



Quarterly Weather & Climate Summary Western Arctic Parklands Winter 2015

Kotzebue Winter Weather

It was a warm and dry winter season in Kotzebue. The average winter temperature for December-February was 7.3°F, the 3rd warmest winter on record and 7.7°F warmer than the long-term average. Every month was warmer than normal, with February having the largest deviation from normal temperatures. Winter precipitation (water equivalent) was only 59% of normal with 1.2 inches. Snowfall was dismal, with less than 10 inches from December to February. Only 1977-78 had less snowfall for the September-February time period.

December 2014 was warmer and drier than normal. The average temperature for December in Kotzebue was 7.8°F, compared to a normal of 2.3°F. The month ended with a warm storm with gusts up to 60 mph on the 28th. Rain was recorded on the 30th and the 31st, with a new daily high record of 34°F on the 31st. Only 3 inches of snow fell in December, the 4th smallest monthly total on record. Precipitation (water equivalent) was 46% of normal for the month.

January was warmer and drier than normal. The average temperature was 3.9°F, 6.7°F warmer than the 1981-2010 normal. The coldest days of the winter were on January 26-27 with temperatures down to -30°F. Precipitation totals were low, only 58% of normal with a total of 0.36 inches for the month.

It was the 3rd warmest February on record. The mean monthly temperature was 10.2°F, 11.0°F warmer than normal. Daily high records were set on February 21, 22, 23, and 26 with temperatures at or above freezing each day. Rain or mixed precipitation occurred on each of these days, with wind gusts up to 44 mph. On average 9.6 inches of snow falls during February; this February only 3.3 inches of snow fell (Figures 1 and 2; Tables 1, 2, and 3).

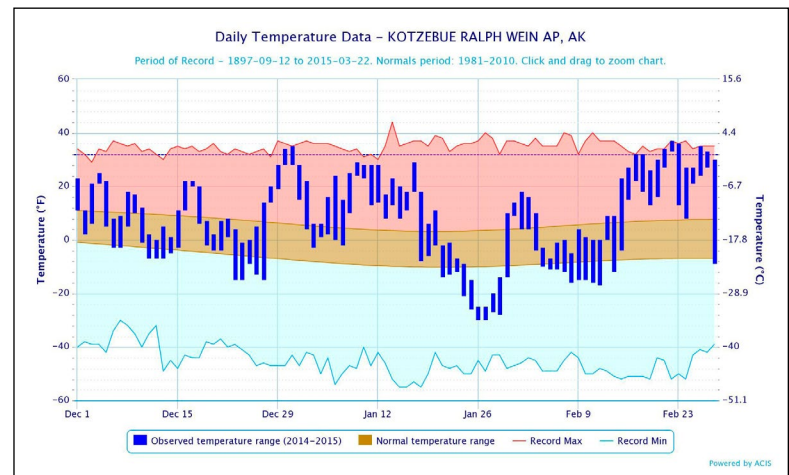


Figure 1. Winter 2014-15 daily temperatures at Kotzebue showing **record maximum** (red), **record minimum** (blue), **normal** (brown) and **2015 observed** range (blue bars).

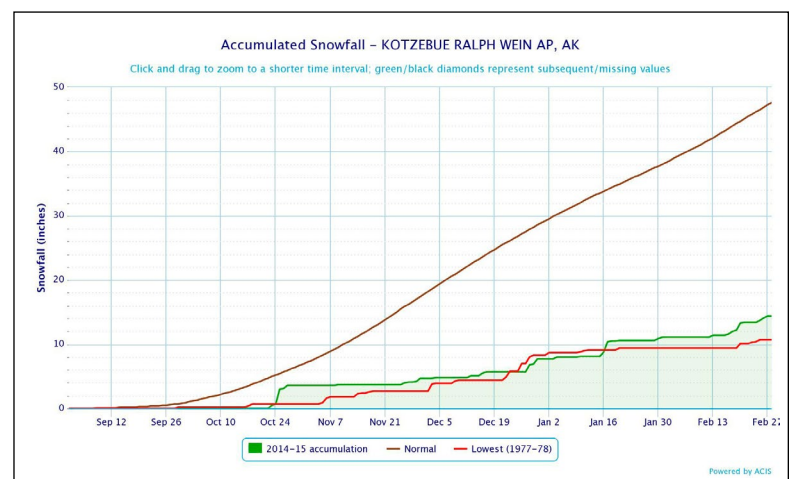


Figure 2. **2014-15** (green) snowfall at Kotzebue for September through February compared to the **lowest year** (1977-78; red line) and **normal** (brown line).

Table 1. Kotzebue Temperature: Winter 2014-2015 average monthly temperatures compared to the 1981-2010 normal.

