



Annual Climate Summary 2014

Central Alaska Network

Natural Resource Data Series NPS/CAKN/NRDS—2017/1081



ON THE COVER

Photograph of climate station maintenance crew working on a station in Wrangell – St. Elias National Park and Preserve.
Photograph courtesy of the National Park Service.

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Executive Summary

The Central Alaska Network's climate monitoring program has established seventeen remote weather stations to monitor climate in Denali National Park and Preserve, Wrangell -St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve. The main goal of the program is to operate these remote sites for the long-term in order to help scientists and park managers understand the climate patterns across these large parks. There are five other weather and climate stations around the parks operated by various state and federal agencies that are used as index sites to compare current climate conditions in the region to the climatological normal - the average weather conditions over a 30-year period. The current normal period is 1981-2010. This report summarizes the annual and monthly temperature and precipitation deviations for the index sites and compiles monthly and annual statistics for the sites with shorter records, including five additional fire weather stations located within park boundaries. A brief synopsis of regional, national, and global climate conditions for 2014 is included for climatic context.

All of the CAKN index sites had mean annual temperatures that were above the 1981-2010 normals. The winter months had the largest positive temperature deviations; in January the monthly mean temperatures ranged from ~13 to 22°F warmer than normal at the interior sites and 8°F warmer than normal along the Gulf Coast at Yakutat. The mean annual temperature at both Talkeetna and McKinley Park was 2.4°F above normal; Gulkana and Yakutat were 0.8°F warmer than normal and Eagle annual temperatures averaged near normal at just 0.2° above the 1981-2010 normal.

The eastern region of CAKN was wetter than normal; McKinley Park was near normal and both Talkeetna and Yakutat were below normal in terms of total annual precipitation. The total annual precipitation in Eagle was 141% of normal with a total of 17.45 inches; January, April, June, July and December were the wettest months of the year. January precipitation totals were well above average for all the sites, especially in Gulkana with a monthly total of 2.42 inches, which is 526% of normal. The spring season was drier than normal at all the index sites, but transitioned into a very wet June and July with the monthly precipitation in June averaging ~182% of normal. August, September and December on average were near normal for the region. The average annual temperatures and total annual precipitation values once again do not do justice to the extreme variability in month to month or season to season weather statistics for 2014.

2014 was the warmest year on record for Alaska. The mean annual temperature for Alaska was 4.0°F warmer than normal and the precipitation totals were slightly above normal. Nationally temperatures were 0.5°F above the 20th century average making it the 34th warmest year on record, while globally 2014 was the warmest year on record since records began in 1880.

Between May and September of 2014, the Central Alaska Network staff performed annual site maintenance at the thirteen CAKN weather stations in the three parks, three of the fire weather stations, and assisted the Natural Resources Conservation Service with maintenance of the four snow telemetry sites in the network.

Introduction

Denali National Park and Preserve, Wrangell–St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve make up the Central Alaska Inventory and Monitoring Network (CAKN), covering over 21 million acres. The network was established to monitor key components of ecosystems of the parks and to provide that information back to park managers for use in stewardship of park resources. Climate is considered to be the most important broad-scale factor influencing ecosystems and therefore the natural resources of parks. Because global climate models indicate that climate change and variability will be greatest at high latitudes, climate monitoring is critical to understanding the changing conditions of park ecosystems.

There are five National Weather Service (NWS) stations in the CAKN region that have been in operation for 64 to 89 years that are used as index sites to place current year regional weather conditions into climatological context. Monthly and annual statistics are compared to the latest climate normal period (1981-2010).

The CAKN parks represent a large portion of the mountainous environment of the state of Alaska and therefore provide an opportunity to understand climate gradients that have been, in the past, a challenge to instrument and monitor. The CAKN climate monitoring program deployed 12 climate stations between 2003 and 2005, mostly at higher elevations, to capture elevational and latitudinal climate gradients within the parks, and to capture data in areas where there were no baseline references. A new site was established in 2013 at Wigand Creek in Denali, bringing the total to thirteen. These sites are referred to as CAKN RAWS (remote automated weather stations). For detailed information on station locations, station design, and maintenance schedules see the CAKN climate monitoring protocols (Sousanes, 2006). There are nine additional sites that are analyzed in this report including four snow telemetry (SNOTEL) sites and five fire RAWS. The SNOTEL sites were installed in the CAKN parks to get year-round precipitation measurements from representative locations. These sites are operated and maintained under an interagency agreement between the NPS and the Natural Resources Conservation Service (NRCS). The five fire RAWS are located within the park boundaries and are part of the national fire program and are maintained under contract with the National Interagency Fire Center.

The 2014 field season marked the eighth year of operational climate monitoring in CAKN parks. Annual maintenance was performed at all of the climate stations. Maintenance at the climate sites included sensor replacement, troubleshooting, upgrades, data downloads, and sensor calibrations. Station maintenance logs were used to keep track of the climate station inventory for the stations, which includes: sensors, data loggers, towers, solar panels, and batteries. Sensor and power performance was tracked and instrumentation was replaced as necessary. A maintenance report is completed after each field season to document the details of the site visits – these reports include the field notes, photos, logistics, and sensor metadata (Hill and Sousanes, 2015).

This is the tenth in a series of annual data reports that summarize the annual and monthly weather statistics of the most recent year for the Central Alaska Network Climate Monitoring Program.

Central Alaska Network Climate Overview

The Central Alaska Network (CAKN) encompasses strong climate gradients, from the maritime climates in the southern parts of Wrangell – St. Elias National Park and Preserve (WRST) where it borders the North Pacific Ocean, to the strongly continental climates found in northern parts of Denali National Park and Preserve (DENA) and Yukon –Charley Rivers National Preserve (YUCH). The Central Alaska parks constitute parts of the Northeast Interior, Southeast Interior, Central Interior, and Cook Inlet Alaska climate divisions (Bieniek, et al 2012). A transitional climate region lies between the coast and the interior influenced by major mountain ranges which act not only as the environmental controls to drive climate but also contribute to the highly localized micro climates found in complex mountain terrain (Redmond and Simeral 2006). The climate gradients are intrinsic to the ecosystem patterns, and vegetative and faunal communities found in CAKN parks.

The climate patterns of Alaska are primarily influenced by latitude, continentality, and elevation. The high latitude drives the seasonal pendulum of available solar radiation; areas farther north have limited incoming solar warmth in the winter and an abundance of available light in the summer. Major mountain ranges in the state act as barriers to the moisture spinning off of the Pacific Ocean to the south. The warm, moist air masses deposit precipitation on the windward sides of the mountains – rain at low elevations and snow at higher elevations. Large scale atmospheric and oceanic circulation patterns influence seasonal and annual weather patterns in the state, like the repositioning of the polar jet stream and the Aleutian low pressure system or the frequency of La Ninas and El Ninos (Papineau, 2001). Each of these can affect the regional patterns of storm tracks, prevailing winds, snowfall amounts, and the extent of sea ice (ACIA, 2004).

There are several large-scale climate patterns and indices that are of particular interest to Alaska, including the Pacific Decadal Oscillation (PDO) which is an index of sea surface temperatures in the North Pacific Ocean. Typical winter sea surface temperatures during the warm phase of the PDO are warmer off of the Gulf Coast of Alaska moderating air temperatures over Alaska (Hartmann and Wendler, 2005; Keen, 2013). The PDO seems to cycle through a warm and cool phase every 20 -30 years. Temperature trends that have shown climatic warming tend to be strongly biased by a sudden shift in 1976 from the cooler regime to a warmer regime. In the most recent decade it appeared that a phase shift to cooler ocean temperatures near Alaska was underway. Beginning in about 2005 the PDO index was predominantly negative; however, for most of 2014, the ocean temperatures off the coast of Alaska were warmer than normal and the year ended with strong positive deviations of the PDO index.

While the north Pacific seems to explain some of the temperature trends in the region, the Arctic Ocean, and in particular the extent of sea ice will likely influence both temperature and precipitation patterns in Alaska. In recent years there has been a continued significant reduction in the extent of the summer sea ice cover and the decrease in the amount of relatively older, thicker ice (NSIDC, 2012). Models predict that retreating sea ice will affect the temperature and ecosystems of adjacent lands. An increase in the amount of energy absorbed by vegetation and its transfer to the atmosphere, will contribute to the further high-latitude amplification of climate warming (Chapin et al., 2005).

Methods

Data were compiled from the index sites; the five long-term climate stations with the most complete records nearest the three CAKN parks that represent the major climate regimes in the network (Table 1). These stations have records for a sufficient number of years to compare 2014 data with the latest normal period, 1981-2010. Temperature, precipitation, and snowfall were analyzed for the long-term sites. Monthly temperature means and precipitation totals for 2014 are compiled and compared with the 1981-2010 normal values for each site.

Data were also compiled from thirteen CAKN RAWS in the three parks and five additional fire RAWS in the parks (Figure 1; Table 2 and 3). During the annual site visits data were downloaded from each climate station and checked for quality. CAKN station data, metadata, quality control flags/notes, and sensor history is managed with Aquatic Informatics software and stored through the NPS Water Resources Division server in Fort Collins, Colorado. Errors or values outside a standard range were flagged and not used in the summary statistics. The quality checked data files are then sent to the Western Regional Climate Center for archival purposes; there has been a lag between when these files are sent and when they get updated. A report on data quality is kept on file for each site. Monthly and annual means and totals were compiled for the climate variables measured at each location including, temperature, wind speed and direction, peak wind gust, relative humidity, solar radiation, soil temperatures, snow depth, and summer rainfall.

Five snow telemetry (SNOTEL) sites were also analyzed for year-round precipitation and snowfall amounts at locations in and around the CAKN parks (Table 4).

Most of the summaries, analyses, charts, and graphs included in this report from the National Oceanic and Atmospheric Administration (NOAA) and from the Natural Resources Conservation Service (NRCS) are in standard units; for consistency all data are presented in standard units.

Table 1. Long-term index sites.

<i>Name</i>	<i>Lat</i>	<i>Long</i>	<i>Elev. (ft.)</i>	<i>Network</i>	<i>Start of Record</i>	<i>End</i>	<i>Park</i>
Eagle	64.767	-141.200	850	COOP	1947	Present	YUCH
McKinley Park	63.720	-148.966	2060	COOP	1925	Present	DENA
Talkeetna	62.180	-150.060	350	COOP	1919	Present	DENA
Gulkana	62.150	-145.450	1580	SAO	1943	Present	WRST
Yakutat	59.500	-139.670	30	SAO	1918	Present	WRST

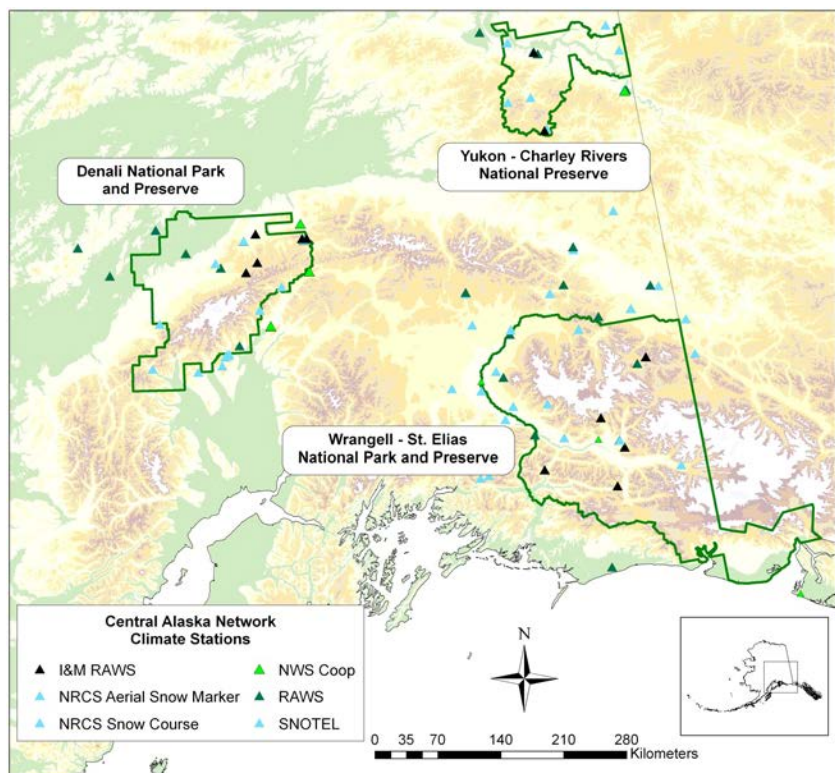


Figure 1. Map of CAKN climate station locations.

Table 2. CAKN RAWS sites.

<i>Name</i>	<i>Lat</i>	<i>Long</i>	<i>Elev. (ft.)</i>	<i>Network</i>	<i>Start</i>	<i>End</i>	<i>Park</i>
Dunkle Hills	63.2670	-149.5415	2651	CAKN RAWS	2003	Present	DENA
Eielson Visitor Center	63.4307	-150.3102	3730	CAKN RAWS	2005	Present	DENA
Ruth Glacier	62.7099	-150.5398	3301	CAKN RAWS	2008	Present	DENA
Stampede	63.7478	-150.3281	1800	CAKN RAWS	2003	Present	DENA
Toklat	63.5255	-150.0465	2920	CAKN RAWS	2005	Present	DENA
Wigand	63.8142	-150.1094	1717	CAKN RAWS	2013	Present	DENA
Coal Creek	65.3041	-143.1570	820	CAKN RAWS	2004	Present	YUCH
Upper Charley	64.5169	-143.2023	3654	CAKN RAWS	2005	Present	YUCH
Chicken Creek	62.1240	-141.8473	5260	CAKN RAWS	2004	Present	WRST
Chititu	61.2735	-142.6209	4554	CAKN RAWS	2004	Present	WRST
Gates Glacier	61.6029	-143.0132	4060	CAKN RAWS	2005	Present	WRST
Tebay	61.1810	-144.3392	1880	CAKN RAWS	2005	Present	WRST
Tana Knob	60.9080	-142.9013	3739	CAKN RAWS	2005	Present	WRST

Table 3. Fire RAWS.

<i>Name</i>	<i>Lat</i>	<i>Long</i>	<i>Elev. (ft.)</i>	<i>Network</i>	<i>Start</i>	<i>End</i>	<i>Park</i>
Denali Visitor Center	63.7333	-148.9006	1670	RAWS	2007	Present	DENA
McKinley River	63.6487	-151.6421	840	RAWS	1992	Present	DENA
Wonder Lake	63.4900	-150.8800	2119	RAWS	1995	Present	DENA

Table 4. CAKN SNOTEL sites.

<i>Name</i>	<i>Lat</i>	<i>Long</i>	<i>Elev. (ft.)</i>	<i>Network</i>	<i>Start</i>	<i>End</i>	<i>Park</i>
Kantishna	63.53845	-150.98365	1670	SNOTEL	2005	Present	DENA
Tokositna Valley	62.62942	-150.77578	850	SNOTEL	2006	Present	DENA
Chisana	62.07194	-142.06528	3320	SNOTEL	2007	Present	WRST
May Creek	61.34833	-142.69417	1650	SNOTEL	2008	Present	WRST

Air Temperature Correction October 2015

During a datalogger and programming change in 2013 we started recording the values from the secondary air temperature sensor on site. A thermistor manufactured by Therm-X provides the primary air temperature measurement at each site, while a Vaisala air temperature and relative humidity sensor provides a secondary air temperature measurement. Prior to 2013 only the primary air temperature sensor value was logged. A closer look at the difference between the two air temperature sensor measurements led to further investigation. The programming used for the thermistor was based on a linear equation, however, the output was not linear, resulting in either a + or - error of ~ 1.1 to 1.2°C over the -50 to +50°C temperature range. The warm bias in the Therm-X sensor prompted a discussion with Alaska SNOTEL network staff. An extensive review of the SNOTEL network by Oyler et al. (2015) revealed the non-linear bias in the sensor (Figure 2).

By adjusting the equation to a 9th order polynomial within the programming we will be able to reduce the error to + or – 0.2°C, which is better than the specifications provided by the manufacturer. The thermistors were installed on the CAKN stations in 2006. NOAA electrical engineers and scientists tested the CAKN Therm-X sensors against NIST calibrated sensors at the Climate Reference Network program lab and have developed the equation to correct the data. The Western Regional Climate Center is in the process of updating all of the archived air temperature data with the correction for all the CAKN sites.

The ninth order polynomial equation that is being used to correct the data is as follows (also see Table 5):

$$f(x) = p1 * x^9 + p2 * x^8 + p3 * x^7 + p4 * x^6 + p5 * x^5 + p6 * x^4 + p7 * x^3 + p8 * x^2 + p9 * x + p10$$

Table 5. Coefficients for ninth order polynomial equation air temperature correction

Coefficient	Ninth Order Coefficient
p1	610558.2264
p2	-2056177.655
p3	2937046.429
p4	-2319657.129
p5	1111854.338
p6	-337069.8833
p7	66105.70159
p8	-8386.783206
p9	824.8180218
p10	-86.73210068

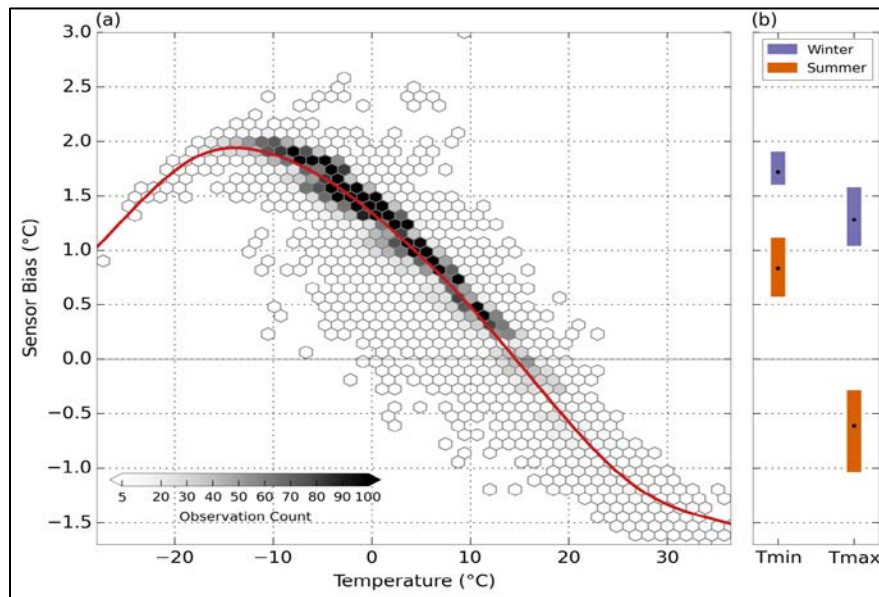


Figure 2. From Oyler et al. 2015. Graph showing the bias of the Therm-X air temperature sensor using a linear equation to measure output.

Results

Climate Year 2014 Synopsis

There was great variability in temperature and precipitation patterns across the CAKN region in 2014. The mean annual temperature at the CAKN index sites averaged +1.3° F warmer than the 1981-2010 normal, with impressive differences between months and between seasons. The mean annual temperature at Yakutat, Gulkana, and Eagle were at or near normal, while both Talkeetna and McKinley Park were 2.4°F warmer than normal for the year. Statewide it was the warmest year on record with the largest positive deviations in the western regions of the state. Annual precipitation totals across the CAKN region varied from 72% of normal in Talkeetna to 141% of normal in Eagle. Denali was near average for the year at 104% of normal. Yakutat's annual precipitation was 86% of normal and Gulkana was 133% of normal (Figure 3).

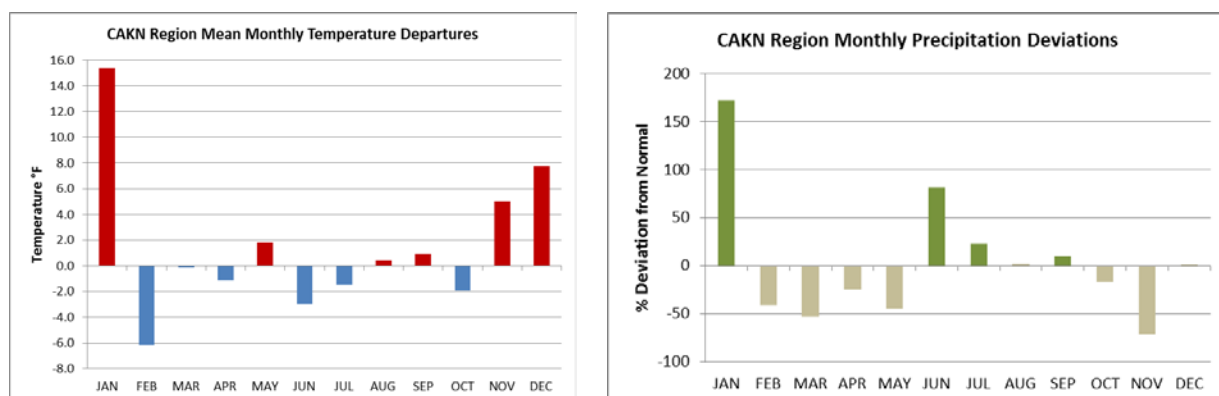


Figure 3. Average monthly temperature departures (left) and monthly precipitation deviations (right) for the five index sites around CAKN in 2014.

