Resource Brief

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Southwest Alaska Network

Weather and Climate

Katmai - Winter 2014 - 2015 Weather Summary

MODIS image Jan 4, 2015/NASA/GSFC/ESDIS

King Salmon weather

It was a warm and low-snow winter in King Salmon. The average temperature for December was 31.6 °F compared to a normal of 18.6 °F. It was the 3rd warmest December since reliable record keeping began in 1949. 1.96 inches of precipitation fell in December—which is slightly above average. 7.5 inches of snow fell, compared to the December average of 9.5 inches. Two inches of very wet snow fell on the last day of 2014.

Similar weather conditions continued into early January when the average temperature was 21.2 °F, which is 4.9 °F warmer than the average temperature for this month. For comparison, January of 2014 was the warmest on record and more than 16 °F warmer than the 30-year climatological normal (i.e. average conditions). Just under an inch of snow fell during this month, compared to the January average of 10.2 inches.

February saw only two inches of snow fall (on one day—February 27) and minor amounts of rain on several days. The average temperature in February was 26.8 °F compared to an average temperature of 18.8 °F. This month was the 8th warmest ranking February since 1949. The average snowfall for this month is 6 inches.

Daily temperatures for winter 2014 - 2015 are shown compared to record temperatures and average conditions in Figure 1. A similar graph showing daily accumulation of precipitation is shown in Figure 2. Monthly temperature and precipitation summaries—including average snow depth or range—can be found in Tables 1 and 2.

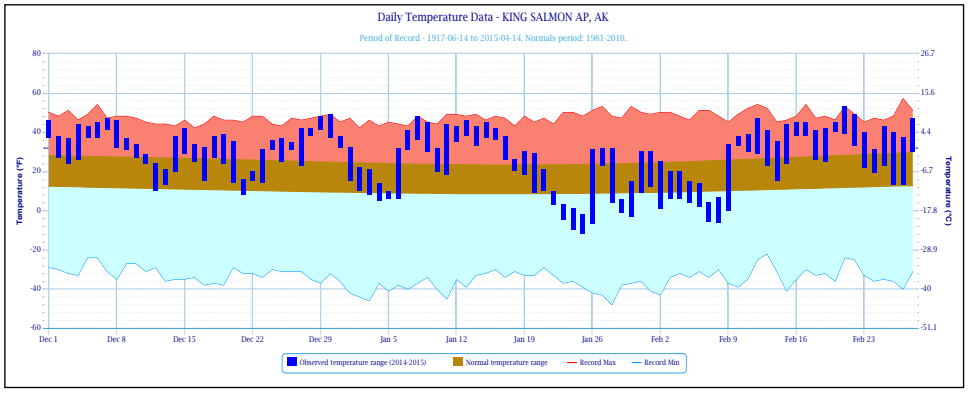

Figure 1. Winter 2014 - 2015 daily temperatures at King Salmon showing record maximum (red), record minimum (blue), normal (brown) temperatures, and 2014 observed range (blue bars).

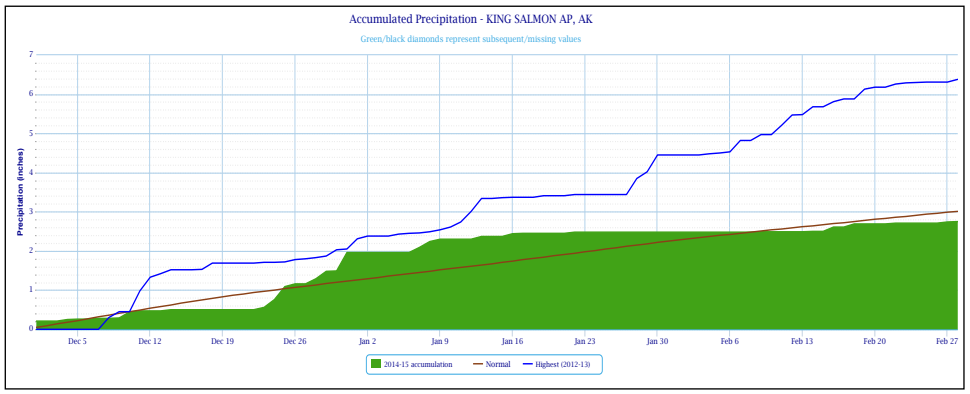

Figure 2. Winter 2014 - 2015 precipitation at King Salmon (green) compared to normal (brown line) and the wettest winter of 2012 - 2013.