Winter 2014-2015	Average Monthly Temp °F	1981-2010 Normal °F	Departure from Normal °F	Monthly High °F / Date	Monthly Low °F / Date
December	7.8	2.3	+5.5	35 / Dec. 31	-15 / Dec. 23,24,27
January	3.9	-2.8	+6.7	29 / Jan. 1, 17	-30 / Jan 26, 27
February	10.2	-0.8	+11.0	37 / Feb. 22	-17 / Feb. 12

Winter Season Temperature Departure from Normal: +7.7°F

Table 2. Kotzebue Precipitation: Winter 2014-2015 monthly precipitation totals compared to normal.

Winter 2014-2015	Total Monthly Precip. in.	1981-2010 Normal in.	Departure from Normal in.	Greatest 24 -hr. total in. / Date	# Days with >=0.01 in. water
December	0.35	0.76	-0.41	0.17 / Dec. 28	7
January	0.36	0.62	-0.26	0.16 / Jan. 17	8
February	0.49	0.66	-0.17	0.15 / Feb. 23	11

Winter Season Precipitation Departure from Normal: -0.84 inches (59% of normal)

Table 3. Kotzebue Snowfall: Winter 2014-2015 monthly snowfall totals compared to normal.

Winter 2014-2015	Total Monthly Snowfall in.	1981-2010 Normal in.	Departure from Normal in.	Greatest 24 -hr. snowfall total in. / Date	Cumulative snowfall since 1-July in.
December	3.0	11.5	-8.5	1.1 / Dec. 28	7.7
January	3.4	9.1	-5.7	1.6 / Jan. 17	11.1
February	3.3	9.6	-6.3	1.1 / Feb. 20	14.4

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 (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.

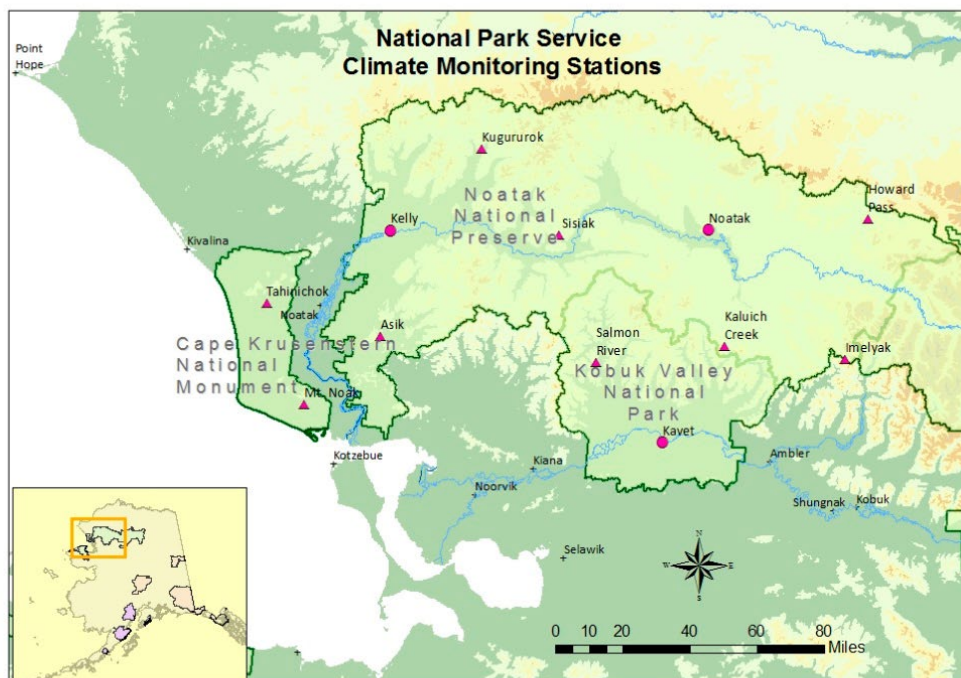


Figure 3. NPS Climate stations in Western Arctic Parklands.

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 in 2012.

Park	Site	Elev. (ft)	Average Temp °F			Extreme High (°F)	Extreme Low (°F)	Average Temp. Winter Season (°F)	Feb. 28 Snow Depth (inches)	Peak Wind (mph)	No. of days Tmax >32 (°F)
			Dec	Jan	Feb						
CAKR	Tahinichok	966	--	--	--	--	--	--	--	--	--
	Mt. Noak	809	10	7.9	13.8	33	-25	10.6	13	46	2
NOAT	Asik	285	10.2	10.8	15.1	34	-19	12.0	< 1	61	4
	Kelly RAWS/Snotel*	2260	5.8	-0.4	9.1	37	-32	4.8	27*	43	6
	Kugururok	1020	6.9	7.6	13.4	37	-22	9.3	24	37	8
	Sisiak	1495	1.6	4.6	9.5	32	-21	5.2	--	59	2
	Noatak RAWS	321	-3.9	-11.1	1.6	34	-45	-4.5	--	68	2
	Howard Pass	518	-5.1	2.7	8.7	36	-33	2.1	2	--	5
	Kaluich	2486	-2.7	2.7	9	33	-28	3.0	7.5	60	2
KOVA	Imelyak	3569	11.9	10.8	12.6	31	-27	11.8	--	47	0
	Kavet Creek RAWS	253	4.6	-5.8	7.2	37	-48	2.0	--	47	7
	Salmon River	1201	5.6	7.2	13.5	33	-35	8.8	36	40	2

*Tahinichok is transmitting intermittently through the winter. Not enough transmitted data for analysis. Full data will be downloaded this summer.