Temperatures were variable across the network from month to month, but the positive temperature departure in January and December and the negative temperature departure in February stand out. The year started out with temperatures that were well above normal for January; positive temperature deviations ranged from +7.9°F in Yakutat to +21.5°F in Gulkana. Temperatures cooled in February and remained on the cool side through April. May was warmer than normal at every location except for Eagle, which was almost 3° cooler than normal for the month. The summer was cool, particularly June and July. August and September temperatures were near normal and October was cooler than normal at all the interior sites, Yakutat was just above normal for the month. The temperatures in November and December were well above normal in the region.

January was a particularly wet month for much of the region with monthly totals that were well above normal. The monthly total in Gulkana was 2.42 inches, normal is 0.42 inches. February through May were very dry throughout the region with all sites having monthly precipitation totals that were below normal. April in Gulkana was the exception with precipitation totals at 138% of normal. June was wet around the region with monthly totals ranging from 144% to 230% of normal. The rain continued to fall in July in the northern and eastern interior with McKinley Park, Eagle, and Gulkana all having wetter than normal July periods. Talkeetna and Yakutat had below normal rainfall

totals for July. August through October had near normal conditions with regards to precipitation. November was dry; on average monthly precipitation totals were ~ 29% of normal. The snowpack was late to develop in the fall of 2013 with warm temperatures in October that brought rain throughout the month rather than snow. The snow on date for the season was delayed about a week in interior Alaska and occurred ~ October 24.

The 2013-2014 snow season was late to start, but increased incrementally throughout December and the first half of January. The record warm temperatures during the second half of January caused widespread melting. Rain was recorded in January in many interior Alaska communities that left some areas of the interior snow free. Temperatures cooled again in February and some areas, including the eastern Alaska Range, gained quite a bit of snow in February that persisted into March. Higher elevation sites in the upper Susitna Basin gained snow, while the lower elevations never caught back up after the warm January and mid-winter rains. The Copper Basin, including the Chugach and Wrangell Mountain Ranges, ranged between normal and just above normal. The Central Yukon Basin near Yukon-Charley also had near normal conditions for early spring. Warm April temperatures diminished much of the snowpack in the interior and by May 1 most of the lower elevation sites were close to melt-out. The higher elevations in the Alaska Range had near normal snow conditions for May 1. Snow off dates were recorded at Tokositna on April 26, followed by May Creek and American Creek on May 3, Kantishna on May 4, and Chisana on May 5.

Alaska Statewide Synopsis

According to National Climatic Data Center's (NCDC) State of the Climate Report for 2014, the average annual temperature for Alaska was 4.0°F above the 1971-2000 average making 2014 the warmest year on record. The average annual temperature deviations for the first order stations in Alaska are shown in Figure 4. Based on the mean monthly temperature departures from normal, the warmest months of 2014, in decreasing order, were January (+12.8°F), December (+7.5°F), and November (+7.0°F), while June was the coldest month with a mean monthly temperature deviation of -1.3°F (Figure 5).

Precipitation statewide was just above average and ranked as the 52nd wettest year on record (Figure 6). January was wet around the state ~21.2% above average. Spring precipitation statewide was ~10% below average; summer of 2014 was the third wettest on record with June and July with record summer rainfall totals for Fairbanks and Juneau. Both the fall season and December were drier than normal at 90% and 81% of normal, respectively (NOAA 2015) (Figure 7). Note that the NCDC uses 1971-2000 as the normal base period for Alaska statistics. The snowpack was less than 50% of normal in many locations in the western and southwestern areas of the state, while the interior and the Arctic slope areas had closer to normal snowpacks for March diminishing through May1 (Figure 8).

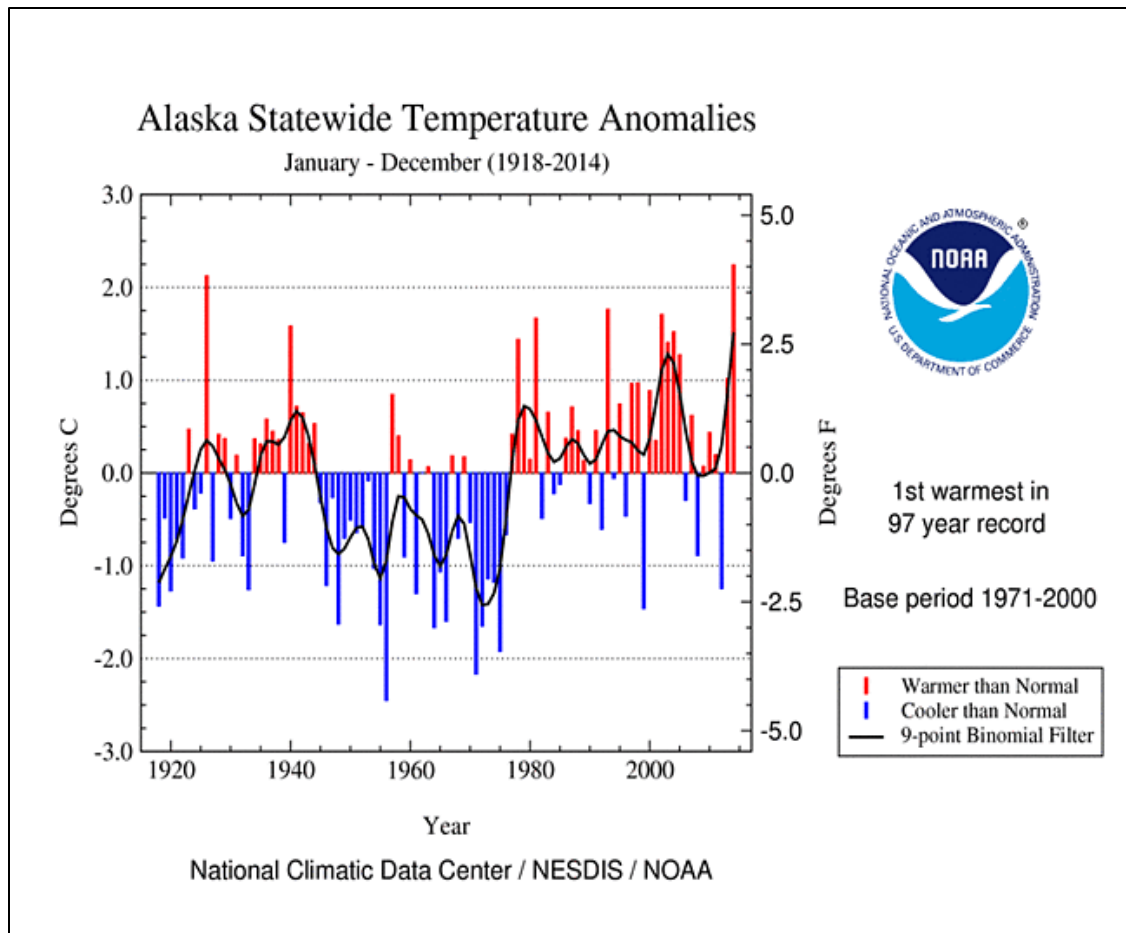


Figure 4. Average temperatures across Alaska in 2014 were 4.0° F above the 1971-2000 mean. Graph courtesy of NOAA (NOAA 2015a).

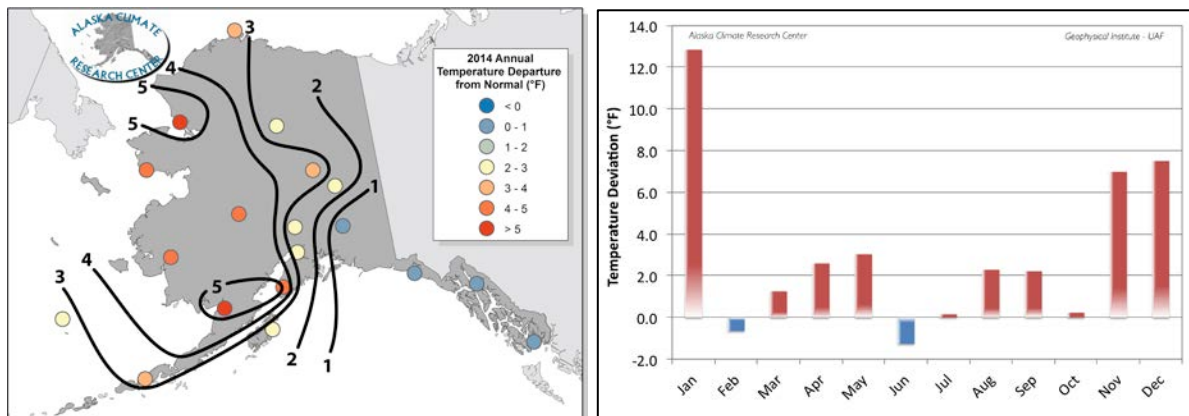


Figure 5. Statewide temperature departures for 2014 (left) and mean monthly temperatures deviation for the 20 first order stations in Alaska by month for 2014 (right). Graphs courtesy of the Alaska Climate Research Center (ACRC 2015).

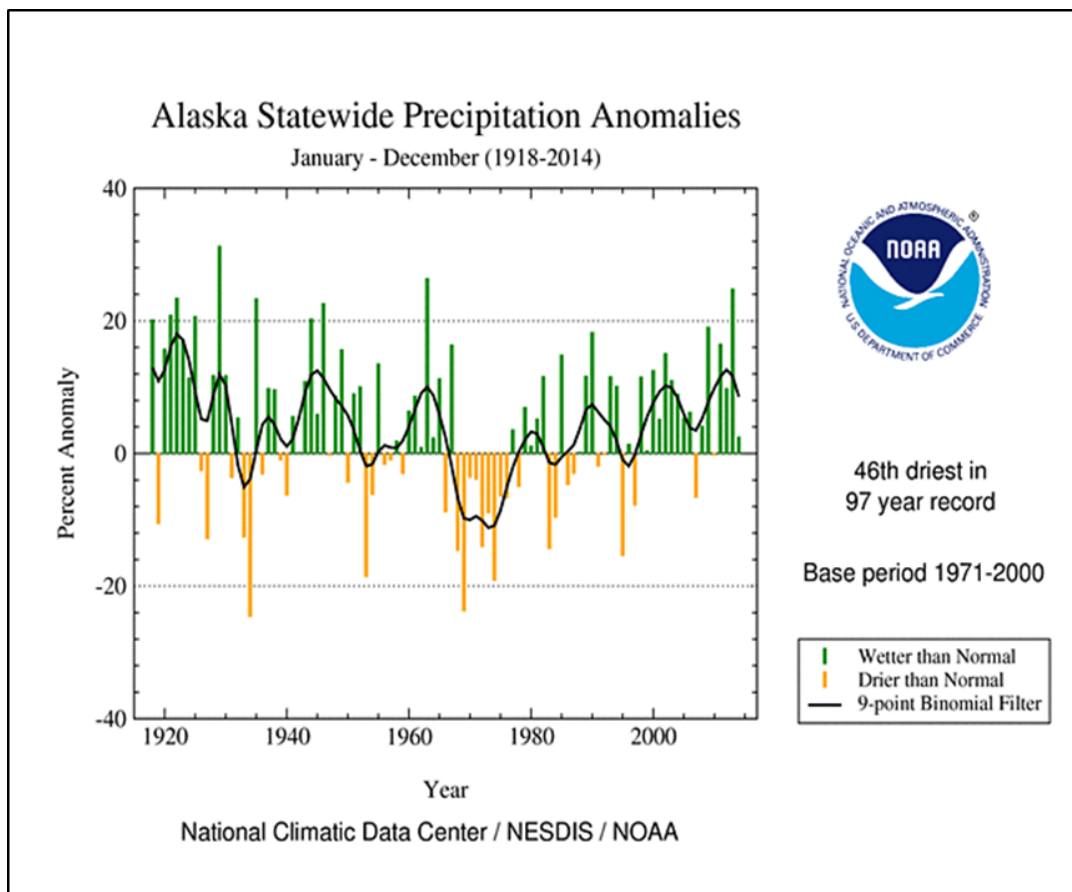


Figure 6. Annual precipitation anomalies 1918-2014. Graph courtesy of NOAA (NOAA 2015a).

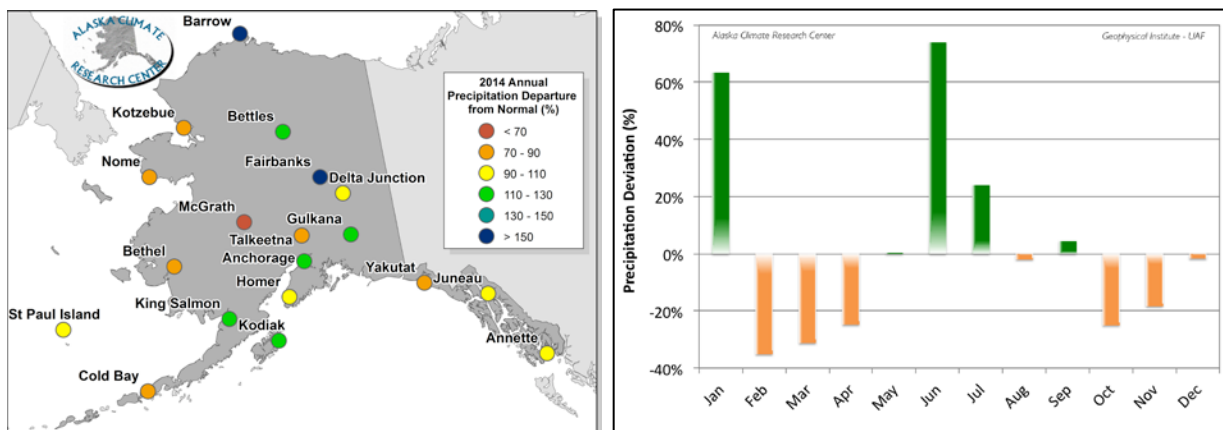


Figure 7. Annual precipitation departures from normal for 2014 (left) and monthly deviations (right) for the 20 first order climate stations in Alaska. Graphs courtesy of the Alaska Climate Research Center (ACRC 2015).

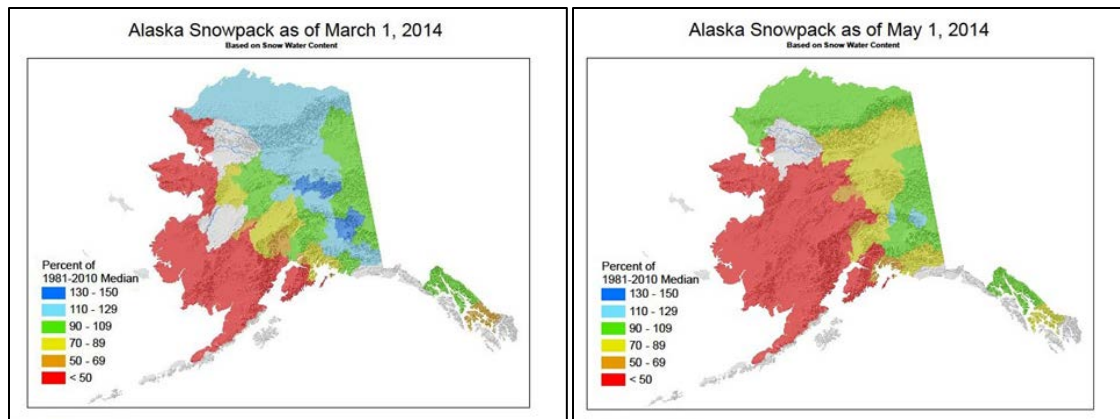


Figure 8. March 1 and May 1 snowpack percent of normal for Alaska 2014 (NRCS 2015).

Climate Teleconnections

The El Nino Southern Oscillation index remained in a neutral state during all of 2014. Ocean heat content in the North Pacific did warm from 2013 to 2014, especially south of the Alaska Peninsula. Climatologists are closely watching the Pacific to see if this pattern combined with warming in the equatorial Pacific could indicate a transition toward a positive (warm) phase of the PDO. The PDO index was negative for the first couple months of 2014, positive for the spring period, near neutral during the summer months, and the fall and early winter had the largest positive deviations (NOAA, 2015b) (Figure 9). The Arctic Sea Ice extent in September 2014 was the sixth lowest extent in the satellite record (NSIDC 2015) (Figure 10).

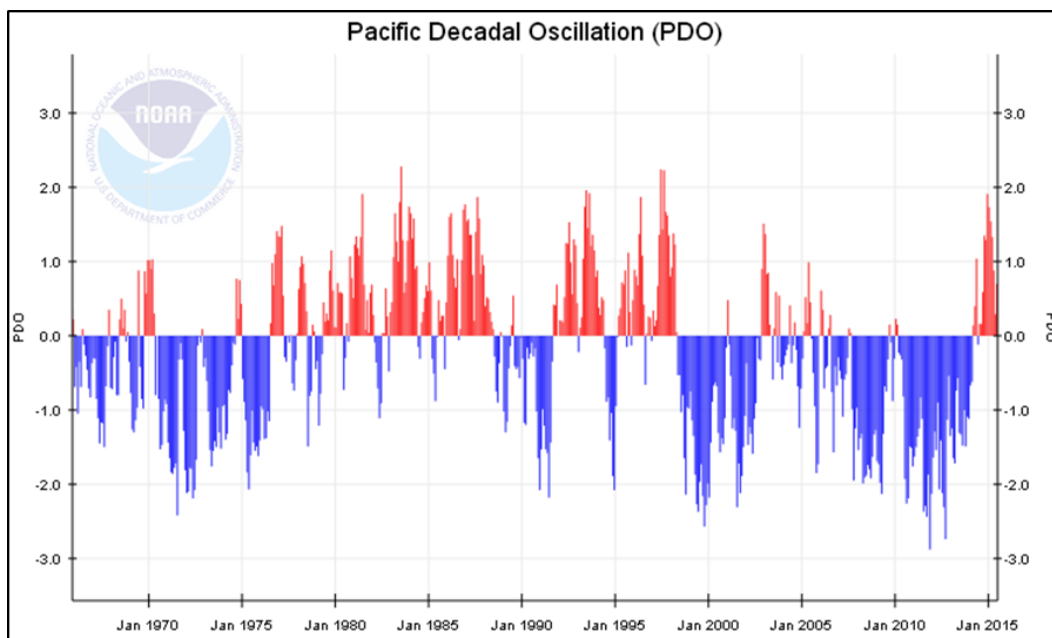


Figure 9. Pacific Decadal Oscillation index based on NOAA's extended reconstruction of SSTs (ERSST Version 3). Graph courtesy of NOAA (NOAA, 2014b).

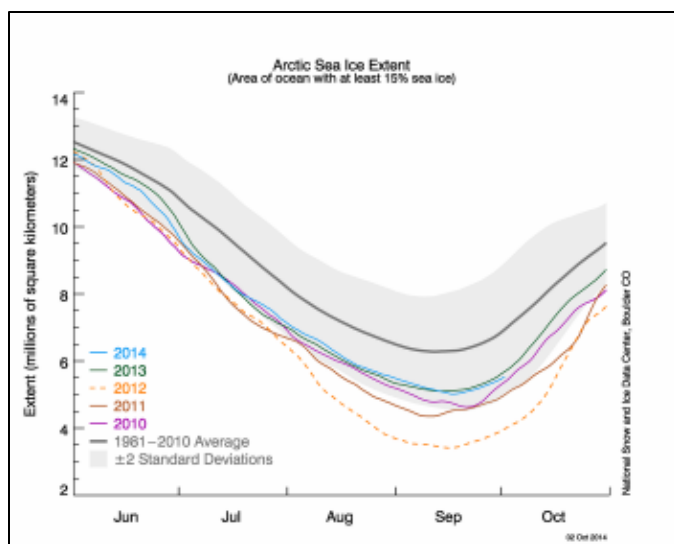


Figure 10. Arctic Sea Ice extent 1979-2014. 2012 was the lowest seasonal minimum extent on record (NSIDC 2015).

Wildfire Activity

According to the Alaska Interagency Coordination Center (AICC), the summer of 2014 will go down in history as one of the wettest summers ever recorded in Alaska. Summer precipitation totals (June-July-August) broke records in both Fairbanks and Juneau. Although the spring was dry and melt out was earlier than normal, the summer rains kept fire starts and spreads to a minimum. Statewide there were a total of 393 wild land fires in 2014, with a total of 233,529 acres burned. 339 of the 393 were human caused fires. The total area burned in the CAKN parks was 0 acres this year (AICC, 2015).

National and Global Synopsis

Based on data from January through December, the average annual temperature for the contiguous U.S. for 2014 was 52.6°F, 0.5°F above the 20th century average. It was the 34th warmest year over the 120-year record (NOAA, 2014c). The temperature trend for the lower 48 states is + 0.13 °F per decade since records began in 1895. The average precipitation total for the lower 48 states in 2014 was 30.76 inches, 0.82 inches above average, making it the 40th wettest year on record. The precipitation trend for the contiguous U.S. has increased by about 0.14 inches per decade over the past 120 years.