Table 1. Temperature summary for King Salmon for winter 2014 - 2015 and 30-year average (climate normal).

Winter 2014-15	Average monthly temp (°F)	30-year average 1981-2010 climate normal (°F)	Departure from normal (°F)	Monthly high (°F / date)	Monthly low (°F / date)
December	31.6	18.6	+13.0	49 / Dec 30	8 / Dec 21
January	21.1	16.2	+4.9	48 / Jan 8	-12 / Jan 25
February	26.8	18.8	+8.0	53 / Feb 21	-6 / Feb 7 & 8

Winter season temperature departure from Normal: Warmer than normal—by +8.6°F

Table 2. Precipitation summary for King Salmon for winter 2014 - 2015 and 30-year average (climate normal).

Winter 2014-15	Total monthly precipitation (inches)	30-year average 1981-2010 climate normal precipitation (inches)	Departure from normal (inches)	Total monthly snowfall (inches)	30-year average 1981-2010 climate normal snowfall (inches)
December	1.96	1.23	+0.73	7.5	9.5
January	0.52	1.02	-0.50	0.7	10.2
February	0.27	0.76	-0.49	2.0	6.0

Winter season precipitation departure from Normal: Slightly drier than normal—approximately -0.26 inches (91% of Normal)

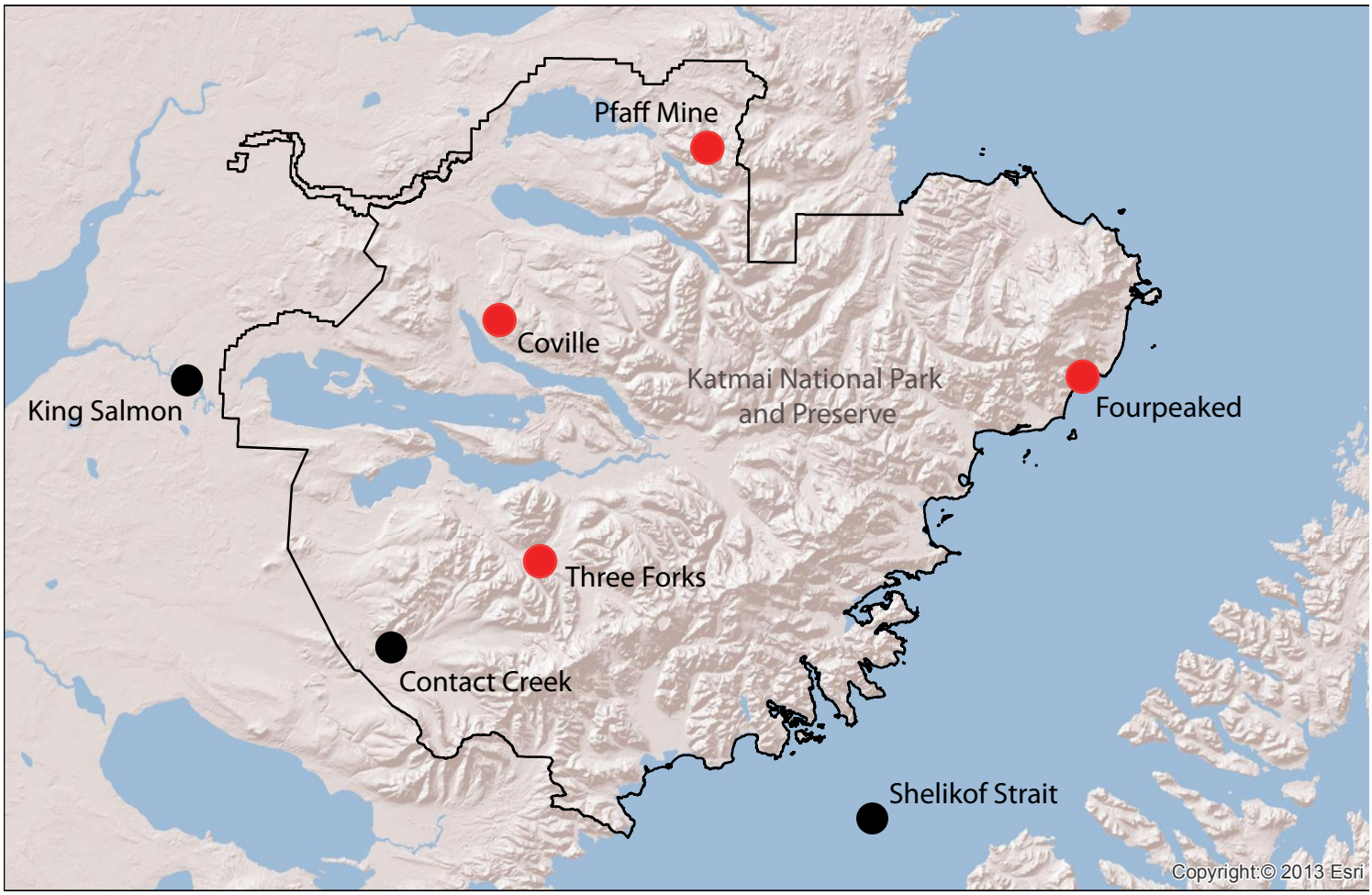

Figure 3. Selected climate stations in or near Katmai National Park and Preserve. Stations operated by the Southwest Alaska Network are shown in red and stations operated by other organizations are shown in black.

Table 3. Summary of weather statistics from selected climate stations in or near Katmai National Park and Preserve. Asterisk (*) indicates stations operated by the Southwest Alaska Network. All data are preliminary and subject to review. Data that are not available or suspect are indicated with "n/a". Contact Creek is the only station capable of measuring both liquid and solid precipitation (rain and snow). ^The Shelikof Strait buoy stopped transmitting on Dec 30, 2014.

Site	Elev. (feet)	Ave. temperature (°F)			Snow depth range (inches)			Wind max (mph)
		Dec	Jan	Feb	Dec	Jan	Feb	
Contact Creek	657	34.5	22.8	27.9	n/a	n/a	n/a	53
Coville*	1567	34.3	28.8	29.6	0 - 7	0 - 3	0 - 2	75
Fourpeaked*	1074	35.1	32.0	32.2	n/a	n/a	n/a	103
Pfaff Mine*	2018	29.8	27.3	29.4	0 - 7	2 - 7	2 - 7	97
Shelikof Strait^	0	43.9	n/a^	n/a^	n/a	n/a	n/a	52^
Three Forks*	1358	31.5	24.7	27.1	0 - 2	0 - 4	0 to 4	65