Interesting Notes from the ARCN Climate Stations

- Almost all stations reached temperatures above freezing this winter. Most stations were warmest during the February 21-24 time period, with temperatures as high as 37°F at Kelly River, Kugururok, and Kavet Creek.
- The site on the Noatak River at the confluence with Mapkik Creek was much cooler than any other site. Temperatures were as low as -45°F and the average temperature for the winter was -4.5°F. The Noatak RAWS is the lowest interior site in the bunch and subject to cooler temperatures due to inversions.
- Very little snow accumulates at the NPS stations that are on exposed ridges or in passes; the snow that falls near these stations is continuously redistributed by the wind.

Kotzebue Winter Temperature Trend

The average winter temperature in Kotzebue for 2015 was 7.3°F, the 3rd warmest winter on record and 7.7°F warmer than the 1981-2010 normal period. Only 2014 and 2001 were warmer.

We calculate the average winter temperature by simply taking the average of December, January, and February monthly temperatures. Average winter temperatures show great variability with a range between -11.6°F in 1971 and 11.6° F in 2001.

There has been a significant increase in winter temperatures of 1.1° F per decade since 1949 based on a simple linear regression ($p < 0.01$). The four warmest winters have all occurred since 2001 (Figure 4).

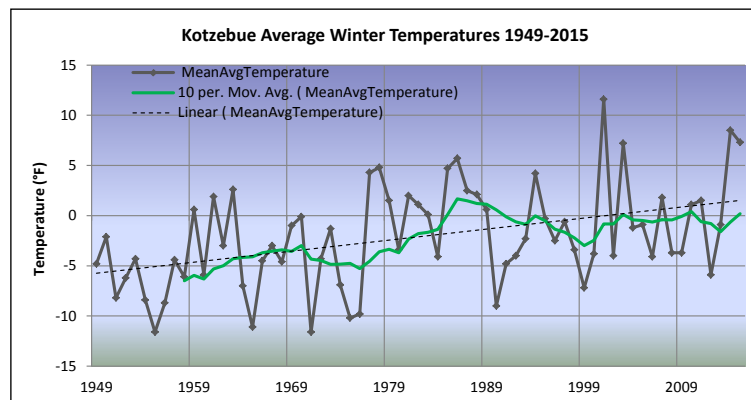


Figure 4. Average winter temperatures (December, January, February) at Kotzebue since 1949. The green line is a 10-year moving average. The dashed line is a simple linear regression.

Kotzebue Winter Precipitation Trend

The total winter precipitation in Kotzebue in 2015 was 1.20 inches. Normal winter precipitation totals average 2.04 inches. Precipitation amounts in the winter are variable; there have been several years with less than 0.5 inches of total precipitation over the three month seasonal winter period and a few years with more than 4 inches of precipitation.

Although recent winters have been relatively dry, overall, there has been a significant increase of 0.29 inches per decade in winter precipitation since 1949 based on a simple linear regression. 2015 ranked as the 29th driest winter for water equivalent. Snowfall was anomalous, with only 9.7 inches recorded in 2015 compared to a normal snow total of over 30 inches.

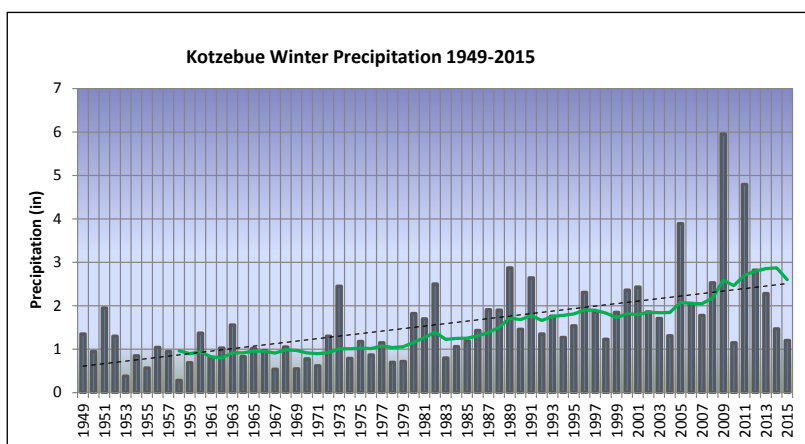


Figure 5. Winter precipitation totals (December, January, February) at Kotzebue since 1949. The **green line** represents a 10-year moving average and the dashed line is a simple linear regression.

Glimpses of the fall season in Kobuk Valley

The new phenology camera on the Salmon River station in Kobuk Valley National Park and Preserve site captured images through most of fall 2013 before it went into hibernation for winter. The photos (below) capture the onset of the snow season with scenes 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 the Western Arctic Parklands

More Information

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