Globally, 2014 was the warmest year on record. Over land and ocean combined, 2014 was 1.2°F above the 20th century average of 57.0°F. Including data from 2014, the Earth is warming at a rate of 0.11°F per decade since 1880 and at a rate of 0.28°F per decade since 1970. 9 out of 10 warmest years on record have occurred in the 21st century. Precipitation, globally, was near average, but varied from region to region (NOAA, 2015c). See Appendix B and C for more information on national and global climate anomalies.

Temperature Analysis

Index Sites

Temperatures were variable across the network from month to month, but the positive temperature departures in January, November and December stand out. The calendar year started off very warm with temperatures well above average across the entire state. February had the largest negative departure of any month of the year with the strongest deviations in Gulkana and McKinley Park at -14.0°F and -6.9°F cooler than normal, respectively. March and April temperatures were near normal with a slight tilt towards cooler than normal temperatures. May was warm in all CAKN areas except for Eagle, which remained quite cool and ended with a monthly average almost 3°F cooler than normal.

June and July were unseasonably cool in the interior; in June the coastal area near Yakutat remained near normal, but the interior sites were between 3 and 4°F cooler than normal. July temperatures remained cool with the largest negative deviations in Eagle and McKinley Park. Temperatures in August moderated and were near normal.

The fall started out warmer than normal in September and then cooled in October. The pattern shifted in November and the monthly average temperatures were well above normal.

The 2014 monthly mean temperature deviations at CAKN index sites are shown in Figure 11. Table 6 lists the monthly average temperatures and the annual temperatures at each location compared to the 1981-2010 normal value.

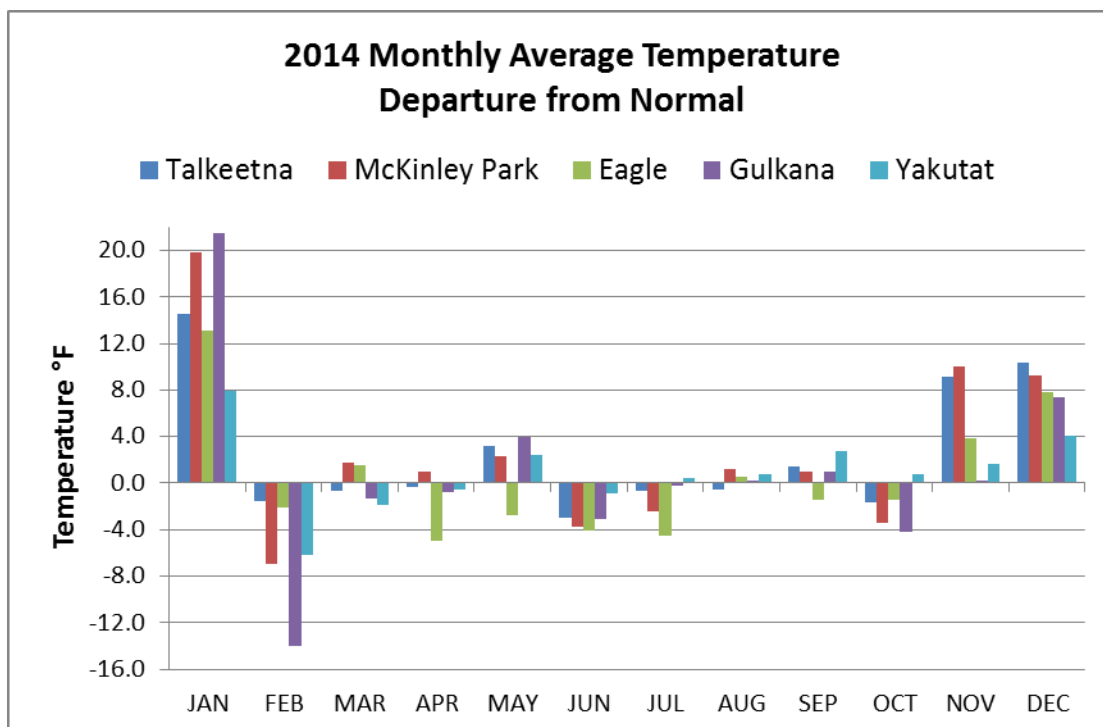


Figure 11. 2014 average monthly temperature departure from normal (1981-2010) at long-term sites.

Table 6. Mean monthly and annual temperatures (°F) for 2014 from long-term sites compared to the 1981-2010 normal period.

Site	Year(s)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Ann
Talkeetna	2014	28.7	16.6	24.2	35.6	51.0	54.0	59.4	56.2	48.9	31.6	28.6	26.3	38.4
Talkeetna	1981-2010 normal	14.2	18.1	24.9	35.9	47.8	57.0	60.1	56.7	47.5	33.2	19.5	16.0	36.0
McKinley Park	2014	22.9	0.7	15.2	28.9	45.1	49.1	53.2	51.8	41.4	19.5	18.9	16.2	30.2
McKinley Park	1981-2010 normal	3.1	7.6	13.4	27.9	42.8	52.8	55.6	50.6	40.4	22.9	8.9	6.9	27.8
Eagle	2014	3.5	-5.8	8.7	24	43.5	53.9	55.9	54.3	40.4	21.6	6.5	3.8	25.9
Eagle	1981-2010 average*	-9.6	-3.7	7.2	29	46.3	58	60.4	53.7	41.8	23	2.6	-4	25.7
Gulkana	2014	18.6	-8.5	14.3	31	49.2	51.3	57.4	53.7	44.3	22.4	6.0	7.8	29.0
Gulkana	1981-2010 normal	-2.9	5.5	15.6	31.8	45.2	54.4	57.6	53.5	43.3	26.6	5.8	0.4	28.2
Yakutat	2014	36	23.5	30.0	37.2	47.1	49.9	54.7	54.6	51.2	41.7	34.0	33.7	41.1
Yakutat	1981-2010 normal	28.1	29.7	31.9	37.8	44.7	50.8	54.3	53.8	48.4	40.9	32.3	29.6	40.3

CAKN RAWS

Although the CAKN climate stations and other Remote Automated Weather Stations (RAWS) around the CAKN parks have relatively short records, measurements from these sites fill in some of the large spatial gaps in the network and provide information on climate patterns related to elevation and topography. Table 6 lists the monthly and annual temperatures for these sites grouped by park. Deviations or departures from normal cannot be calculated for these new sites. Note: These are the corrected air temperature values as of December 2015.

Table 7. Monthly and annual mean temperatures (°F) from CAKN stations 2014.

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Denali VC	21.0	-1.0	15.0	31.0	46.0	52.0	55.0	53.0	43.0	19.0	16.0	14.0	30.3
Dunkle Hills	20.6	5.2	11.1	22.5	38.5	45.8	50.4	48.0	m	21.2	18.5	18.4	m
Eielson VC	27.9	15.3	18.5	28.3	41.0	44.6	50.4	49.7	40.5	20.2	30.3	25.8	32.7
Kantishna	12.0	-5.0	10.0	30.0	46.0	49.0	53.0	51.0	40.0	19.0	13.0	7.0	27.1
Ruth Glacier	25.9	16.7	20.6	27.4	40.8	42.2	48.6	46.9	40.5	27.8	28.4	24.6	32.5
Stampede	11.7	-5.4	9.6	27.8	45.1	49.9	54.1	51.0	39.6	17.1	11.2	5.9	26.5
Toklat	24.7	5.4	13.2	27.6	42.2	47.1	51.2	49.3	39.1	14.5	22.6	18.1	29.6
Tokositna	27.0	15.0	23.0	34.0	48.0	51.0	55.0	52.0	44.0	29.0	26.0	26.0	35.8
Wigand	16.5	-0.8	12.6	29.7	46.4	50.7	55.0	53.0	41.8	18.5	16.8	9.4	29.1
Wonder Lake	17.0	2.0	13.0	30.0	45.0	49.0	54.0	52.0	40.0	18.0	16.0	11.0	28.9
Coal Creek	-0.4	-13.4	6.3	29.2	48.5	55.5	57.8	54.4	40.2	20.1	3.4	0.0	25.1
Upper Charley	10.5	-1.4	9.1	25.3	41.7	47.1	50.7	48.0	36.8	18.6	9.5	8.0	25.3
Chicken Creek	22.9	6.7	11.1	23.7	38.0	39.9	46.7	45.1	35.4	19.9	20.4	18.3	27.4
Chisana	17.0	-9.0	7.0	28.0	45.0	47.0	53.0	50.0	39.0	19.0	3.0	0.0	24.9
Chititu	25.7	9.9	13.7	24.9	39.5	40.0	46.2	45.6	37.6	23.9	24.2	22.3	29.5
Gates Glacier	26.3	11.2	15.5	26.4	41.1	41.2	47.8	46.5	38.8	25.8	26.1	23.7	30.8
May Creek	21.0	-7.0	17.0	34.0	49.0	51.0	56.0	53.0	43.0	24.0	8.0	9.0	29.8
Tebay	22.3	-2.0	14.5	27.3	42.8	48.0	52.8	50.4	43.4	26.5	16.2	15.4	29.8
Tana Knob¹	m	m	m	m	m	m	49.7	48.6	41.4	25.5	24.6	22.5	m
Chitina	24.0	-7.0	19.0	35.0	52.0	54.0	58.0	55.0	46.0	27.0	12.0	13.0	32.3
Klawasi	26.0	3.0	18.0	31.0	46.0	48.0	54.0	52.0	43.0	23.0	20.0	19.0	31.9

Black = CAKN RAWS; **Blue**=SNOTEL; **Green**=Fire RAWS

¹ Catastrophic datalogger failure – no data recovered from site June 2013-July 2014.

The patterns and variability in temperatures show up well when all of the CAKN RAWS sites are combined into one graph (Figure 12 and 13). Note the large variation in winter temperatures between sites versus other seasons. The curve for 2014 highlights the warm January temperatures and cold temperatures in February. The warmest temperatures of the season for all of the sites in the region occurred in July, which is normal. January is usually the coldest month, but January 2014 was, on average, 5.0°F warmer than December of 2014. The 2014 mean annual temperatures at the CAKN sites were the warmest on record in a decade of measurements.

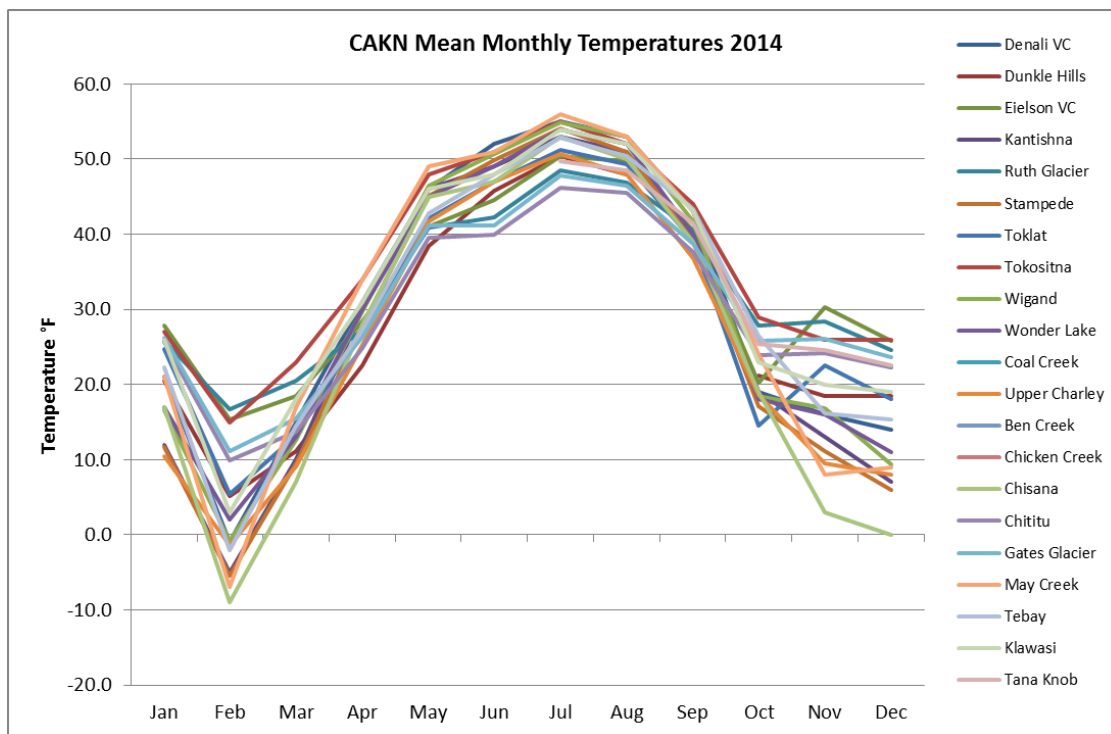


Figure 1. CAKN 2014 mean monthly temperatures.

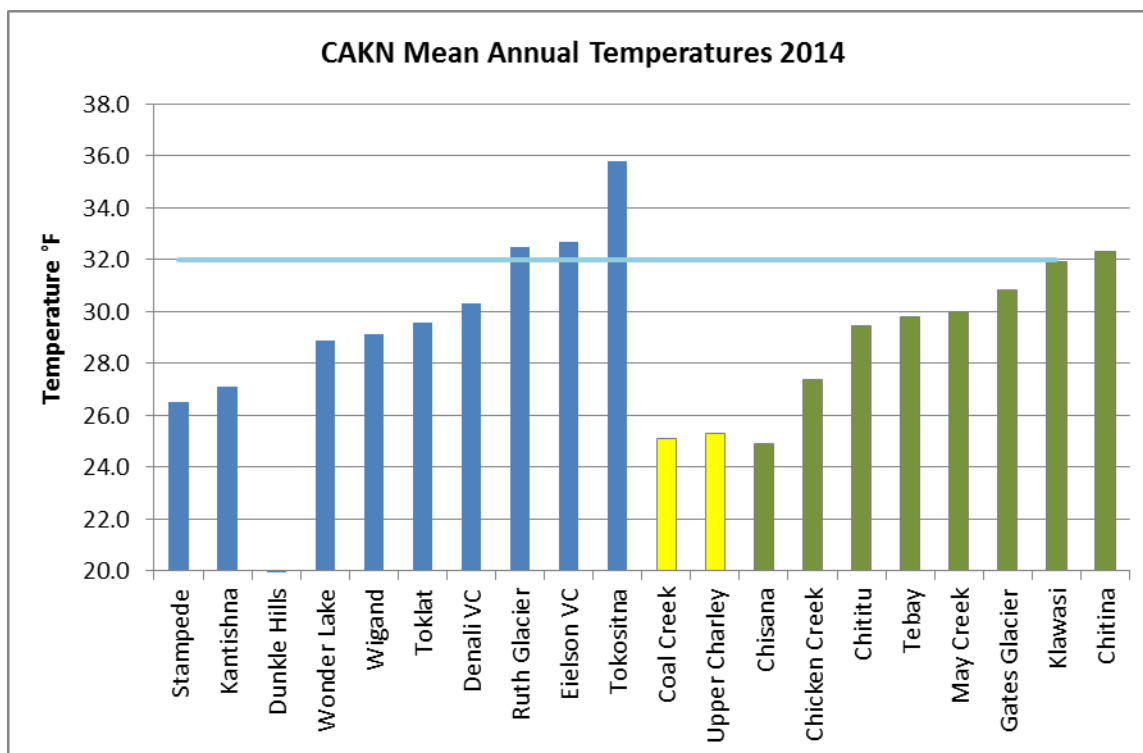


Figure 2. CAKN 2014 mean annual temperatures. Blue sites DENA, yellow YUCH, and green WRST.

One of the objectives of the CAKN climate program was to instrument these higher elevation sites to acquire information related to temperature gradients in complex topography. In some cases higher sites were deployed in the vicinity of existing lower elevation sites for comparison. Correlations between the paired high and low elevation sites are best described by monthly means rather than annual means. In the warm season, the higher sites tend to be 5 to 10°F colder depending on the elevation, but in the winter during cold spells, a persistent inversion can set up and the higher elevations can be 10 to 20°F warmer than the surrounding lowlands. The air is often calm in the darker winter months due to the lack of solar radiation that generates surface winds that are more common in the summer. There are exceptions to winter inversions however, a storm system can move in from the Gulf of Alaska or Bering Sea, bringing warm maritime winds (called Chinooks) that funnel through the mountain passes, raising temperatures and mixing the air. The areas just north of these mountain passes often get winds > 40 mph during these events.

The following tables show the monthly and annual variation between low and high elevation sites in the three CAKN parks. Table 8 shows Chicken Creek and Chisana, sites located in the continental interior region of northeastern WRST, north of the Chugach and Wrangell Mountain ranges. Chicken Creek is in the Nutzotin Mountains and Chisana is in the Chisana River flood plain below the terminus of the Chisana Glacier. The annual temperature was 2.5°F warmer at Chicken Creek, the higher site. Table 7 also shows May Creek and Gates Glacier. Gates Glacier is located within the Wrangell Mountains on a ridge between the Gates and Kennicott Glaciers and May Creek is in the valley between the Wrangell Mountains and the Chugach Mountains. The average annual temperature between Gates Glacier and May Creek was 0.8°F; again, Gates Glacier, the higher elevation site, was warmer than the valley site when comparing the annual temperature values.

Table 8. Mean monthly temperatures for 2014 at high and low elevation paired sites in WRST.

Month	Chicken Creek Elev. - 5260'	Chisana Elev. - 3320'	Gates Glacier Elev. - 4060'	May Creek Elev. - 1600'
Jan	22.9 ¹	17 ²	26.3 ¹	21 ²
Feb	6.7 ¹	-9 ²	11.2 ¹	-7 ²
Mar	11.1 ¹	7 ²	15.5 ²	17 ¹
Apr	23.7 ²	28 ¹	26.4 ²	34 ¹
May	38.0 ²	45 ¹	41.1 ²	49 ¹
Jun	39.9 ²	47 ¹	41.2 ²	51 ¹
Jul	46.7 ²	53 ¹	47.8 ²	56 ¹
Aug	45.1 ²	50 ¹	46.5 ²	53 ¹
Sep	35.4 ²	39 ¹	38.8 ²	43 ¹
Oct	19.9 ¹	19 ²	25.8 ¹	24 ²
Nov	20.4 ¹	3 ²	26.1 ¹	8 ²
Dec	18.3 ¹	0 ²	23.6 ¹	9 ²
Annual	27.4	24.9	30.8	30.0

¹warmer temperatures

²blue shade=colder temperatures.

Table 9 shows the high and low elevation sites in YUCH and DENA. The Upper Charley site in YUCH is located in the southern extent of the Preserve at the headwaters of the Charley River and Coal Creek is located along the Yukon –River Valley about 4 miles upstream on the Coal Creek tributary. The mean annual temperature at Upper Charley in YUCH, the higher elevation site, was 0.2°F warmer than Coal Creek. The Upper Charley site was warmer for each of the winter months, and also November in the fall and March in the spring. In Denali, Eielson Visitor Center is located at a high elevation site just north of the crest of the Alaska Range. This site is compared with Stampede which is located farther north and east from the crest of the range. The mean annual temperature at Eielson was 6.2°F warmer than Stampede (Table 9). The monthly average temperatures were warmer at Eielson Visitor Center in January, February, March, October, November, and December, or 8 out of 12 months. This site is subject to the warm Chinook winds that come through the passes in the winter.

Table 9. Mean monthly temperatures (°F) for 2014 at high and low elevation paired sites in YUCH (left) and DENA (right).

Month	Upper Charley Elev. - 3654'	Coal Creek Elev. - 802'	Eielson VC Elev. - 3730'	Stampede Elev. - 1800'	Coal Creek had the most extreme tempera- ture swi
Jan	10.5 ¹	-0.4 ²	27.9 ¹	11.7 ²	
Feb	-1.4 ¹	-13.4 ²	15.3 ¹	-5.4 ²	
Mar	9.1 ¹	6.2 ²	18.5 ¹	9.6 ²	
Apr	25.3 ²	29.2 ¹	28.3 ¹	27.8 ²	
May	41.7 ²	48.5 ¹	41.0 ²	45.1 ¹	
Jun	47.1 ²	55.5 ¹	44.6 ²	49.9 ¹	
Jul	50.7 ²	57.8 ¹	50.4 ²	54.1 ¹	
Aug	48.0 ²	54.4 ¹	49.7 ²	51.0 ¹	
Sep	36.8 ²	40.2 ¹	40.5 ¹	39.6 ²	
Oct	18.6 ²	20.1 ¹	20.2 ¹	17.2 ²	
Nov	9.5 ¹	3.4 ²	30.3 ¹	11.2 ²	
Dec	8.0 ¹	0.0 ²	25.8 ¹	5.9 ²	
Annual	25.3	25.1	32.7	26.5	

ng between summer and winter in 2014. The mean monthly temperature for the coldest month at Coal Creek was -13.4°F and in July it was 57.8°F, a 71°F difference. Ruth Glacier, Eielson Visitor Center, Chititu, and Gates Glacier, the higher elevation sites, have the least amount of variation, the average February – July difference was ~34°F. See Appendix A for period-of-record, monthly, and annual data summaries for each CAKN site.

