



Quarterly Weather & Climate Summary Western Arctic Parklands Fall 2014

Kotzebue Fall Weather

It was a very warm and relatively dry fall in Kotzebue. The average fall temperature for 2014 was 30.6°F, the 2nd warmest fall on record and 5.4°F warmer than the long-term average. Every month was warmer than normal, with November having the largest deviation from normal temperatures. September precipitation was near normal, but only ~5 inches of snowfall was recorded for October and November; normally there would be close to 17 inches of snow recorded over those two fall months. The total precipitation for the fall season was only 75% of normal.

September 2014 was warmer and wetter than normal. The average temperature for September in Kotzebue was 45.7°F, compared to a normal of 42.3°F. A new record high temperature of 65°F was set on September 12th. It was the tenth warmest September in station history. The monthly precipitation total was 1.81 inches. A trace of snow was recorded on September 23. Overall, September precipitation was 115% of normal.

October was warmer and drier than normal. October 2014 averaged 26.7°F, 2.4°F warmer than the 1981-2010 normal. Precipitation totals were low, only 43% of normal with a total of 0.43 inches for the month.

November was much warmer and drier than normal. The mean monthly temperature was 19.3°F, 10.2°F warmer than normal. November 2014 is tied with 1952 as the second warmest November on record; 2002 was the warmest at 20.2°F. The average daily temperature was above average for about 3 weeks of the month; the average minimum temperature was the warmest on record, with many daily records for the month. Precipitation was below normal with

0.28 inches in November compared to a normal monthly total of 0.77 inches. On average 10.5 inches of snow falls during November; this November only 1.1 inches of snow fell during the month (Figures 1 and 2; Tables 1, 2, and 3).

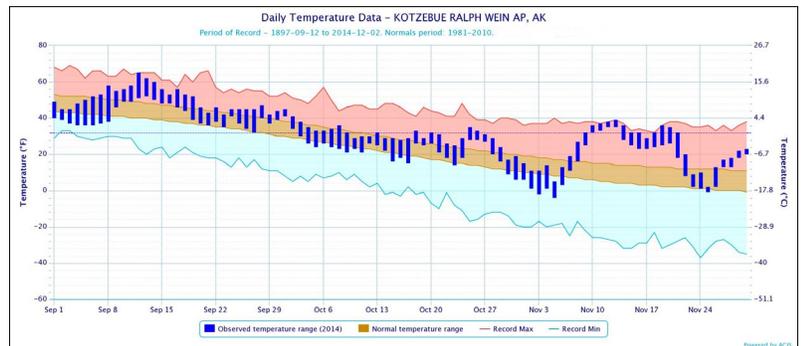


Figure 1. Fall 2014 daily temperatures at Kotzebue showing record maximum (red), record minimum (blue), normal (brown) and 2014 observed range (blue bars).

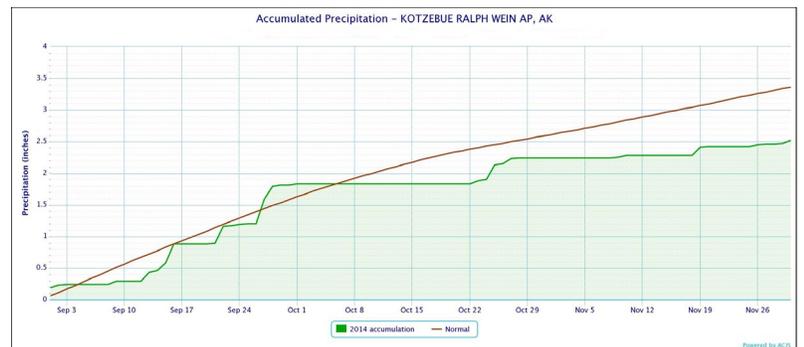


Figure 2. Fall 2014 accumulated precipitation at Kotzebue (green) compared to normal (brown line).

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	45.7	42.3	+3.4	65* / Sep 12	32 / Sep 27
October	26.7	24.3	+2.4	45 / October 1	6 / Oct 31
November	19.3	9.1	+10.2	39 / Nov 13	-4 / Nov 5

* Record high. Fall Season Temperature Departure from Normal: +5.4°F

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

Fall 2014	Total Monthly Precip. in.	1981-2010 Normal in.	Departure from Normal in.	Greatest 24-hr. total in. / Date	# Days with >=0.01 in. water
September	1.81	1.58	+0.23	0.39 / Sep 27	16
October	0.43	1.01	-0.58	0.23 / Oct 25	7
November	0.28	0.77	-0.49	0.40 / Aug 22	11

Fall Season Precipitation Departure from Normal: +0.28 inches (75% of normal).

