitation totals in Bettles between 1951 and 2014. The brown line represents a 10-year moving average and the dashed line is a simple linear regression.

Precipitation amounts in the fall range between <1 inch to almost 8 inches. The fall of 1984 had less than an inch of total precipitation over the three month season and two years, 1993 and 2013, had more than 7 inches of precipitation. The average for the fall season is 3.86 inches; the 2014 total is 51% of normal.

Glimpses of the fall season in Kobuk Valley

The new phenology camera at the Pamichtuk station in Gates of the Arctic National Park and Preserve captured images through most of fall 2013 before it went into hibernation for winter. Below are photos that capture the onset of the snow with images from September 1, October 2, and November 1, 2013. The camera capture images five times per day; the images are downloaded once a year. The photos are used to help quantify the snow season, green-up period, and other basic phenologic information

Connecting Further

- New paper published – [Strong Temperature Increase and Shrinking Sea Ice in Arctic Alaska](#)
- Previous weather summaries and other climate monitoring documents on the [Arctic Network web portal](#)
- Access near real-time data from [Western Regional Climate Center](#) and [MesoWest](#)
- Statewide summary of weather highlights in the latest [Alaska Climate Dispatch](#) from the Alaska Center for Climate Assessment and Policy.
- [Map](#) of projected temperature and precipitation changes for Bering Land Bridge National Preserve.

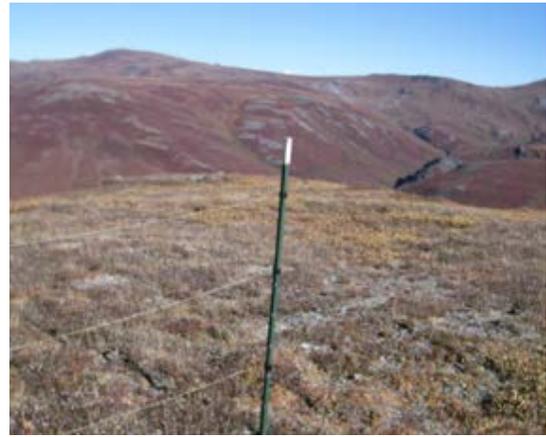


Figure 6. Images capturing the onset of the snow season at Pamichtuk climate station last year in Gates of the Arctic. The top photo is from September 1, 2013; the middle photo is from October 1, 2013; and the bottom photo is from November 5, 2013.

More Information

Pam Sousanes
 Email: pam_sousanes@nps.gov
 Phone: 907-455-0677

Ken Hill
 Email: kenneth_hill@nps.gov
 Phone: 907-455-0678

<http://science.nature.nps.gov/im/arcn>