Climate monitoring updates

The Southwest Alaska Network operates four climate stations in Katmai National Park and Preserve (Figure 3).

This summer we will add a RM Young alpine wind sensor to the Fourpeaked RAWS (Figure 4). This sensor will be mounted lower than the existing wind sensors at 3 m (~10 ft) height. so it will better sustain the rime-icing and heavy winds that occur each winter. In past winters, the existing wind vane has broken—its tip or tail has fallen off. Wind sensors will operate at both the existing 6 m (~20 ft) and 3 m height for one year to allow for scaling of historic data to 3 m wind speed.

We will also begin measuring soil moisture and tempreature at the Coville and PfaffMine stations this summer. Both will be measured in profile (Figure 5) at 5, 10, 20 and 50 cm beneath the surface or, fi at less than 50 cm, in the first surface ofthe active layer. Additionally matric potential sensors will be installed at 10 and 50 cm depth. These sensors will help in determining when and how much water is availalbe to plants throughout the growing season.

Why measure soil moisture?

Soil water content in the surface layer of the earth affects land-atmosphere processes and is important at all spatial scales but is very difficult to measure. To monitor soil moisture globally NASA launched the SMAP (Soil Moisture Active Passive) satellite on January 31, 2015 and scheduled to begin collecting data in late April. The low-end of the microwave spectrum measured by SMAP is well suited for the remote sensing of water content in soil but requires measuremnts to be calibrated.

The addition of soil moisture and temperature sensors to our weather stations, located in the interior of Katmai National Park and Preserve will serve this purpose providing valuble basline data. Because this region is between the Pacific Ocean and increasingly ice free Bering Sea winter precipitation frequently transitions between rain and snow across the study area, thus the snowpack and active layer depth are sensitive to small changes in mean annual temperature. For these reasons data from theses sensors will contribute greatly to our scientific understanding of the region.