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

Fall 2014	Total Monthly Snowfall in.	1981-2010 Normal in.	Departure from Normal in.	Greatest 24-hr snowfall total in. / Date	Cumulative since 1-July in.	Normal Snowfall from July 1 in.
September	0	0.8	-0.8	T / Sep 23	0	0.7
October	3.6	6.1	-2.5	2.3 / Oct 25	3.6	5.7
November	1.1	10.5	-9.4	0.5 / Nov 30	4.7	14.6

NPS Climate Monitoring Stations

We now have additional NPS climate stations in Cape Krusenstern, Noatak, and Kobuk Valley that complement existing National Weather Service stations at Kotzebue and along the Kobuk River to the south of the parks (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 Western Arctic Parklands.

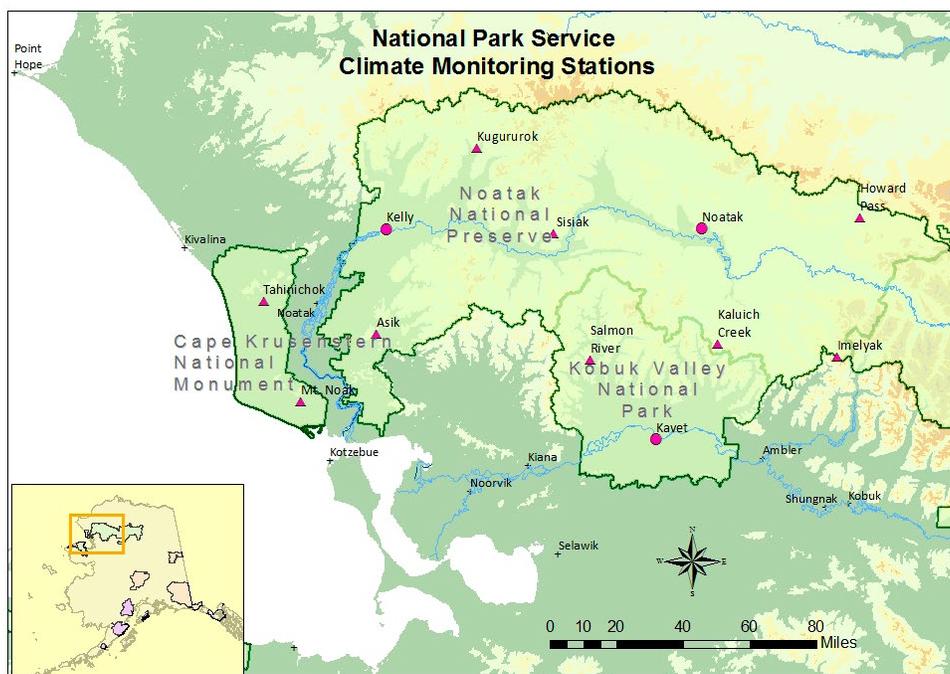


Figure 3. NPS climate stations in Western Arctic Parklands.

Table 4. Summary of weather statistics from climate stations in and near Western Arctic Parklands. All data are preliminary and subject to review. Sites in **bold** font are NPS stations installed between 2011-2014.

Park	Site	Elev. (ft)	Average Temp °F			Season High Temp	Season Low Temp	Peak Wind	Sept. Rain
			Sep	Oct	Nov	(°F)	(°F)	mph	In.
CAKR	Tahinichok	966	m	m	m	m	m	m	m
	Mt. Noak	809	41.6	24.9	21.4	62	0	39	3.39
NOAT	Asik	285	39.8	22.8	22.1	54	3	51	n/a
	Kelly RAWS	2260	41.4	23.1	16.8	66	-10	35	2.87
	Sisiak	1495	36.8	19.1	16.8	58	-4	44	n/a
	Noatak RAWS	321	37.6	20.3	2.4	64	-29	50	n/a
	Howard Pass	518	35.8	17.1	16.8	56	-13	60	n/a
	Kaluich	2486	35.7	16.1	17.1	57	-5	49	n/a
	Imelyak	3569	33.7	16.2	22.4	52	2	45	n/a
	Kugururok	1020	39.4	23.3	19.4	61	-3	40	1.46
KOVA	Kavet Creek RAWS	253	42.6	24.0	11.9	68	-22	41	1.96
	Salmon River	1201	40.2	22.8	18.4	61	-2	39	1.81

*Tahinichok had telemetry problems in early fall; data record will be downloaded next summer. Not enough transmitted data for analysis.

Interesting Notes from the ARCN Climate Stations

- Howard Pass, once again, had impressive wind statistics. The average wind speed for the four day period between October 10th and 13th was 48 mph and the average peak gust was 56 mph.
- November 2014 was warm. The average November temperatures for the sites in Table 4 were on average ~10°F warmer than last year. The site on the Noatak River at the confluence with Mapkik Creek was much cooler than any other site; the Noatak RAWS is the lowest interior site in the bunch and subject to cooler temperatures due to inversions.
- September precipitation values were calculated for the lower elevation sites where the mean monthly temperature was > 40°F. Mt. Noak, the site near the coast in CAKR, had the most measurable precipitation with a total of 3.39 inches.