Precipitation Analysis

Index Sites

Annual precipitation totals across the CAKN region varied from 72% of normal in Talkeetna to 141% of normal at Eagle. Denali was near average for the year at 104% of normal. Gulkana was 133% of normal and Yakutat was 86% of normal (Figure 14). Every site recorded above normal precipitation for January. The largest deviation from normal was in Gulkana, which recorded a total

of 2.42 inches; this is an impressive 526% of normal. Eagle was at 291% of normal for the month, Talkeetna 218% , Yakuta 183%, and McKinley Park 143% of normal. Because of warm temperatures, some of this precipitation fell as rain even in the interior locations. After January the precipitation tapered off and for the rest of the winter and all of the spring monthly precipitation totals across the region were below normal. The precipitation in Yakutat was significantly below normal for the February – May period ranging from 19% to 50% of normal. March was the driest month followed by May, February, and April.

The first couple of months of summer 2014 were wet. Eagle had 230% and 213% of normal respectively for June and July and was the location with the largest deviation from normal in the region. All locations were above normal for June, by July Talkeetna and Yakutat were well below average while Eagle remained well above average and Gulkana and McKinley Park were also wetter than normal. There was quite a bit of variability between sites from the end of the summer through the end of the year. The monthly precipitation totals for Talkeetna were consistently below average; October and November were the driest months. The other locations were closer to normal for August and September and then transitioned to a relatively dry fall. Gulkana was the exception in October with precipitation totals that were 219% of normal. November was by far the driest month of the 2014 fall season with very little precipitation recorded at the long-term sites. Most sites remained on the dry side through December; Eagle was the exception with a bit more snowfall than other areas of the network. Table 10 lists the monthly precipitation totals and the annual totals at each location compared to the 1981-2010 normal value and figure 15 shows the regional monthly deviations of all sites combined.

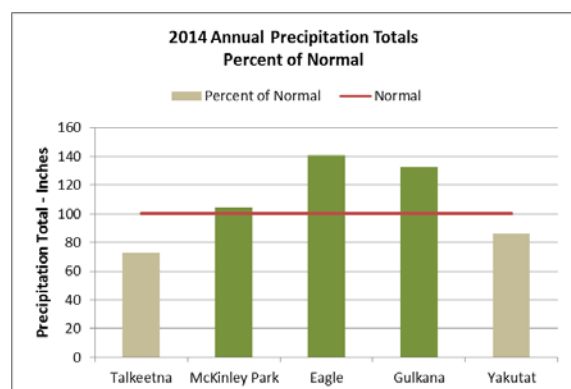


Figure 3. Annual precipitation totals (% of normal) at long-term CAKN sites – 2014.

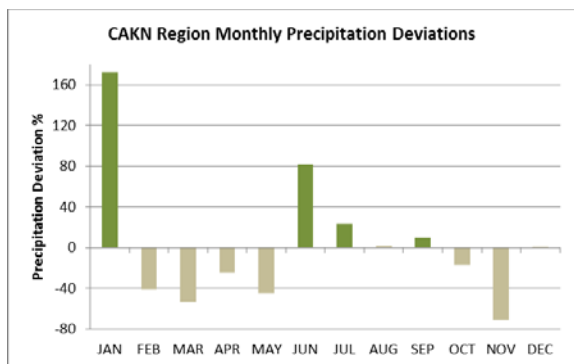


Figure 4. Mean monthly precipitation deviations - % from normal for 2014 for all index sites combined.

Table 10. Total monthly precipitation (inches) at long-term CAKN sites for 2014 compared to normal.

Site	Year(s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Talkeetna	2014	2.97	0.08	1.01	1.01	1.12	3.952	1.76	2.19	3.38	0.8	0.47	1.5	20.24
Talkeetna	1981-2010 normals	1.36	1.45	1.05	1.29	1.62	1.92	3.39	5.11	4.32	2.9	1.63	1.93	27.97
McKinley Park	2014	0.9	0.41	0.27	0.01	0.48	3.66	4.61	2.31	2.25	0.45	0.05	0.29	15.69
McKinley Park	1981-2010 normals	0.63	0.54	0.39	0.4	0.87	2.15	3.22	2.71	1.7	0.78	0.75	0.92	15.06
Eagle	2014	1.54	0.29	0.12	0.38	0.85	3.54	5.18	2	1.34	0.39	0.23	1.59	17.45
Eagle	1981-2010 normals	0.53	0.47	0.4	0.3	1.1	1.54	2.43	1.86	1.17	0.95	0.73	0.7	12.41
Gulkana	2014	2.42	0.67	0.01	0.33	0.17	2.02	2.26	1.94	2.06	2.21	0.09	0.74	14.92
Gulkana	1981-2010 normals	0.46	0.51	0.30	0.24	0.65	1.40	1.81	1.80	1.58	1.01	0.72	0.78	11.26
Yakutat	2014	24.98	2.08	4.05	2.87	4.13	10.10	6.42	23.17	19.81	14.91	9.37	12.05	133.94
Yakutat	1981-2010 normals	13.66	10.86	11.04	9.19	8.21	6.39	7.88	14.07	21.11	21.98	14.45	16.28	155.12

2013-2014 Snow Season

In Eagle, the 2013-2014 seasonal snowfall was 47.2 inches, which is 79% of normal. The snow-off date, which is the last day of where there is measureable snow on the ground, was April 27. The McKinley Park long-term NWS site was 71% of normal for the year with an annual total of 54.3 inches of snow. Snow on date was October 23 and snow off date was May 5, 2014. Snow is not recorded in Gulkana, but the nearby Kenny Lake snow course melted out before the May 1st snow survey.

CAKN SNOTEL Sites

Year round precipitation is recorded at the snow telemetry (SNOTEL) sites deployed in Denali and Wrangell-St. Elias as part of the CAKN climate and snow program. The Kantishna SNOTEL is on the north side of the Alaska Range in Denali, and the Tokositna Valley is on the south side of the range. In Wrangell-St. Elias, the Chisana SNOTEL site is located on the north side of the Wrangell Mountain Range near the town of Chisana, and the May Creek SNOTEL is between the Wrangell and Chugach Mountain Ranges near the town of McCarthy. The American Creek SNOTEL site near Eagle is a good index site for Yukon-Charley Rivers.

The SNOTEL sites provide an accurate representation of winter snow water equivalent at remote sites as well as summer rainfall. The data from these sites, along with the snow courses and aerial markers, surveyed monthly throughout the winter season, are based on the ‘water year’ running from October 1 through September 30. An annual report summarizing the snow and precipitation data from snow courses, aerial markers, and SNOTEL sites around the network is produced in the late fall of each year.

For water year 2014, the Kantishna SNOTEL site recorded 6.0 inches of total winter precipitation (snow water equivalent) from October 1, 2013 through May 1, 2014, which is 130% of the 1981-2010 normal. The total annual precipitation for the site was 21.2 inches; the winter snow accounted for 28% of the total annual precipitation. Snow-on date was September 29, 2013 and the snow-off date was May 4, 2014. The precipitation gage at Tokositna Valley recorded 28.8 inches of precipitation from October 1, 2013 through May 1, 2014. This is 57% of the total annual precipitation of 50.6 inches for the 2014 water year. The annual precipitation was 141% of normal (Figure 16). The snow on date at this site was November 3, 2013 and the snow off date was May 8, 2014.

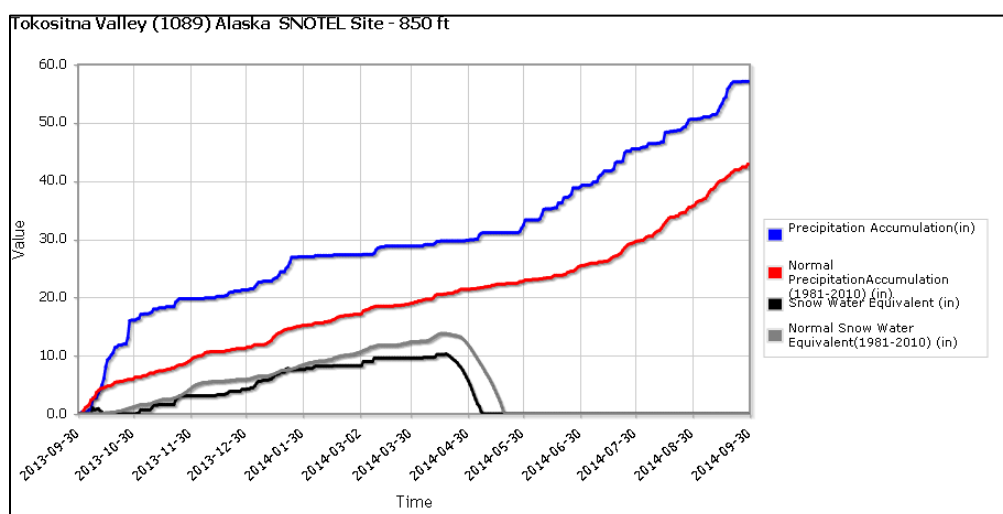
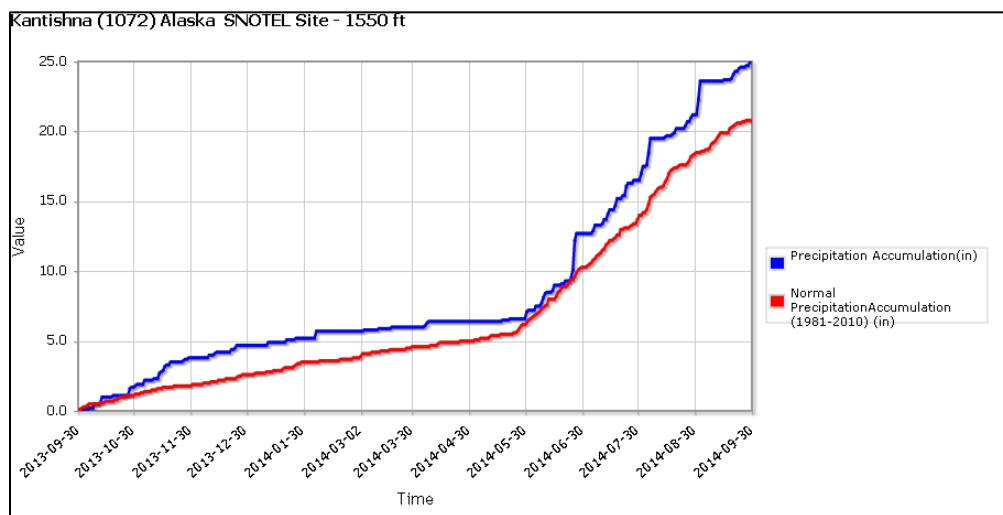


Figure 56. Cumulative precipitation for Water Year 2014 (Oct. 1 – Sep.30) at Kantishna and Tokositna Valley in DENA. Graphs generated from NRCS (2015b).

The SNOTEL site at May Creek reported 8.4 inches of snow water equivalent on May 1st; the annual total precipitation was 14.5 inches, 102% of normal. The winter snowfall accounted for 58% of the total precipitation for the year. The snow-on date was November 11, 2013 and the snow-off date was May 4, 2014. The Chisana SNOTEL site recorded 5.0 inches of total winter precipitation from Oct 1 through May 1. The total annual precipitation was 12.9 inches; the winter snow accounted for 39% of the total annual precipitation for the 2014 water year. The snow on date was November 9 and the snow off date was May 5 (Figure 17). The record at the site is not long enough to calculate normals.

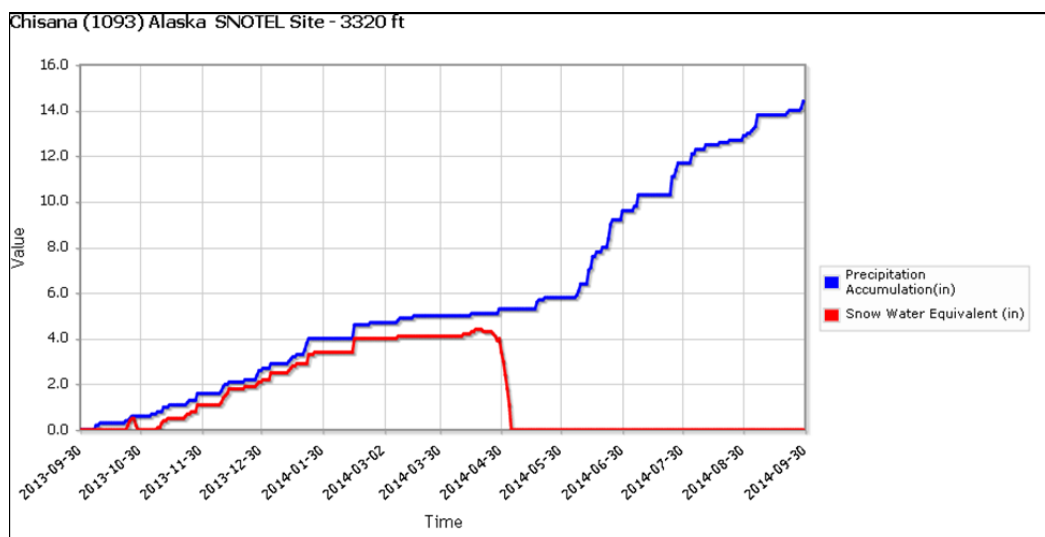
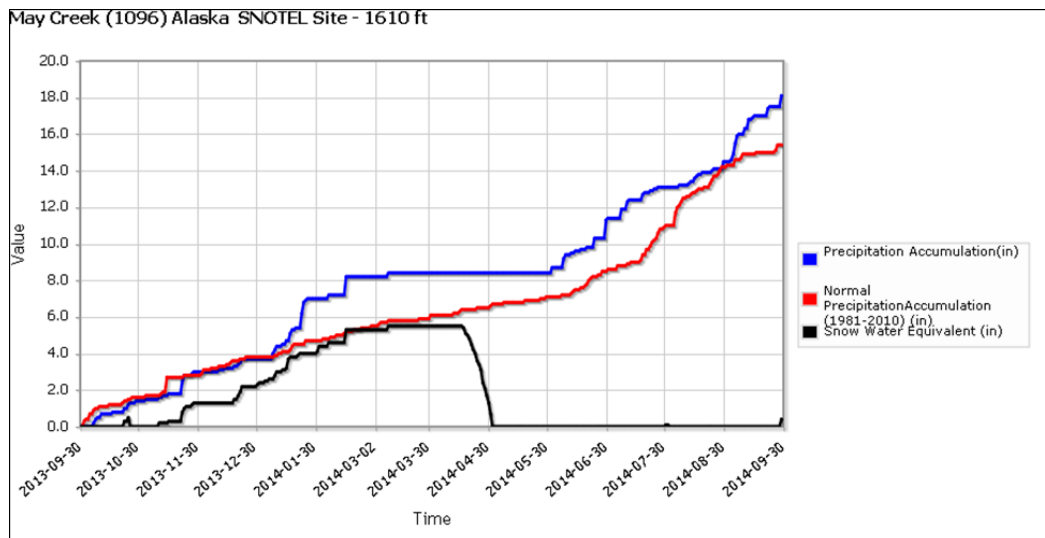


Figure 17. Cumulative precipitation for Water Year 2014 (Oct. 1 – Sep.30) at May Creek and Chisana in WRST. Graphs generated from NRCS (NRCS 2015b).

The American Creek SNOTEL site near Eagle recorded a total of 4.0 inches of precipitation from October 1, 2013 through May 1, 2014. The total precipitation for the water year was 12.9 inches, the winter precipitation accounted for 31 % of the annual total. This site has a six year record and therefore normal conditions cannot be calculated (Figure 18).

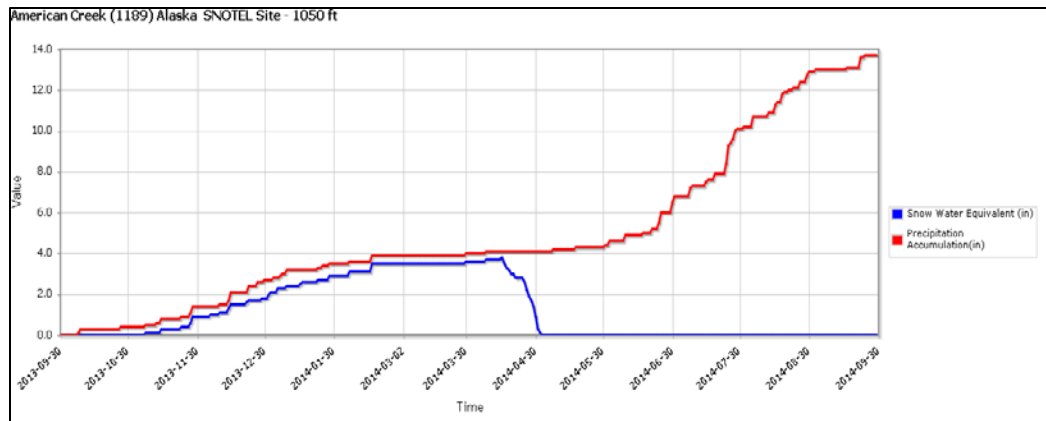


Figure 18. Cumulative precipitation for Water Year 2014 (Oct. 1 – Sep.30) at American Creek near YUCH. Graphs generated from NRCS (NRCS 2015b).

Discussion

2014 was a very warm year. The warmest on record for the state of Alaska as a whole and the warmest on record for the CAKN RAWs, with a decade long record. The mean annual temperature at the CAKN index sites averaged +1.3° F warmer than the 1981-2010 normal, with impressive differences between months and between seasons. The mean annual temperature at Yakutat, Gulkana, and Eagle were at or near normal, while both Talkeetna and McKinley Park were 2.4°F warmer than normal for the year. Statewide it was the warmest year on record with the largest positive deviations in the western regions of the state. Annual precipitation totals across the CAKN were variable and ranged from 72% of normal in Talkeetna to 141% of normal in Eagle. Denali was near average for the year at 104% of normal. Yakutat's annual precipitation was 86% of normal and Gulkana was 133% of normal.

Conclusion

The climate data for 2014 was compiled and summarized using CAKN data from the NPS sites and from index sites around the region. Seasonal weather summaries are also produced four times a year for DENA, WRST, and YUCH and provide timely and relevant information on current weather statistics. These summaries are available from the network website or from the [Integrated Resource Management Application](#) (IRMA) portal.

The data from long-term sites are available from the [National Centers for Environmental Information](#) (NCEI) formerly the [National Climatic Data Center](#). The CAKN climate stations transmit data via satellite and are available on the web from [MesoWest](#) and the [Western Regional Climate Center](#). Products that are available include daily and monthly summaries, time series graphs, wind rose graphs, data inventories, and station metadata for all of the automated stations. The data are downloaded from the stations each year and are QA/QC by network staff and sent to WRCC to fill in any gaps from missed satellite transmissions. The raw data are also available for download through the 'data lister' tool on the WRCC website. These data are also ingested by multiple other networks and agencies and displayed in various formats. Manual QA/QC procedures are performed on each dataset annually and corrections are compiled as a metadata file which is available from network staff. The ARCN climate program is currently transitioning towards managing all time series data in Aquatic Informatics Time Series software supported by the NPS Water Resources Division. All data corrections and metadata are stored in an audit log within the software.

Significant changes in data archiving, quality control, and reporting methods are expected over time. All NPS Inventory and Monitoring networks monitor climate and a national protocol is being developed to provide guidance for data management and reporting. Currently, cleaned datasets are sent to WRCC for archiving and are also available on request by network staff.

An interagency agreement is in place for the maintenance, data archiving, and data dissemination for the four SNOTEL sites in the network. The data from the stations are transmitted hourly via meteor burst communication and are on-line at [National Water and Climate Center](#).

This annual report provided a climate summary for the CAKN region in 2014 with brief references to the Alaska regional climate and the global climate for 2014.

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Appendix A. 2014 CAKN Climate Station Data by Park

**Please note the tables in Appendix A include the updated corrected air temperature data.

Yukon-Charley Rivers National Preserve

Climate Summary

Yukon-Charley Rivers National Preserve lies within the continental interior climate zone and is characterized by large variations in seasonal temperatures. The Preserve is subject to long, very cold winters and short, warm summers. July temperatures at lower elevations along the Yukon River average ~ 16°C (60°F), while January temperatures average ~ -25°C (-12.5°F). Cold temperatures in the -40°C (-40°F) range are not uncommon, nor are summer temperatures in the high 20°C (80°F) range in summer. The higher elevations of the Preserve are cooler than the river valleys in the summer, yet are often warmer in the winter due to persistent inversions that last from about October through March. The average annual temperature is -4.2°C (24.5°F) The lowest temperature recorded in the Preserve, thus far, is -51°C (-59°F) and the highest is 33°C (91°F).

The Preserve receives very little precipitation, which contributes to the role of fire as a major natural disturbance. On average, 8,100 ha (20,000 acres) burn within the preserve each year, nearly all of which are ignited by lightning. Average summer (June, July, and August) rainfall totals average ~ 178 mm (7.0 inches). Although year-round precipitation is not measured within the Preserve boundary, in nearby Eagle, the average annual precipitation total is ~ 315 mm (12.4 inches). The seasonal snow pack within the Preserve begins to develop in early to mid-October and by January the snowpack average about 41 cm (16 inches). The snowpack reaches its peak in March with average depths of about 51 cm (20 inches). Generally, by the end of April warmer temperatures return and bring a quick demise to the seasonal snowpack.