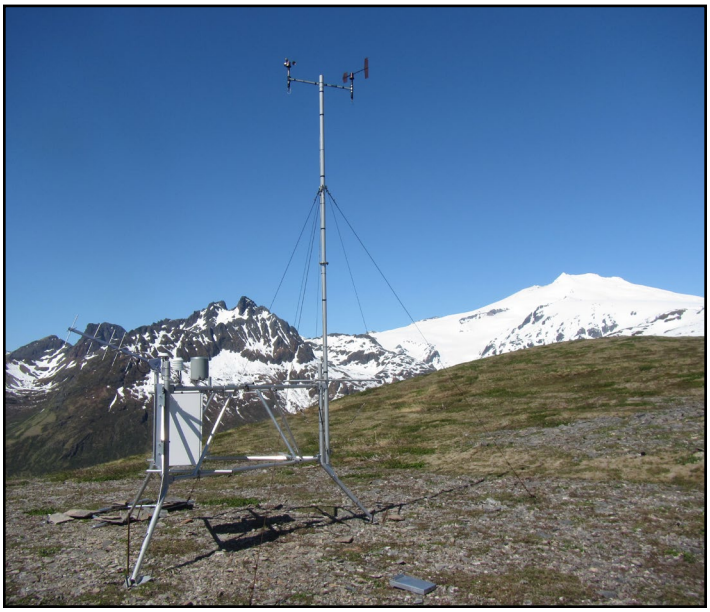

Figure 4. Climate monitoring station near Fourpeaked Volcano. A sturdier wind sensor will be installed at half the height of the existing wind sensors.

Figure 5. Soil pit profile near Pfaff Mine.

King Salmon winter temperature trend

The average winter temperature for 2014 – 2015 was 26.5 °F, the 4th warmest winter on record (during 1948-49 to 2014-15) and 8.6 °F warmer than the 1981-2010 climate normal period.

We calculate the average winter temperature by simply taking the average of December, January, and February monthly temperatures. Note that some months may have days with missing data. Historically, average winter temperatures show great variability with a range between 3.1 °F in 1956 and 29.2 °F in 2001.

If years with <5 missing days are analyzed, there has been an overall increase in winter temperatures of 1.3 °F per decade over the period of record based on a simple linear regression (Figure 6). The 10-year moving average shows the warmest periods in the late 1980s and the mid 2000s.

Connecting further

• Interesting new paper published: Evidence for a wavier jet stream in response to a rapid Arctic warming

• Access near-real time data from the Western Regional Climate Center and MesoWest and check the National Weather Service point weather forecast for Brooks Camp

• Read climate monitoring reports and other documents from the Southwest Alaska Network

• See a map of projected temperature and precipitation changes for Katmai National Park and Preserve

• Find climate-related information from the Alaska Climate Research Center

• Explore NOAA's Climate.gov

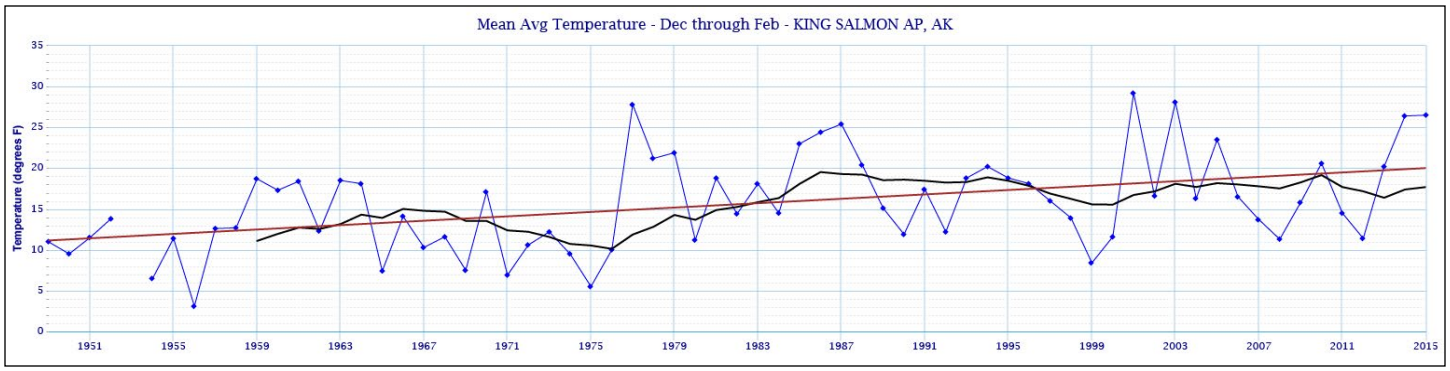

Figure 6. Average winter (December, January, February) temperatures at King Salmon between 1949-2015. The black line is a 10-year moving average. The brown line is a simple linear regression.

More information

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Tundra and unnamed lake north of Coville Lake /NPS