Kotzebue Fall Temperature Trend

The average fall temperature in Kotzebue for 2014 was 30.6°F, the 2nd warmest fall since 2002 and 5.4°F warmer than the 1981-2010 normal period.

We calculate the average fall temperature by simply taking the average of September, October, and November monthly temperatures. Average fall temperatures show great variability ranging from 16.2°F in 1956 to 32.0°F in 2002.

There has been a significant increase in fall temperatures of 0.4° F per decade since 1949 based on a simple linear regression (p<0.05). The 10-year moving average shows the coolest period in the mid-1960s. Four out of the ten warmest falls since 1949 have occurred in the last ten years (Figure 4).

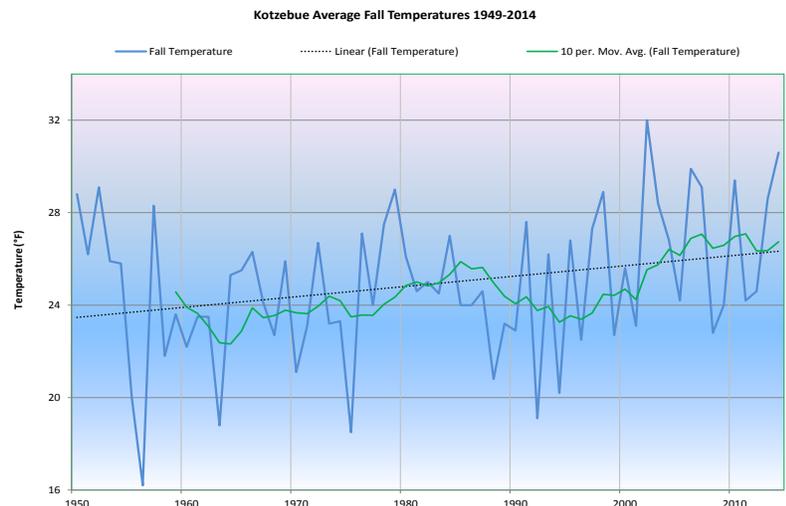


Figure 4. Average fall temperatures (September, October, November) at Kotzebue since 1949. The green line is a 10-year moving average. The dashed line is a simple linear regression.

Kotzebue Fall Precipitation Trend

The total fall precipitation in Kotzebue in 2014 was 2.52 inches. When we calculate the total precipitation amount we include rain and melted snow. In fall of 2014 1.81 inches of rain fell in September and a total of 0.71 inches of water equivalent was measured from the 4.7 inches of snow that fell in October and November. Normal fall precipitation totals average 3.36 inches, with an average of 17.4 inches of total snowfall. The 2014 fall season was 75% of normal.

Fall precipitation amounts are variable in Kotzebue. There were several years with less than an inch of total precipitation over the three month seasonal fall period and a few years where more than seven inches of precipitation was recorded. 2014 ranks as the 31st driest fall period on record for total precipitation, but there have been only five years on record with less fall snowfall.

Kotzebue Total Fall Precipitation 1949-2014

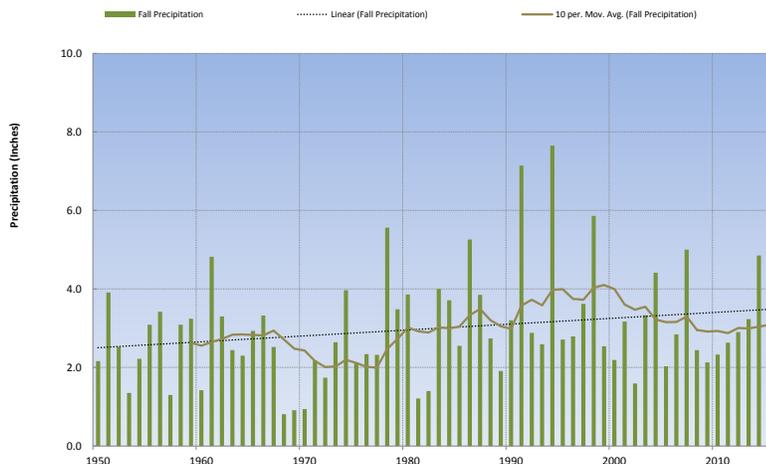


Figure 5. The green bars show the fall precipitation totals in Kotzebue between 1949 and 2014. The brown line represents a 10-year moving average and the dashed line is a simple linear regression.

Glimpses of the Fall Season in Kobuk Valley

The new phenology camera on the Salmon River station in Kobuk Valley National Park and Preserve captured images through most of fall 2013 before it went into hibernation for the winter. Below are photos that capture the onset of the snow season with images from September 1, October 2, and

November 1, 2013. The camera captures 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.



Figure 6. Images capturing the onset of the snow season at Salmon River in KOVA. The left photo is from September 1, 2013; the middle photo is from October 2, 2013; and the right photo is from November 1, 2013.

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

- [Maps](#) of projected temperature and precipitation changes for Noatak, Kobuk and Cape Krusenstern

More Information

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