Coal Creek – Yukon-Charley Rivers National Preserve

Period of record: 9/17/2004 – Present

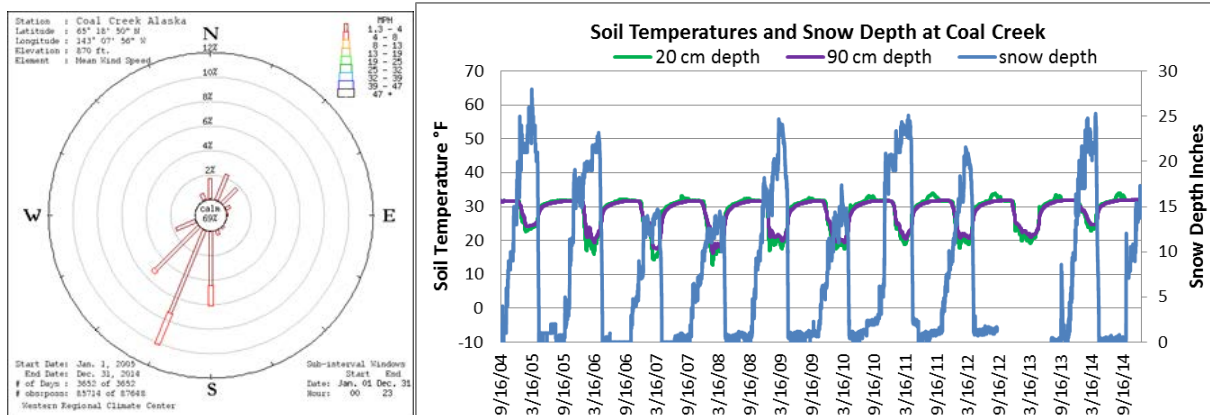


Coal Creek site is a classic continental interior climate location at an elevation of 958'. The site is very cold in the winter and very warm in the summer. The station sits on the edge of an old fire burn in a mixed spruce and deciduous forest approximately 5 km south of the Yukon River. The site is in a well-protected valley and hence has light winds. This is a good location to measure interior soil temperatures as well as a good location for snow measurements. The period of record mean annual air temperature is 23.6°F. The lowest temperature recorded thus far is -58.0° on 1/29/2012 and the highest is 93.0°F on 7/29/2009. The maximum snow depth recorded at the site is 28 inches.

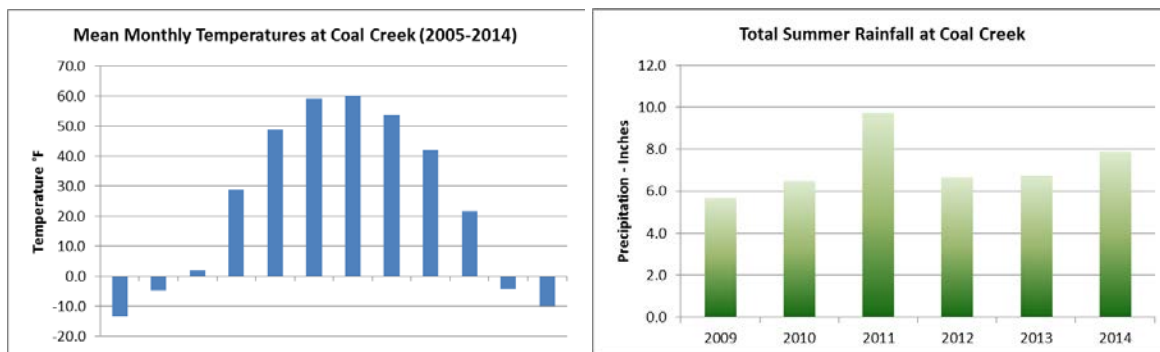
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Month	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	57	0	166	9	0	41	-52	1	-1	19	29	30	18	
Feb-14	103	1	153	7	-13	24	-45	-12	-15	15	26	27	21	
Mar-14	497	2	170	10	6	42	-35	8	4	17	23	25	22	
Apr-14	638	2	174	11	29	64	-17	31	28	27	26	26	15	
May-14	772	2	180	13	48	79	24	50	47	34	31	30	0	
Jun-14	875	1	178	10	55	82	34	57	54	41	31	31	0	2.40
Jul-14	856	1	186	12	58	87	34	59	56	46	32	31	0	2.96
Aug-14	766	1	171	9	54	78	28	56	53	45	33	32	0	2.53
Sep-14	561	1	173	12	40	73	13	42	39	35	33	32	0	
Oct-14	284	1	189	11	20	44	-11	21	19	32	32	32	7	
Nov-14	109	1	169	8	3	36	-28	4	2	31	32	32	10	
Dec-14	5	1	149	8	0	29	-26	1	-1	26	32	32	14	

Coal Creek Climatology 2004-2014: Wind rose climatology and soil temperatures and snow depth:



Coal Creek mean monthly and annual temperatures and summer rainfall totals (June-Aug:)



Coal Creek	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004										23.8	-0.3	-12.1	
2005	-10.9	-5.8	11.4	30.9	52.5	60.6	58.0	53.6	43.6	22.9	-10.1	-2.6	25.3
2006	-21.9	4.4	-1.0	25.7	48.7	58.1	60.1	51.9	45.7	27.4	-16.3	-5.7	23.1
2007	-3.8	-17.1	-9.6	34.6	49.1	61.9	63.5	56.0	41.2	16.3	9.5	-7.4	24.5
2008	-16.4	-9.7	5.3	30.5	48.5	58.0	57.1	49.2	40.4	10.9	-1.2	-18.4	21.2
2009	-18.0	-0.1	-2.7	29.0	48.7	58.8	64.1	51.8	42.5	26.0	-5.1	-3.4	24.3
2010	-17.4	-0.8	8.8	35.2	51.9	59.1	60.9	56.0	39.7	20.6	8.9	-25.3	24.8
2011	-13.6	-7.3	1.0	25.1	51.0	56.6	59.6	52.4	43.6	23.9	-12.5	0.6	23.4
2012	-26.9	5.6	-2.2	33.5	46.2	60.6	59.4	54.8	43.7	17.7	-20.1	-20.8	20.9
2013	-6.4	-5.0	2.1	15.2	42.1	62.6	61.6	55.8	39.2	30.6	-0.1	-15.4	23.5
2014	-0.4	-13.4	6.3	29.2	48.5	55.5	57.8	54.4	40.2	20.1	3.4	0.0	25.1
Period of Record Average	-13.6	-4.9	1.9	28.9	48.7	59.2	60.2	53.6	42.0	21.6	-4.4	-9.8	23.6

Upper Charley - Yukon-Charley Rivers National Preserve

Period of Record 8/3/2005-Present

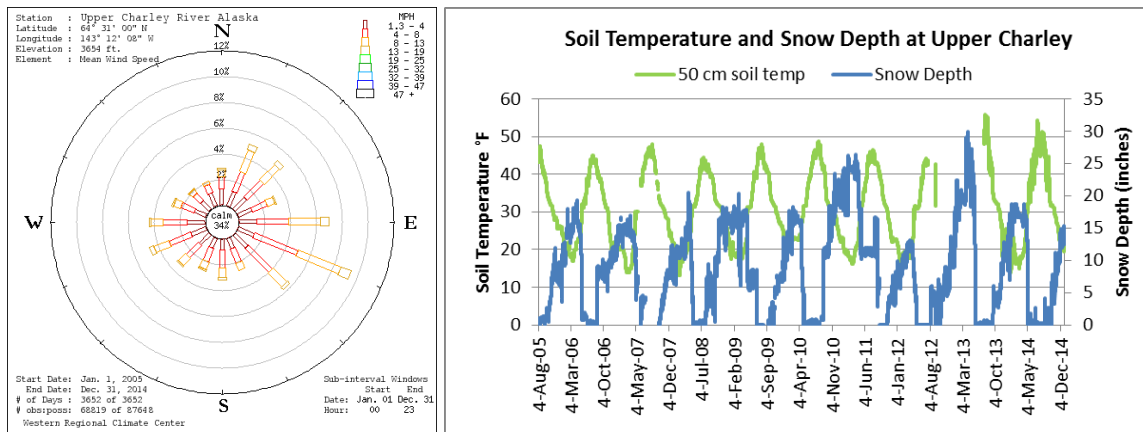


The Upper Charley site is near the southern boundary of the Preserve, approximately 5 km south of the Three Fingers airstrip in an area of gentle rolling hills. At an elevation of 3655' the site is cooler than the lower valleys in the summer, but often warmer in the winter due to persistent inversions that last from about October through March. Winds in the spring and fall tend to blow from the southeast and in mid-summer from the southwest. The period of record average air temperature is 23.0°F. The highest temperature recorded thus far is 82.6°F on 6/26/2013 and the lowest is -36.1°F on 2/23/2007. The maximum snow depth recorded at the site is 30 inches.

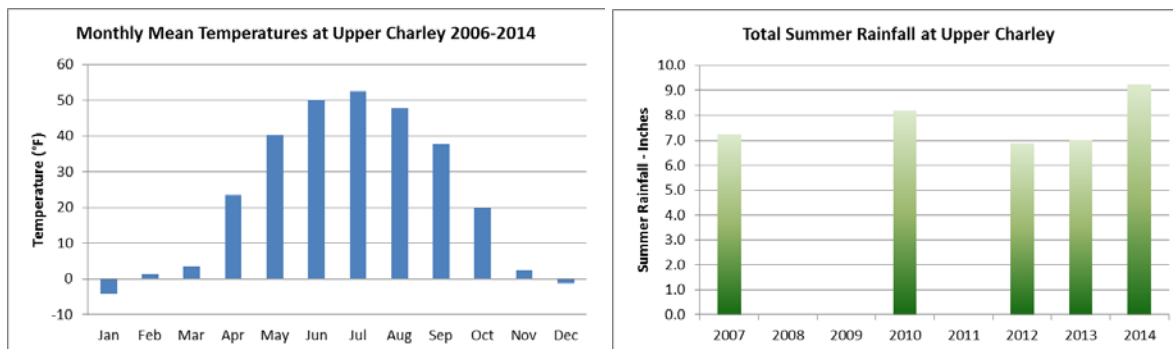
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	153	3	204	24	10	38	-29	11	10	17	18	21	15	
Feb-14	383	7	144	27	-1	22	-25	0	-2	17	18	21	18	
Mar-14	599	7	136	23	9	30	-23	10	8	16	17	19	17	
Apr-14	823	5	155	18	25	52	-9	27	24	22	22	22	17	
May-14	800	6	197	31	42	65	24	43	41	36	35	36	2	
Jun-14	917	5	183	24	47	69	30	49	46	45	43	44	0	3.72
Jul-14	860	5	208	24	51	73	35	52	50	50	49	49	0	3.05
Aug-14	748	5	196	23	48	68	27	49	47	48	47	47	0	2.46
Sep-14	606	6	181	22	37	62	15	38	36	38	38	39	0	
Oct-14	410	4	165	17	19	36	0	19	18	30	31	32	5	
Nov-14	182	4	171	21	9	26	-8	10	9	25	26	28	9	
Dec-14	25	0	210	17	8	26	-4	8	8	21	22	24	13	

Upper Charley Climatology 2005-2014: Wind rose climatology and soil temperatures and snow depth:



Upper Charley mean monthly and annual temperatures and summer rainfall (Jun-Aug):



Upper Charley	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005								50.7	38.2	20.2	-1.2	9.9	
2006	-8.0	6.5	0.6	20.7	39.7	47.6	52.4	45.0	39.6	22.4	-8.5	m	m
2007	m	-5.9	-8.6	28.1	m	52.1	54.6	51.5	m	17.3	12.1	-3.0	m
2008	-8.2	-2.9	7.4	24.0	39.3	48.8	48.5	43.4	37.0	12.1	5.9	-5.5	20.8
2009	-7.6	-2.4	-2.0	24.2	41.9	50.5	57.6	46.4	38.8	22.7	0.7	7.2	23.2
2010	-2.7	9.1	11.4	27.9	44.3	49.3	52.4	49.9	37.3	20.8	11.7	-10.4	25.1
2011	0.2	-3.3	6.1	22.2	42.1	48.7	51.5	46.3	38.9	20.9	-5.8	5.3	22.8
2012	-14.8	9.4	2.1	29.5	37.4	51.5	51.3	49.0	38.5	15.9	-5.9	-9.1	21.2
2013	-3.2	4.0	6.2	10.5	35.3	55.7	54.2	51.3	34.9	27.3	1.3	-2.8	22.9
2014	10.5	-1.4	9.1	25.3	41.7	47.1	50.7	48.0	36.8	18.6	9.5	8.0	25.3
Period of Record Average	-4.2	1.5	3.6	23.6	40.2	50.1	52.6	47.9	37.7	19.8	2.3	-1.3	23.0

Fire RAWS sites in Yukon-Charley Rivers – 2014 Summary

Ben Creek: Located east of Coal Creek Camp on old airstrip on ridge at an elevation of 1850'

2014	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	m	m	m	m	m	m	
Feb-14	m	m	m	m	m	m	
Mar-14	m	m	m	m	m	m	
Apr-14	4	305	24	31	60	-1	
May-14	4	295	<u>28</u>	49	74	28	
Jun-14	3	345	21	55	77	37	2.43
Jul-14	3	275	22	58	83	43	2.95
Aug-14	3	116	20	54	73	32	2.76
Sep-14	4	115	27	42	69	22	
Oct-14	2	237	24	20	40	1	
Nov-14	4	122	24	7	32	-16	
Dec-14	m	m	m	m	m	m	

Denali National Park and Preserve

Climate Summary

There are two distinct climates in the park, separated by the Alaska Range. They differ not only in physical measurements, but also in the types of vegetation and landscape features they produce. The transitional maritime climate on the south side of the Alaska Range is influenced by the prevailing weather patterns of the Gulf of Alaska, with milder air temperatures with less seasonal variation and more precipitation. Temperatures in the northwest area of the park are typical of an interior climate with very warm summers and cold winters. Park headquarters lies in another transitional zone between the northern flanks of the Alaska Range and the Interior and has slightly cooler summers and warmer winters than sites farther north away from the direct effects of the Alaska Range.

At park headquarters, daily weather observations have been recorded since 1925. Temperature extremes range from 91° F (33°C) to -54° F (-48°C). Summers are short and warm, and winters are long and cold. The average daily high temperature in July is 66° F (19°C), and the average daily low temperature in January is -8° F (-22°C). Total precipitation is relatively low at 15 inches (382 millimeters). The sub-zero temperatures in winter coupled with relatively low snowfall contribute to the presence of widespread permafrost.

The climate south of the Range is transitional between the mild and moist conditions near the Gulf of Alaska and the cold and dry of Interior Alaska. The mean annual precipitation at Talkeetna, just southeast of the Park, is 28 inches (711 mm), nearly double that at headquarters. The average daily high in July is 68° F (20 °C) and the average daily low temperature in January is 1.4° F (-17°C). Along the southern flanks of the Alaska Range snowfall is high, and snowcover is often present through late spring. Permafrost is generally absent.



Eielson Visitor Center – Denali National Park and Preserve

Period of Record 7/26/2005 - Present



The Eielson Visitor Center station is located on rolling tundra on the northern flanks of the Alaska Range at an elevation of 3944'. In the summer it is cooler and wetter than surrounding low elevation areas. Persistent winter inversions keep this site remarkably warm in the winter. The period of record average air temperature is 28.5°F. The total summer rainfall is on average 17.99 inches. The highest temperature recorded thus far is 77.4°F on 8/13/2005 and the lowest is -36°F on 1/25/2012.

2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	10	9	171	41	28	52	1	29	26	—	—	—	12	
Feb-14	46	7	181	37	15	55	-28	17	14	—	—	—	9	
Mar-14	123	8	175	36	19	47	-10	20	17	—	—	—	7	
Apr-14	204	5	191	27	28	50	-7	30	27	—	—	—	5	
May-14	201	7	196	29	41	61	22	42	40	—	—	—	3	
Jun-14	185	5	194	22	45	64	29	46	44	—	—	—	0	7.10
Jul-14	173	5	192	22	50	76	33	51	49	—	—	—	1	7.38
Aug-14	140	6	182	26	50	67	29	51	49	—	—	—	1	6.88
Sep-14	103	6	187	35	41	63	19	42	40	—	—	—	1	
Oct-14	58	3	226	24	20	46	-2	22	19	—	—	—	8	
Nov-14	18	8	192	42	30	51	10	32	29	—	—	—	4	
Dec-14	3	6	224	36	26	43	8	27	24	—	—	—	11	

—Soil temperatures not measured at this site

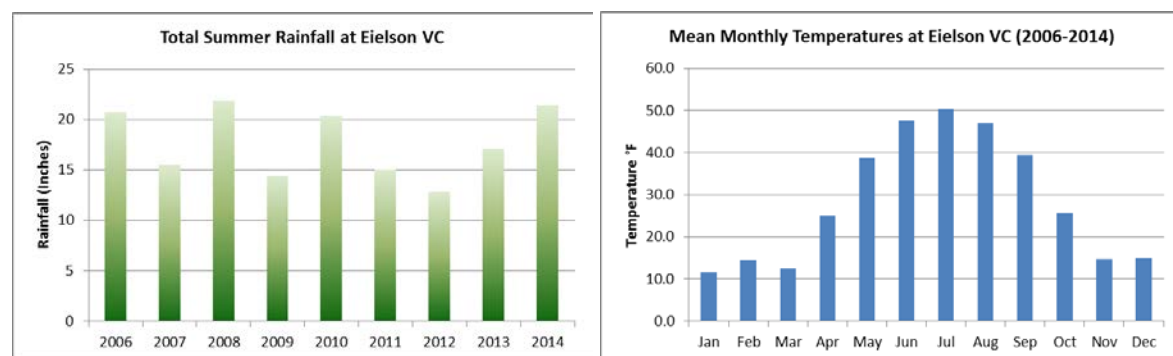
Station : Eielson Visitor Center Alaska
 Latitude : 63° 25' 53" N
 Longitude : 150° 18' 34" W
 Elevation : 3730 ft.
 Element : Mean Wind Speed

Start Date: July 1, 2005
 End Date: Dec. 31, 2014
 # of Days : 3471 of 3471
 # obsproc: 81279 of 83304
 Western Regional Climate Center

Sub-interval Windows
 Start End
 Date: Jan. 01 Dec. 31
 Hour: 00 23

MPH
 1.3 - 4
 4 - 8
 8 - 12
 12 - 16
 16 - 20
 20 - 24
 24 - 28
 28 - 32
 32 - 36
 36 - 40
 40 - 44
 44 - 47
 47 +

Average Temperature



Eielsen VC	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005								50.5	39.2	25.7	7.1	25.6	
2006	6.7	16.9	15.0	23.5	40.0	46.0	50.0	43.7	42.0	28.9	7.9	13.3	27.8
2007	9.2	13.2	-3.5	31.7	39.3	48.5	51.3	50.4	39.9	22.4	23.7	12.0	28.2
2008	5.4	10.3	18.3	20.7	36.5	45.0	47.2	44.6	38.3	17.0	12.1	14.2	25.8
2009	9.6	11.7	9.2	25.8	39.8	46.6	56.6	45.2	39.3	30.7	9.7	22.9	28.9
2010	18.4	19.0	15.1	27.7	42.6	46.4	49.2	48.2	42.3	27.7	18.6	7.7	30.2
2011	18.9	9.5	17.9	25.4	39.7	46.7	47.9	44.8	40.2	26.7	4.3	11.2	27.8
2012	-7.2	18.2	8.8	30.1	36.0	48.1	48.6	47.0	37.2	22.9	11.9	10.7	26.0
2013	15.9	16.3	13.6	12.4	33.6	55.2	52.2	49.2	35.3	33.6	14.3	16.4	29.0
2014	27.9	15.3	18.5	28.3	41.0	44.6	50.4	49.7	40.5	20.2	30.3	25.8	32.7
Period of Record Average	11.6	14.5	12.6	25.1	38.7	47.5	50.4	47.0	39.4	25.6	14.8	14.9	28.5

Toklat Alaska – Denali National Park and Preserve

Period of Record 7/28/2005 - Present

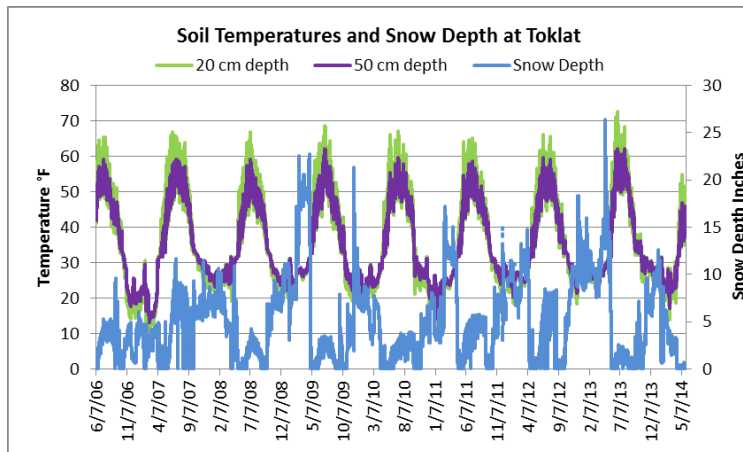
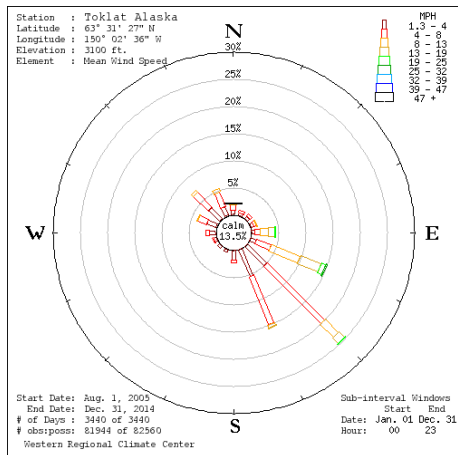


The Toklat station sits on the bank of the Toklat River near the road camp on the north side of the Alaska Range at an elevation of 2920'. The Toklat River is a braided river fed by several large glaciers. High mountains surround the wide river valley. North winds (up valley) or south winds (down valley) are most common. The period of record average air temperature is 26.0°F. The total summer rainfall on average is 10.88 inches. The highest temperature recorded thus far is 81.2°F on 7/8/2009 and the lowest is -46.8°F on 2/10/2008.

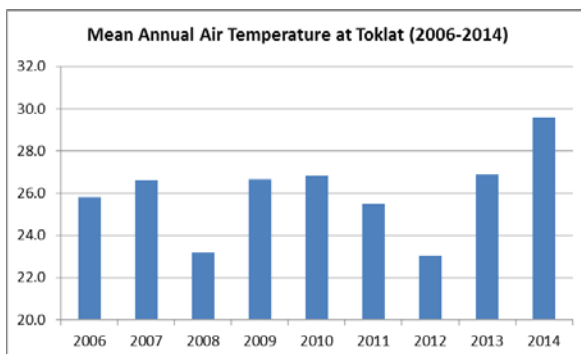
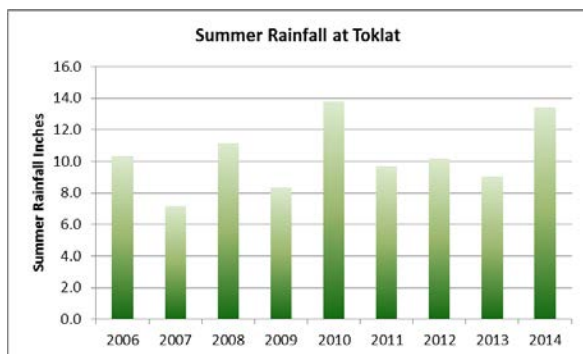
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	7	9	144	35	25	51	-28	27	23	29	29	29	8	
Feb-14	36	5	173	32	5	50	-36	8	2	22	22	24	4	
Mar-14	102	6	175	34	13	45	-26	15	11	22	22	23	3	
Apr-14	180	6	171	30	28	52	-12	29	26	31	30	29	1	
May-14	193	6	202	25	42	63	24	43	41	46	43	41	0	
Jun-14	190	5	177	20	47	68	29	48	46	51	49	48	0	5.02
Jul-14	171	5	194	22	51	77	34	52	50	56	54	52	1	4.05
Aug-14	130	6	168	28	49	66	28	50	48	52	50	49	1	4.35
Sep-14	89	6	179	31	39	62	18	40	38	40	40	40	1	
Oct-14	40	4	192	20	15	38	-11	16	13	31	32	33	8	
Nov-14	14	7	157	31	23	51	-8	25	20	25	26	28	4	
Dec-14	2	6	165	32	18	42	-3	20	16	24	24	26	5	

Toklat Climatology 2005-2014: Wind rose climatology and soil temperatures and snow depth:



Toklat mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Toklat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005								50.8	40.5	23.4	-3.0	20.5	
2006	-3.9	16.5	7.7	23.5	41.1	48.6	51.7	45.8	42.6	28.7	-2.7	10.2	25.8
2007	6.4	3.8	-9.0	31.7	41.3	51.3	53.6	51.3	40.6	18.7	21.1	8.8	26.6
2008	-0.3	1.4	12.8	21.3	38.3	47.4	49.5	45.1	38.3	12.7	6.6	5.1	23.2
2009	0.9	8.1	3.5	23.7	41.7	49.0	57.6	46.9	38.4	28.9	5.0	16.4	26.7
2010	1.0	13.2	9.8	28.3	44.3	48.7	51.9	49.6	39.1	24.6	15.7	-4.5	26.8
2011	10.4	4.6	7.2	23.9	41.3	49.2	50.3	46.3	41.1	25.2	-2.1	8.2	25.5
2012	-14.7	16.9	2.7	29.1	38.2	50.4	51.0	48.2	38.4	18.1	-2.8	1.1	23.0
2013	9.0	10.5	10.8	9.8	32.8	56.3	54.1	50.2	36.0	33.0	12.3	7.8	26.9
2014	24.7	5.4	13.2	27.6	42.2	47.1	51.2	49.3	39.1	14.5	22.6	18.1	29.6
Period of Record Average	3.7	8.9	6.5	24.3	40.1	49.8	52.3	48.1	39.3	22.7	8.4	7.9	26.0

Stampede – Denali National Park and Preserve

Period of Record 6/24/2003 – Present

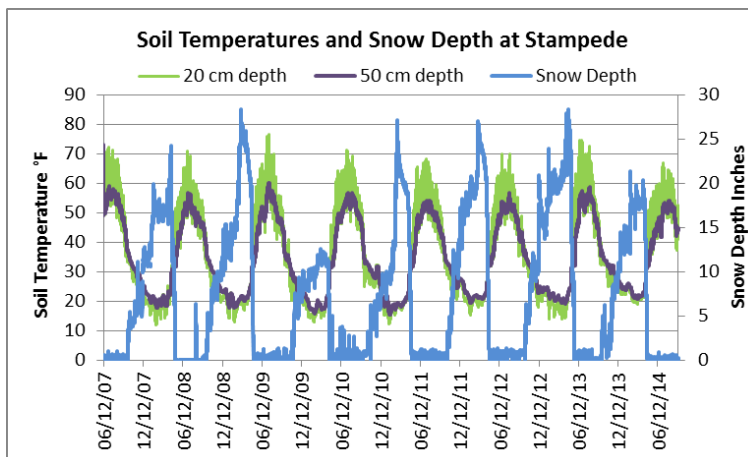
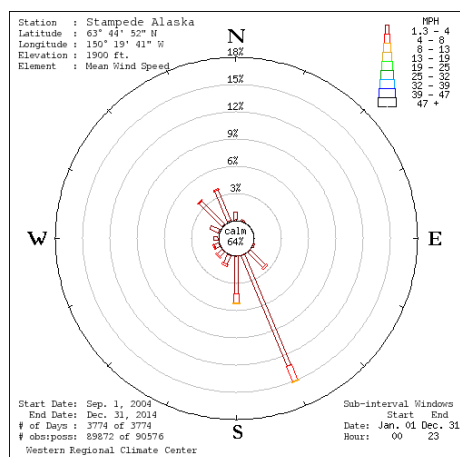


The Stampede station is located in a mixed spruce and deciduous forest near treeline at 1800'. The site is on the eastern edge of the Kantishna Hills; the Toklat River Valley and Toklat Basin are to the east and to the west are rolling hills and high alpine peaks. It is cold in the winter and warm in the summer, with low annual precipitation. The winds are often calm at this site. The period of record average air temperature is 24.3°F. The total summer rainfall on average is 7.95 inches. The highest temperature recorded thus far is 88.5°F on 6/25/2013 and the lowest is -50.4°F on 1/29/2012.

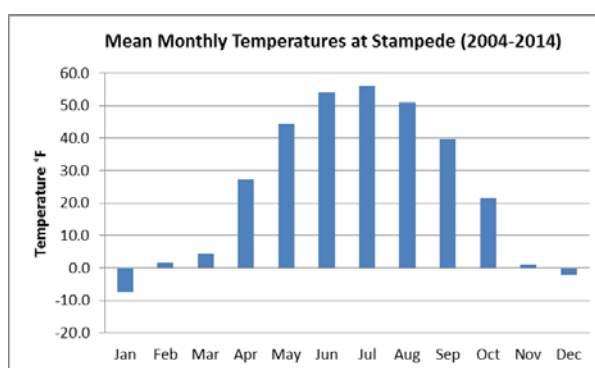
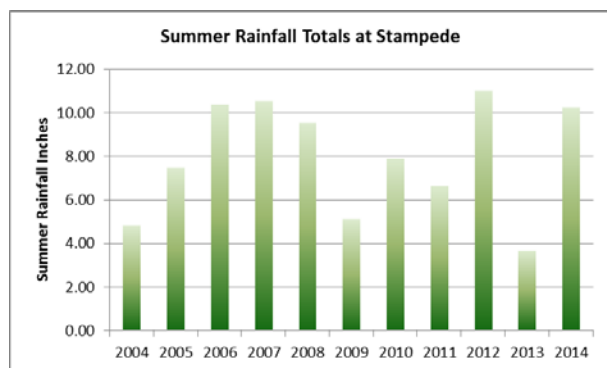
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	5	1	186	15	12	52	-39	14	10	23	24	25	14	
Feb-14	18	1	202	8	-5	42	-38	-4	-7	20	22	23	17	
Mar-14	94	2	209	14	10	46	-34	12	8	19	21	22	18	
Apr-14	180	2	217	12	28	59	-23	30	26	27	27	26	12	
May-14	194	2	226	<u>17</u>	45	72	20	47	43	46	44	38	0	
Jun-14	177	2	210	10	50	73	28	51	48	51	50	46	0	4.21
Jul-14	172	2	223	10	54	84	32	56	53	55	55	51	0	2.4
Aug-14	141	1	193	11	51	76	27	53	50	53	54	52	0	3.64
Sep-14	90	1	210	13	40	72	16	41	38	41	42	43	0	
Oct-14	23	1	221	9	17	43	-12	18	16	30	32	34	6	
Nov-14	8	1	197	15	11	50	-17	13	9	24	26	30	7	
Dec-14	0	0	224	4	6	34	-17	7	5	23	25	27	12	

Stampede Climatology 2004-2014: Wind rose climatology and soil temperatures and snow depth:



Stampede mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Stampede	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2003							56.1	50.7	35.1	27.5	10.8	-8.9	
2004	-15.0	5.1	2.9	31.5	47.5	60.3	59.4	56.2	33.4	25.9	10.6	-1.4	26.4
2005	-3.7	1.9	14.9	27.6	48.9	54.8	56.8	53.2	41.0	21.5	-9.1	4.5	26.0
2006	-17.8	12.4	2.7	23.8	44.9	52.6	54.9	48.2	43.8	27.4	-11.1	-2.1	23.3
2007	-3.0	-5.0	-9.5	33.5	44.9	54.5	57.2	53.4	41.0	16.0	13.0	-1.6	24.5
2008	-6.4	-5.2	9.4	24.7	41.9	51.1	52.9	47.2	38.9	11.4	-1.0	-5.3	21.6
2009	-10.7	3.2	0.6	27.2	44.4	52.4	60.1	48.9	39.8	25.3	-1.6	2.2	24.3
2010	-11.6	3.9	6.6	30.8	47.0	52.4	54.9	52.4	39.3	21.9	11.7	-15.7	24.5
2011	-2.1	0.1	3.8	25.6	44.5	52.9	54.1	48.3	41.8	22.9	-9.6	2.7	23.7
2012	-22.7	8.3	-1.1	31.8	41.5	54.2	53.5	49.8	39.9	16.7	-8.4	-11.4	21.0
2013	-0.6	-1.9	8.0	14.1	38.3	59.4	57.1	52.2	36.7	30.1	7.4	-1.7	24.9
2014	11.7	-5.4	9.6	27.8	45.1	49.9	54.1	51.0	39.6	17.1	11.2	5.9	26.5
Period of Record Average	-7.4	1.6	4.4	27.1	44.4	54.0	55.9	51.0	39.6	21.5	1.2	-2.2	24.3

Dunkle Hills – Denali National Park and Preserve

Period of Record 8/5/2004 - Present

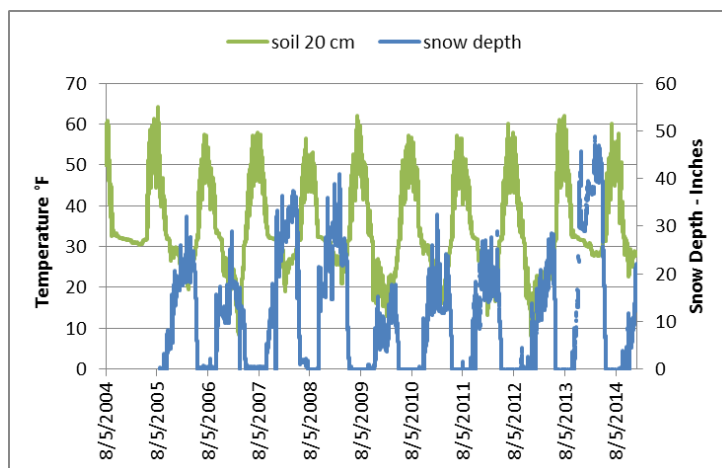
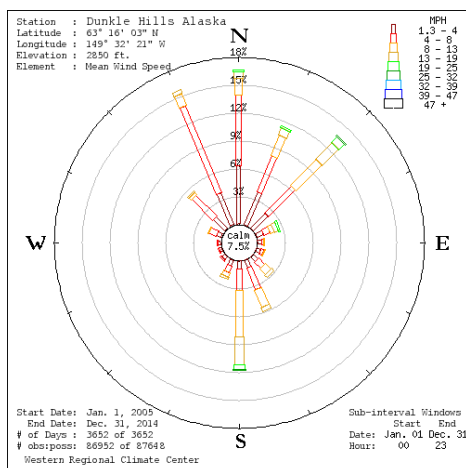


The Dunkle Hills station sits above treeline on the south side of the Alaska Range in rolling hills just south of Broad Pass at an elevation of 2651'. Temperatures are moderated by the warmer air flow coming from the North Pacific Ocean. Temperatures are cool in the summer and relatively warm in the winter, typical of a transitional maritime climate. Snowfall is abundant. The period of record mean annual air temperature is 26.0°F. The total summer rainfall on average is 6.91 inches. The highest temperature recorded thus far is 85.4°F on 6/26/2013 and the lowest is -32.1°F on 2/3/2009.

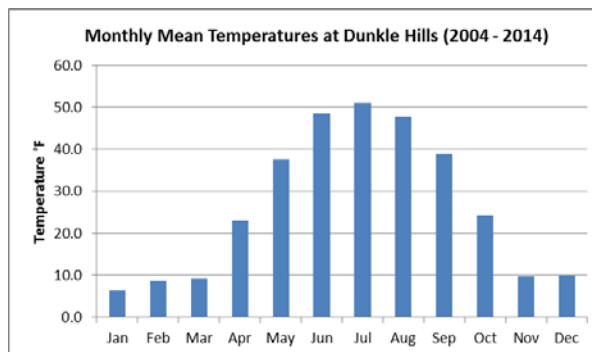
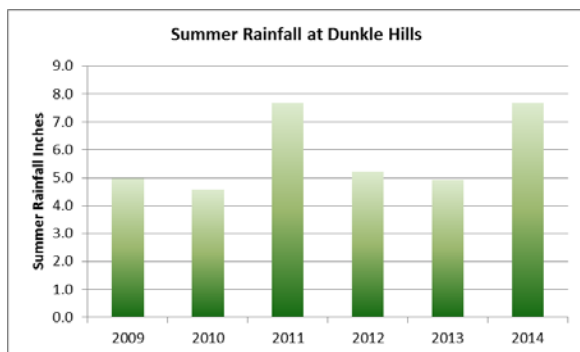
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	8	5	191	29	21	41	-24	22	19	30	30	31	36	
Feb-14	51	8	238	31	5	35	-18	7	3	29	29	29	38	
Mar-14	122	7	244	35	11	37	-21	13	9	28	28	29	41	
Apr-14	218	5	245	24	22	46	-13	24	21	28	28	28	43	
May-14	245	8	250	30	38	53	26	40	37	33	32	32	16	
Jun-14	210	8	185	25	46	67	29	47	45	45	44	43	0	2.12
Jul-14	203	7	187	23	50	77	28	52	49	52	51	50	0	3.00
Aug-14	138	5	174	21	48	68	25	49	47	50	50	50	0	3.43
Sep-14	m	5	196	22	37	55	17	38	36	40	40	41	0	
Oct-14	54	5	190	22	21	44	-2	23	20	31	31	32	1	
Nov-14	17	5	225	25	18	38	-3	20	17	27	27	28	6	
Dec-14	3	5	191	28	18	35	-3	19	17	28	28	28	12	

Dunkle Hills Climatology 2004-2014: Wind rose climatology and soil temperatures and snow depth:



Dunkle Hills mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Dunkle Hills	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004								54.8	32.4	25.4	17.1	11.5	
2005	7.5	9.4	17.8	25.0	37.5	50.3	52.6	50.2	39.3	24.7	5.1	16.4	28.0
2006	-0.6	9.9	6.5	21.1	37.4	46.6	51.3	45.6	40.6	25.4	1.9	11.7	24.8
2007	7.6	4.7	-2.9	28.5	39.6	50.5	51.8	50.3	39.2	22.0	20.1	9.0	26.7
2008	3.1	4.6	14.5	20.9	35.4	45.7	47.9	46.5	38.6	16.2	11.3	5.3	24.2
2009	2.7	5.6	7.0	22.5	39.7	48.1	55.9	46.5	40.0	29.6	7.5	14.4	26.6
2010	8.2	14.3	13.7	25.3	42.2	46.5	48.5	48.3	40.5	26.6	17.5	2.1	27.8
2011	9.7	4.7	8.5	24.0	39.1	48.1	50.1	45.7	40.1	24.8	1.1	10.9	25.6
2012	-6.4	14.0	5.7	27.6	35.4	48.9	48.8	46.8	36.4	21.8	5.0	3.9	24.0
2013	11.4	13.4	9.9	12.7	31.5	54.4	53.3	49.4	37.0	30.2	9.3	6.4	26.6
2014	20.6	5.2	11.1	22.5	38.5	45.8	50.4	48.0	m	21.2	18.5	18.4	m
Period of Record Average	6.4	8.6	9.2	23.0	37.6	48.5	51.1	47.7	39.1	24.2	9.7	9.9	26.0

Ruth Glacier – Denali National Park and Preserve

Period of record 9/2008 -Present

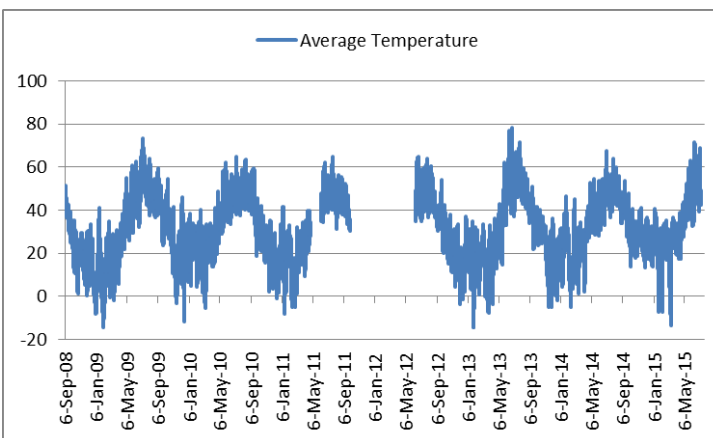
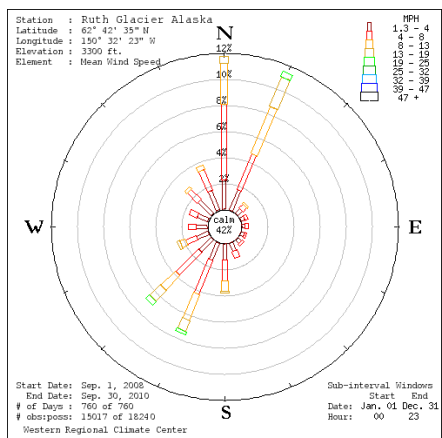


The Ruth Glacier station sits on the southern flanks of the Tokosha Mountains just west of the terminus of the Ruth Glacier in the Alaska Range at an elevation of 3300'. It is an alpine site within the transitional maritime climate region influenced by the moisture and warmth of the Pacific Ocean. The temperatures are cool in summer and relatively warm in the winter. The site gets abundant snowfall and summer rain. The period of record mean annual air temperature is 31.0°F. The total summer rainfall on average is 17.47 inches. The highest temperature recorded thus far is 82.9°F on 6/26/2013 and the lowest is -16.4°F on 1/27/2013.

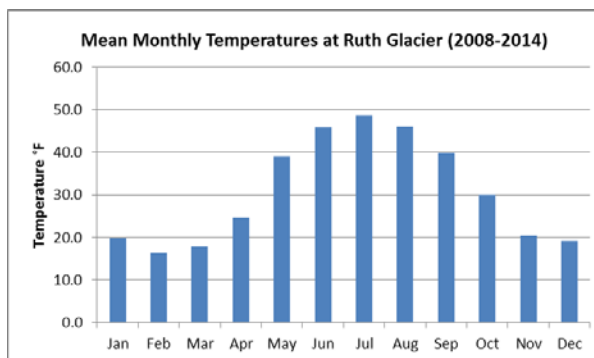
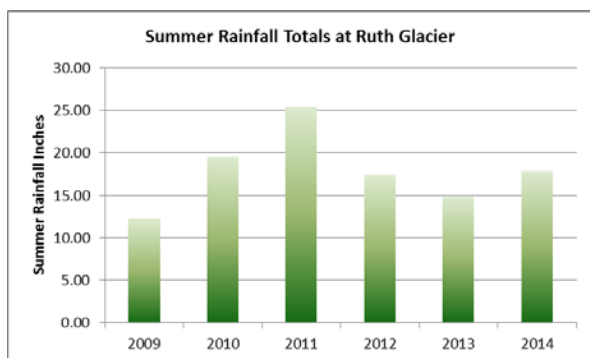
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	199	5	m	30	26	49	2	27	25	31	m	m	37	
Feb-14	467	13	m	30	17	49	-8	18	15	29	m	m	39	
Mar-14	590	9	m	40	21	45	-2	22	19	29	m	m	39	
Apr-14	840	5	m	34	27	48	-1	29	25	30	m	m	40	
May-14	888	6	m	40	41	58	25	42	40	33	m	m	15	
Jun-14	1027	6	180	40	42	61	26	44	41	45	47	44	0	6.56
Jul-14	823	7	184	28	49	70	36	50	48	52	51	48	0	6.28
Aug-14	795	6	192	31	47	62	33	48	46	49	49	48	0	6.16
Sep-14	627	6	198	37	40	55	24	41	40	41	42	42	0	
Oct-14	390	6	175	28	28	44	13	29	27	30	31	34	1	
Nov-14	204	7	179	40	28	43	15	29	27	25	26	29	2	
Dec-14	73	6	198	35	25	37	13	25	24	27	28	30	10	

Ruth Glacier Climatology 2008-2014: Wind rose climatology and daily temperatures:



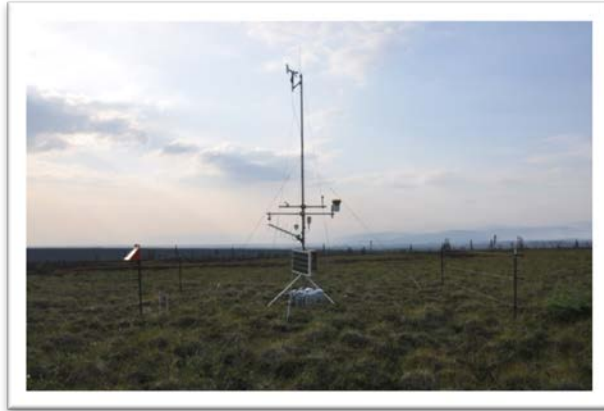
Ruth Glacier mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Ruth Glacier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2008									36.1	21.6	18.3	15.2	
2009	13.0	12.9	14.1	25.3	39.8	45.2	54.4	45.9	40.5	33.5	15.6	23.9	30.3
2010	22.9	22.5	19.7	27.2	41.2	42.6	45.2	47.1	42.9	29.8	22.5	15.1	31.5
2011	19.6	11.8	19.5	26.3	m	m	47.0	44.0	41.0	m	m	m	m
2012	m	m	m	m	m	m	45.8	45.3	36.2	27.3	20.7	14.3	m
2013	17.6	18.4	15.2	17.1	34.7	52.9	51.2	47.7	37.8	31.6	15.1	18.0	29.8
2014	25.9	16.7	20.6	27.4	40.8	42.2	48.6	46.9	40.5	27.8	28.4	24.6	32.5
Period of Record Average	19.8	16.4	17.8	24.7	39.1	45.7	48.7	46.1	39.8	30.0	20.5	19.2	31.0

Wigand – Denali National Park and Preserve

Period of record 8/13/2013 - Present

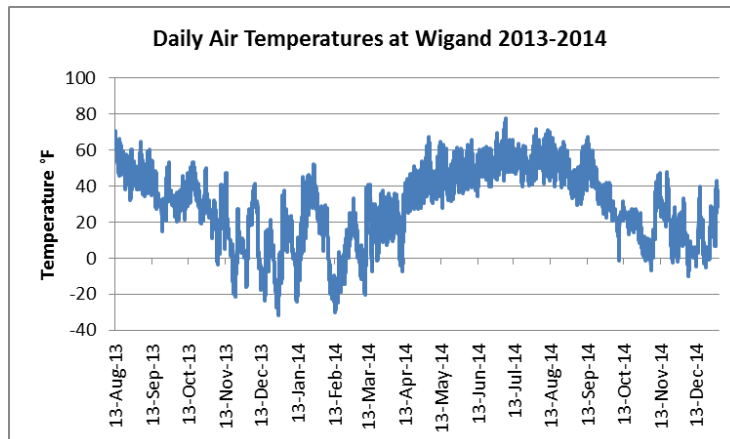
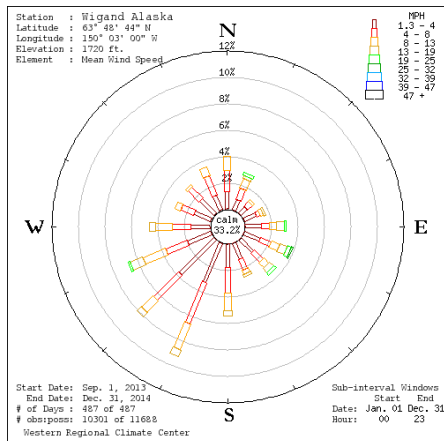


The Wigand site (Elev. 1717') is located on the flat tundra plain of the Toklat Basin, north of the Alaska and Outer Ranges. The area is underlain by permafrost with shrubby vegetation and tussock tundra. Lightning and wild fires are common in the summer. The temperatures are warm in the summer and cold in the winter; there is low annual precipitation. The area is often scoured by wind in winter. This site was installed in 2013 near the location of a site by the same name that collected weather data from 2003-2007.

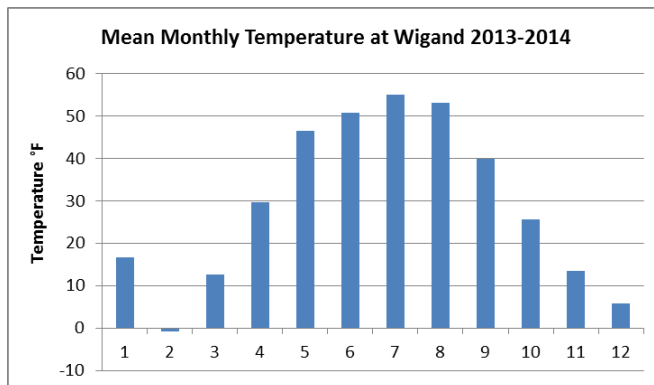
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	172	4	204	46	17	57	-25	19	15	25	26	28	4	
Feb-14	333	2	208	27	-1	38	-30	1	-2	15	17	20	1	
Mar-14	632	5	189	39	13	42	-22	15	11	16	16	18	2	
Apr-14	769	5	210	25	30	58	-11	31	28	26	26	24	2	
May-14	803	7	200	32	46	70	24	48	45	34	31	30	0	
Jun-14	768	7	202	24	51	75	29	52	49	40	33	31	1	4.04
Jul-14	808	7	199	26	55	82	38	56	54	44	37	32	1	2.20
Aug-14	715	6	192	27	53	74	30	55	52	43	39	33	1	3.81
Sep-14	541	6	203	29	42	70	19	43	40	36	35	33	1	
Oct-14	379	3	196	18	19	43	-6	19	18	32	32	32	5	
Nov-14	180	4	201	37	17	53	-10	19	15	30	31	32	3	
Dec-14	69	2	211	31	9	46	-12	11	8	29	30	32	6	

Wigand Climatology 2013-2014: Wind rose climatology and daily air temperatures:



Sigand mean monthly and annual temperatures:



Wigand	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2013									38.0	32.6	10.2	2.2	
2014	16.5	-0.8	12.6	29.7	46.4	50.7	55.0	53.0	41.8	18.5	16.8	9.4	29.1
Period of Record Average	16.5	-0.8	12.6	29.7	46.4	50.7	55.0	53.0	39.9	25.5	13.5	5.8	29.1

Fire RAWS sites in Denali – 2014 Summary

Denali Visitor Center: Located in a mixed forest near the entrance of the park.

	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	°F			In.
	Ave.	Ave.	Max.	Ave.	Max.	Min.	Total
Jan-14	3	197	<u>32</u>	21	55	-38	
Feb-14	2	210	24	-1	52	-37	
Mar-14	3	209	27	15	49	-33	
Apr-14	3	177	24	31	59	-16	
May-14	3	203	26	46	73	21	
Jun-14	3	196	23	52	75	27	3.6
Jul-14	3	207	23	55	84	31	3.99
Aug-14	2	185	21	53	77	30	1.91
Sep-14	3	209	23	43	64	14	
Oct-14	2	245	23	19	50	-11	
Nov-14	2	197	26	16	47	-16	
Dec-14	2	207	<u>32</u>	14	40	-13	

Wonder Lake RAWS: Located NW of Wonder Lake, near the Ranger Station.

2014	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	°F			In.
	Ave.	Ave.	Max.	Ave.	Max.	Min.	Total
Jan-14	3	54	38	17	52	-20	
Feb-14	4	58	<u>47</u>	2	40	-36	
Mar-14	5	50	44	13	47	-21	
Apr-14	4	49	27	30	56	-16	
May-14	6	350	31	45	67	21	
Jun-14	5	301	37	49	72	29	7.35
Jul-14	5	3	39	54	79	35	3.86
Aug-14	4	24	26	52	73	27	4.47
Sep-14	4	36	33	40	69	17	
Oct-14	3	55	17	18	45	-8	
Nov-14	3	63	33	16	46	-11	
Dec-14	2	32	29	11	40	-11	

Lake Minchumina RAWS: Located west of Lake Minchumina and west of the airstrip.

2014	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	2	351	22	8	35	-34	
Feb-14	3	27	<u>38</u>	3	33	-21	
Mar-14	3	44	31	17	42	-14	
Apr-14	3	53	23	34	63	-9	
May-14	2	331	23	50	73	30	
Jun-14	1	253	25	54	75	32	4.18
Jul-14	2	254	22	59	86	38	2.41
Aug-14	1	271	18	56	75	29	3.06
Sep-14	2	307	25	45	73	26	
Oct-14	3	10	24	25	48	3	
Nov-14	2	24	27	12	32	-8	
Dec-14	1	14	20	8	29	-13	

No data recovered from McKinley River RAWS for 2014 – station was damaged by bear.

Wrangell – St. Elias National Park and Preserve

Climate Summary

Wrangell – St. Elias has four major mountain ranges that affect the climate of the park. The St. Elias Range curves northeast from the Canadian border and merges with the Wrangell Mountain Range forming the mountainous heart of the park. The Chugach Mountain Range defines the southern boundary, and the eastern portion of the Alaska Range makes up the northern region. Most of the precipitation coming off of the Pacific Ocean is deposited with the first 100 km of the coast in the high mountains and icefields that dominate the southern regions of the park. The climate quickly transitions to an interior continental climate as you travel north from the coast. The large river valleys of the Copper and Chitina Rivers have long, cold winters, and short, warm, relatively dry summers. The low temperature on record for May Creek, between the Chitina and Nizina Rivers is -51°F; the high temperature on record is 92°F – a difference of 143 degrees. The valley bottoms in the northern region of the park between the Wrangell and Alaska Range have some of the coldest winter temperatures in the state and with relatively warm summers.

The southeast portion of Wrangell – St. Elias has locations that are viable candidates for the wettest location in the world, where climate models have estimated annual precipitation amounts as high as 470 inches. Most of the Chugach Range receives between 115-275 in. of precipitation annually, and above about 5000 ft. most of this precipitation falls as snow. The transition to drier climates occurs over a very short distance. Along the Chitina River on the north side of the coastal ice fields, the annual precipitation range is as low as 12-20 in. The central mountain peaks of the Wrangell Mountains (Mt. Sanford, Mt. Wrangell, etc.) receive “only” 80-120 in. of precipitation. On the north side of this range, annual precipitation declines to only 8 – 12 inches, most of that falling as rain in the summer.



Tana Knob

Period of record 7/6/2005 - Present



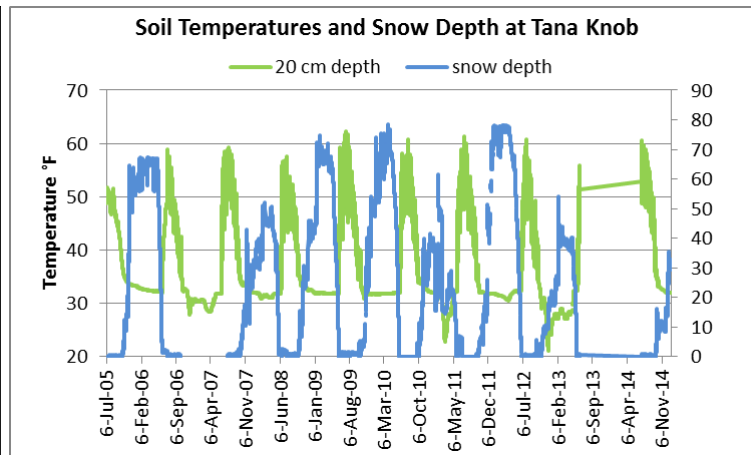
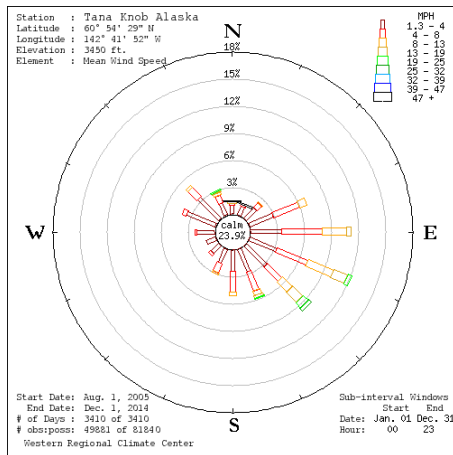
Tana Knob (Elev. 3739') is located in the Chugach Mountain Range in the Tana River valley north of the Bagley Icefield. The site sits on the high bench above the confluence of the Tana and West Fork Tana Rivers. The temperatures are cool in the summer and moderate in the winter. There is abundant snowfall and summer rain due to the elevation and proximity to the Gulf of Alaska. The site has had frequent problems with wildlife reducing the availability of good data for analysis. Based on complete available years of record the average air temperature is 27.6°F. The highest temperature recorded thus far is 74.9°F on 8/13/2005 and the lowest is -30.7°F on 1/7/2009.

2014 Summarized Data

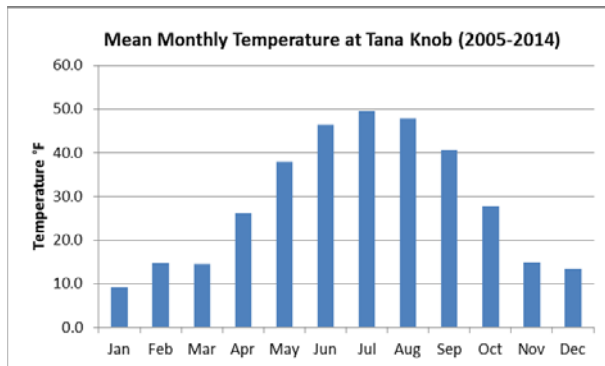
2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	m	m	m	m	m	m	m	m	m	m	m	m	m	
Feb-14	m	m	m	m	m	m	m	m	m	m	m	m	m	
Mar-14	m	m	m	m	m	m	m	m	m	m	m	m	m	
Apr-14	m	m	m	m	m	m	m	m	m	m	m	m	m	
May-14	m	m	m	m	m	m	m	m	m	m	m	m	m	
Jun-14	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Jul-14	205	4	149	16	50	69	40	51	49	54	53	47	0	1.86
Aug-14	144	4	140	30	49	65	38	50	48	50	51	48	0	2.32
Sep-14	86	5	152	28	41	57	26	43	41	41	43	44	0	3.41
Oct-14	43	3	167	26	26	46	1	27	25	32	34	36	8	
Nov-14	19	4	151	24	25	44	-2	26	23	31	32	34	10	
Dec-14	5	4	149	39	23	37	0	24	21	31	32	33	23	

m = catastrophic datalogger failure at this site; unknown reason

Tana Knob Climatology 2005-2014: Wind rose climatology and soil temperatures and snow depth:



Tana Knob mean monthly and annual temperatures:



Tana Knob	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005							49.4	50.5	41.2	26.6	8.4	20.9	
2006	6.4	10.6	7.7	23.6	35.9	45.3	49.6	45.5	41.2				m
2007								50.7	40.5	27.3	24.2	13.3	m
2008	9.5	8.2	19.9	27.0	37.1	43.2	46.1	45.5	39.2	22.7	17.3	7.3	26.9
2009	5.6	11.6	12.4	27.3	40.1	48.2	55.9	47.5	41.4	31.7	13.1	20.6	29.6
2010	11.1	22.9	19.6	27.6	39.5		48.2	49.4	42.3	28.5	20.4	0.2	m
2011	14.3	8.8	11.8	27.5	39.5	45.9	49.1	45.6	39.5	29.8	8.0	19.1	28.2
2012	-0.3	19.7	14.6	31.0	34.9	44.1	47.4	47.5	39.3	23.2	2.7	4.3	25.7
2013	18.3	20.8	16.0	19.1	37.8	52.0	m	m	m	m	m	m	m
2014	m	m	m	m	m	m	49.7	48.6	41.4	25.5	24.6	22.5	m
Period of Record Average	9.3	14.7	14.6	26.2	37.8	46.4	49.4	47.9	40.7	26.9	14.9	13.5	27.6

Note: There are not enough good quality precipitation values for analysis at this site.

Chititu

Period of Record 8/20/2004 – Present



Chititu sits high on a ridge between the Chugach and Wrangell Mountain Ranges. This is a windy location with gusts up to 70 mph. Temperatures are cool in the summer and warmer than the surrounding valleys in the winter due to persistent inversions. The area is scoured in the winter, so any snow that falls is quickly redistributed. Summer rainfall is also difficult to catch due to the exposure. The period of record average temperature is 27.2°F. The highest temperature recorded thus far is 74.6°F on 6/26/2013 and the lowest is -29.9°F on 1/28/2013.

2014 Summarized Data (with updated temperatures)

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Total
Jan-14	221	14	154	63	26	48	4	27	25	24	24	26	
Feb-14	370	5	178	49	10	44	-16	11	9	12	12	18	
Mar-14	584	9	200	58	14	32	-4	15	13	16	16	17	
Apr-14	717	5	196	33	25	41	-5	26	24	27	27	25	
May-14	805	7	249	36	40	58	26	41	38	41	40	35	
Jun-14	867	6	218	41	40	60	27	41	39	43	43	38	4.09
Jul-14	832	6	208	32	46	64	37	47	45	50	51	45	2.49
Aug-14	750	7	169	37	46	62	31	47	45	48	49	49	1.66
Sep-14	618	9	162	53	38	53	17	39	37	39	42	43	2.53
Oct-14	436	8	145	47	24	42	6	25	23	32	34	36	
Nov-14	230	8	140	43	24	42	-1	25	23	27	26	34	
Dec-14	122	12	127	47	22	35	3	23	21	22	21	29	

Station : Chitituk Alaska
 Latitude : 61° 16' 20" N
 Longitude : 142° 37' 08" W
 Elevation : 4554 ft.
 Element : Mean Wind Speed

Chitituk Daily Temperatures 2014

Temperature °F

1-Jan-14 22-Jan-14 12-Feb-14 5-Mar-14 26-Mar-14 16-Apr-14 7-May-14 28-May-14 18-Jun-14 9-Jul-14 30-Jul-14 20-Aug-14 10-Sep-14 1-Oct-14 22-Oct-14 12-Nov-14 3-Dec-14 24-Dec-14

Start Date: Jan. 1, 2004
 End Date: Dec. 31, 2014
 # of Days : 4018 of 4018
 # obspos: 5831 of 96432
 Western Regional Climate Center

Sub-interval Windows
 Start End
 Date: Jan. 01 Dec. 31
 Hour: 00 23

Summer Rainfall Totals at Chititu

Year	Summer Rainfall (inches)
2010	10.5
2011	7.2
2012	4.2
2013	3.6
2014	8.2

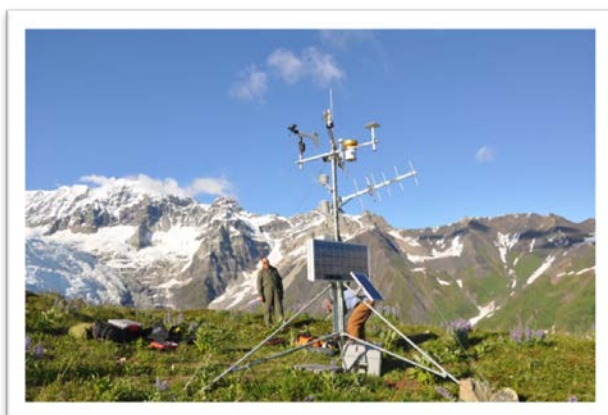
Monthly Mean Temperatures at Chititu (2004-2014)

Month	Mean Temperature (°F)
Jan	13
Feb	13
Mar	13
Apr	25
May	36
Jun	44
Jul	47
Aug	45
Sep	37
Oct	25
Nov	13
Dec	15

Chititu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004									32.9	26.4	21.1	16.3	
2005	12.2	14.3	21.2	29.4	39.7	45.6	45.7	48.4	38.2	25.3	11.7	23.0	29.6
2006	11.2	14.2	10.0	22.1	34.8	43.1	47.7	42.3	37.9	27.4	-4.6	17.5	25.3
2007	14.7	4.8	0.1	27.4	34.5	47.4	47.2	48.1	37.4	24.1	22.5	12.6	26.7
2008	9.1	8.0	17.5	24.3	35.6	41.8	43.3	42.0	36.2	20.6	17.1	8.3	25.3
2009	7.7	10.4	10.3	24.8	37.7	45.3	53.9	44.6	38.9	29.2	13.2	22.1	28.2
2010	14.5	24.0	17.9	25.6	39.3	40.8	45.7	46.3	38.5	26.8	19.0	4.0	28.5
2011	14.0	6.6	10.1	24.3	37.2	43.2	46.2	42.5	37.0	27.1	7.3	17.4	26.1
2012	2.8	19.2	13.3	28.8	32.3	41.9	44.3	44.5	36.8	20.6	6.8	5.8	24.8
2013	17.2	19.3	13.6	15.5	35.7	49.5	50.0	48.3	36.2	31.3	11.2	13.4	28.4
2014	25.7	9.9	13.7	24.9	39.5	40.0	46.2	45.6	37.6	23.9	24.2	22.3	29.5
Period of Record Average	12.9	13.1	12.8	24.7	36.6	43.9	47.0	45.3	37.5	25.6	12.8	14.7	27.2

Gates Glacier

Period of Record 7/6/2005 – Present

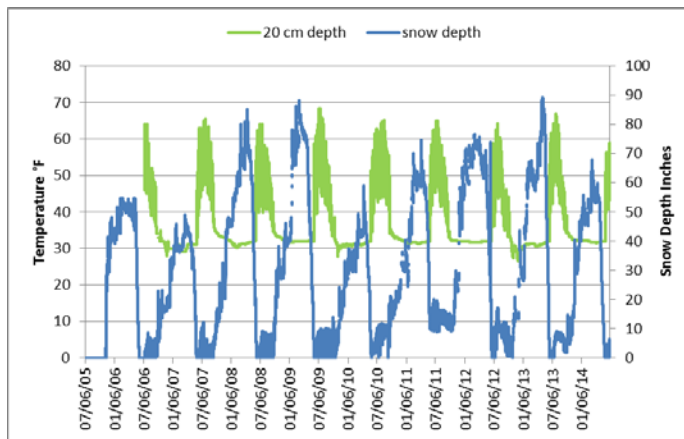
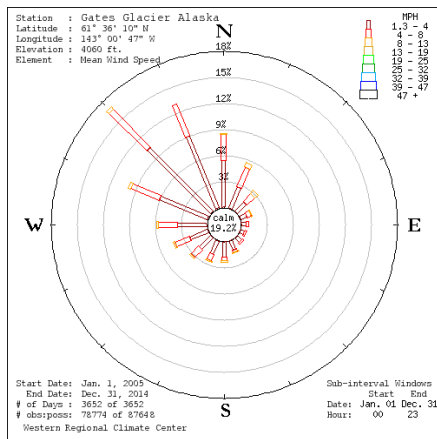


The Gates Glacier site is located on a ridge between the Gates and Kennicott Glaciers in the Wrangell Mountains at an elevation of 4060'. Temperatures are cool in the summer and moderate in the winter due to a persistent inversion that generally sets up in mid-October. Winds move up and down valley, but are not terribly gusty. The site receives an abundant amount of snow in winter and has on average ~ 10.49 inches of summer rainfall. The period of record average temperature is 28.1°F. The highest temperature recorded thus far is 74.6°F on 6/25/2013 and the lowest is -29.2°F on 1/28/2013.

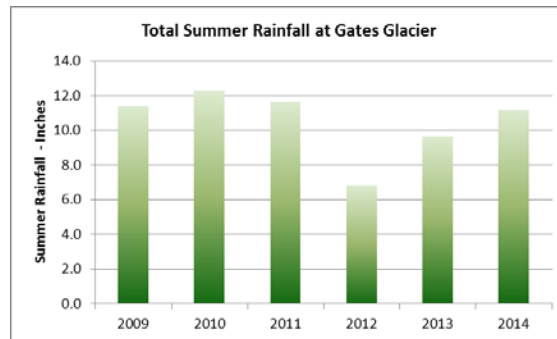
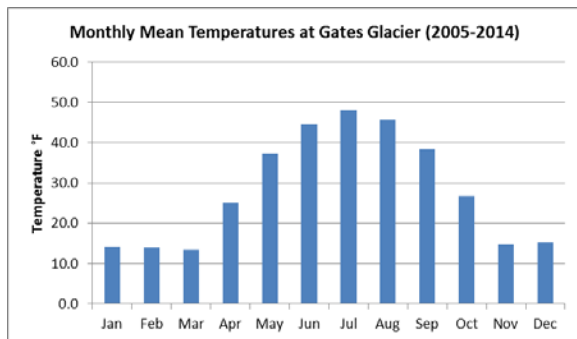
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	5	4	232	33	26	50	5	27	25	31	31	32	38	
Feb-14	33	4	264	25	11	41	-16	13	10	31	31	32	63	
Mar-14	112	4	256	29	16	40	-1	17	14	31	31	32	60	
Apr-14	196	4	227	33	26	45	-2	28	25	30	31	32	69	
May-14	240	4	232	20	41	58	28	43	40	31	31	32	78	
Jun-14	281	4	217	38	41	62	27	43	40	40	38	33	19	3.70
Jul-14	220	3	212	19	48	64	37	49	47	55	53	45	3	2.99
Aug-14	165	3	209	16	47	62	32	48	45	52	51	48	8	4.49
Sep-14	70	4	224	22	39	54	20	40	38	40	41	43	6	
Oct-14	34	4	202	27	26	43	7	27	24	34	34	37	8	
Nov-14	20	3	243	29	26	45	0	27	25	32	33	35	18	
Dec-14	7	3	257	20	24	39	3	25	22	32	32	34	36	

Gates Glacier Climatology 2005-2014: Wind rose climatology and soil temperature and snow:depth:



Gates Glacier mean monthly and annual temperatures and summer rainfall:



Gates Glacier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005							47.4	49.8	39.0	27.0	13.4	24.1	
2006	12.3	14.0	11.7	23.2	36.4	44.5	49.0	42.2	38.3	27.3	-2.0	18.9	26.3
2007	15.5	6.5	2.6	27.8	35.6	48.4	48.2	49.0	37.8	25.1	23.8	14.9	27.9
2008	11.2	10.0	18.6	24.7	35.9	41.9	43.5	42.8	36.6	21.3	18.4	10.2	26.3
2009	8.7	11.2	11.6	25.4	38.2	46.0	55.0	44.9	40.0	30.9	14.4	22.5	29.1
2010	16.1	25.1	19.5	26.4	39.9	41.6	45.8	47.3	40.0	27.8	20.6	5.7	29.7
2011	15.0	8.2	12.5	25.2	38.0	43.7	46.9	43.3	37.6	27.8	9.4	17.9	27.1
2012	4.5	20.1	14.6	29.9	33.0	42.9	45.2	45.6	37.3	22.5	8.4	7.7	26.0
2013	18.0	19.7	14.6	17.0	36.2	50.6	51.4	49.1	38.0	32.2	12.9	15.3	29.6
2014	26.3	11.2	15.5	26.4	41.1	41.2	47.8	46.5	38.8	25.8	26.1	23.7	30.8
Period of Record Average	14.2	14.0	13.5	25.1	37.2	44.5	48.0	46.1	38.3	26.8	14.5	16.1	28.1

Tebay

Period of Record 7/8/2005 – Present

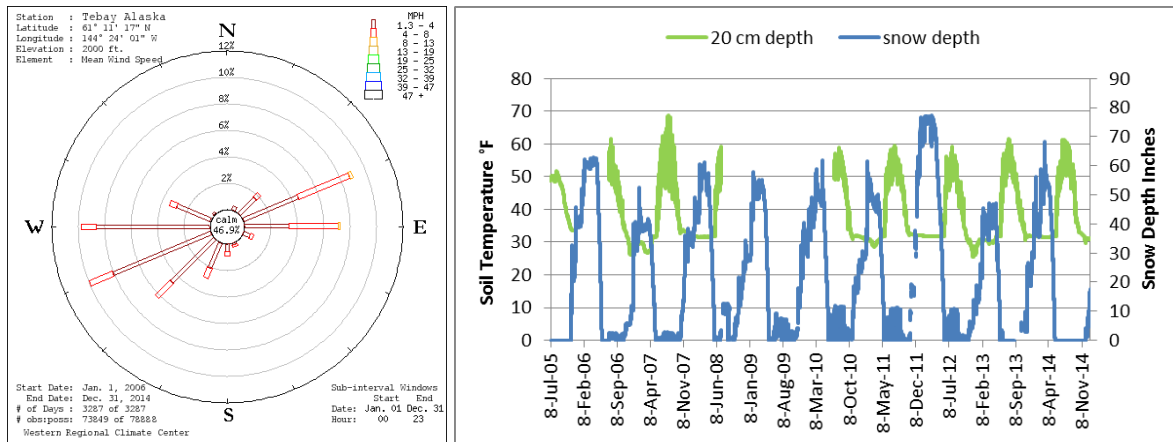


The Tebay site is located on the shores of the upper Tebay Lake in a spruce forest that has been devastated by beetles at an elevation of 1880'. This site is surrounded by high peaks of the Chugach Mountain Range between the Chitina and Copper River Valleys. The summers are warm and the winter temperatures are moderate given the proximity to the Gulf of Alaska. There is abundant snowfall in winter and on average ~ 5.65 inches of rainfall in the summer. The period of record average temperature is 27.1°F. The highest temperature recorded thus far is 87.9°F on 6/17/2013 and the lowest is -33.8°F on 1/1/2009.

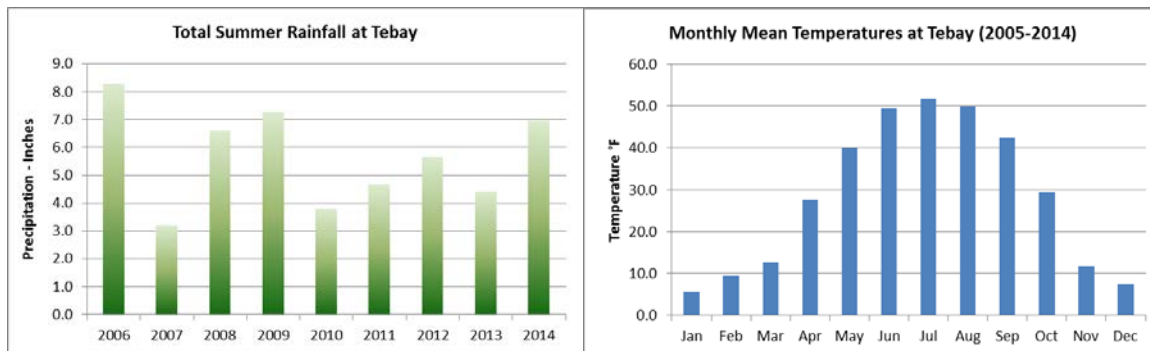
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	5	2	180	16	22	38	-3	23	21	32	32	32	40	
Feb-14	16	2	112	12	-2	30	-23	0	-3	32	32	32	45	
Mar-14	106	2	145	<u>23</u>	15	45	-12	17	12	31	32	32	55	
Apr-14	204	2	179	14	27	60	-8	30	25	31	32	32	48	
May-14	242	2	207	12	43	64	24	45	41	33	33	32	11	
Jun-14	221	3	230	13	48	72	28	49	47	49	49	43	0	1.83
Jul-14	200	3	221	10	53	80	35	54	52	54	55	50	0	1.55
Aug-14	146	2	209	10	50	70	34	52	49	53	54	51	0	3.57
Sep-14	88	2	155	12	43	61	23	44	42	47	47	47	0	
Oct-14	31	2	99	10	27	51	2	27	26	35	35	37	0	
Nov-14	7	2	86	9	16	40	-7	17	15	32	32	34	0	
Dec-14	1	1	104	9	15	36	-7	16	15	31	31	32	6	

Tebay Climatology 2005-2014: Wind rose climatology and soil temperatures and snow depth:



Tebay mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Tebay	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2005								52.8	44.0	29.4	8.2	14.1	
2006	-2.9	10.6	9.0	26.5	38.7	48.6	52.9	48.4	43.0	32.7	-2.4	12.5	26.5
2007	11.2	5.4	4.5	30.0	40.5	51.3	53.4	52.3	42.9	29.0	21.4	9.3	29.3
2008	2.4	6.4	17.7	28.6	39.2	46.0	m	48.0	41.3	24.3	14.4	1.2	24.5
2009	3.4	7.6	14.2	28.8	43.2	m	m	m	42.7	33.4	11.6	11.5	21.8
2010	1.7	16.2	18.9	27.9	40.2	48.3	49.8	51.3	42.0	29.2	19.2	-2.4	28.5
2011	5.2	7.2	9.6	29.4	42.2	49.5	52.8	49.0	41.6	30.4	6.9	18.1	28.5
2012	-4.1	16.9	11.0	29.9	36.0	45.5	49.5	49.3	41.5	24.3	4.0	-1.1	25.2
2013	12.6	16.7	14.4	21.0	36.9	52.3	55.0	51.6	42.8	35.6	14.0	3.0	29.7
2014	22.3	-2.0	14.5	27.3	42.8	48.0	52.8	50.4	43.4	26.5	16.2	15.4	29.8
Period of Record Average	5.8	9.4	12.6	27.7	40.0	48.7	52.3	50.0	42.4	29.5	11.7	7.5	27.1

Chicken Creek

Period of Record 8/1/2004 - Present

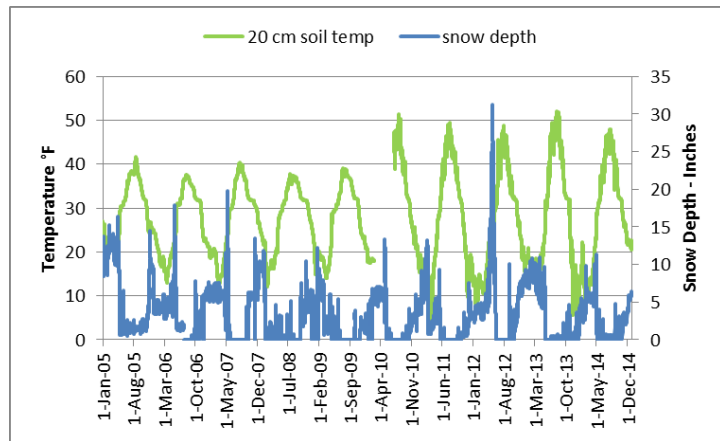
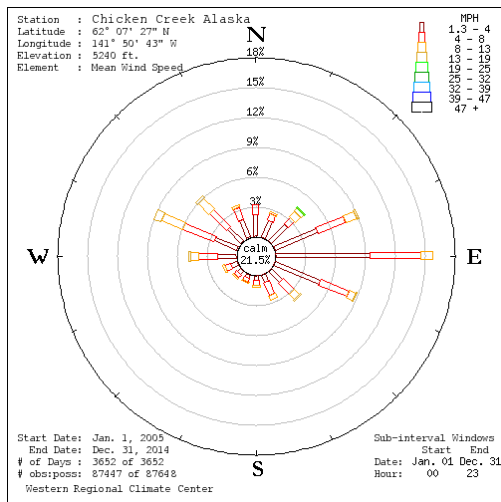


The Chicken Creek site is located in the Nutzotin Mountains north of the Wrangell Mountain Range and east of the Chisana River valley at an elevation of 5240'. This high alpine site is cool in the summer and cold in the winter, although not as cold as the surrounding low valleys due to a persistent inversion that lasts from October through March. The surrounding low river valley is one of the coldest regions in the state in winter. The snow gets scoured away in the winter and the summer rainfall is on average ~ 10.8 inches. The period of record average temperature is 24.8°F. The highest temperature recorded thus far is 75°F on 8/15/2010 and the lowest is -35.5°F on 1/27/2013.

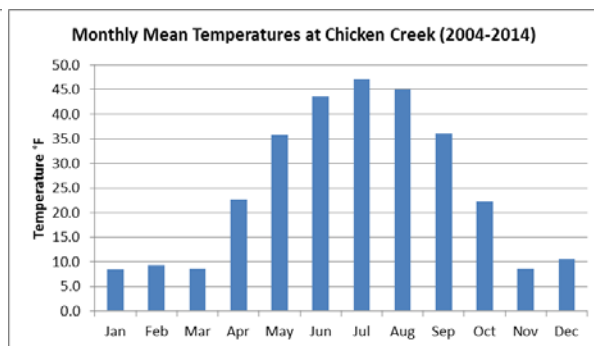
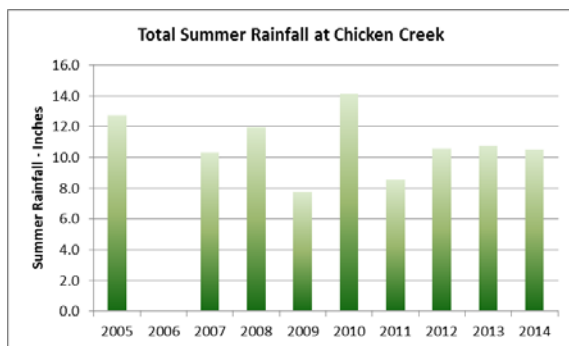
2014 Summarized Data

2014	Solar Radiation	Wind Speed	Wind Direction	Wind Gust	Air Temperature					Average Soil Temperature			Snow Depth	Summer Rain
Date	W/m ²	mph	Deg	mph	Deg F					Deg F			In.	In.
	Ave.	Ave.	Ave.	Max.	Ave.	Max.	Min.	Ave. Max	Ave. Min	10cm	20cm	50cm	Ave.	Total
Jan-14	15	5	130	40	23	47	-12	24	22	18	16	17	4	
Feb-14	53	3	134	44	7	39	-21	8	5	12	11	15	5	
Mar-14	133	4	113	31	11	33	-9	13	10	13	12	14	6	
Apr-14	202	3	157	23	24	49	-5	26	22	20	19	18	6	
May-14	240	6	168	44	38	56	22	39	37	32	31	27	1	
Jun-14	206	6	200	27	40	57	25	41	39	38	38	33	0	4.87
Jul-14	184	5	188	25	47	64	33	48	46	46	45	39	0	4.42
Aug-14	172	5	193	24	45	63	28	47	44	44	44	41	0	1.23
Sep-14	101	4	175	35	35	57	16	37	34	36	37	37	0	
Oct-14	54	3	153	19	20	42	6	21	19	32	31	32	1	
Nov-14	22	3	109	30	20	42	-7	22	19	27	25	29	3	
Dec-14	6	3	113	23	18	41	3	19	17	23	22	25	5	

Chicken Creek Climatology 2004-2014: Wind rose climatology and soil temperatures and snow depth:



Chicken Creek mean monthly and annual temperatures and summer (Jun-Aug) rainfall:



Chicken Creek	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004									30.7	23.3	17.7	12.1	
2005	8.8	11.0	18.6	27.6	40.5	45.3	45.3	48.0	37.8	22.4	7.4	18.7	27.6
2006	6.6	12.2	5.4	20.3	34.4	43.4	47.8	42.5	37.3	25.1	-6.8	11.7	23.3
2007	10.2	1.5	-5.1	24.9	35.1	46.9	48.0	47.8	35.3	19.6	19.0	7.4	24.2
2008	5.3	3.5	13.9	23.1	33.9	41.4	43.3	40.9	35.0	17.0	12.3	5.4	22.9
2009	3.1	8.1	4.7	22.5	36.4	44.3	52.7	43.7	37.5	25.4	7.1	19.7	25.4
2010	9.1	17.7	13.2	24.0	38.1	41.4	47.5	45.9	35.1	22.0	14.8	0.3	25.8
2011	10.1	3.7	5.4	22.1	35.9	42.9	45.9	41.9	35.7	23.6	1.4	13.4	23.5
2012	-1.9	14.5	8.3	27.2	31.0	42.3	45.8	44.6	36.4	17.6	1.6	1.3	22.4
2013	10.4	13.6	9.8	12.1	34.0	48.5	49.1	48.9	35.3	29.7	8.0	8.9	25.7
2014	22.9	6.7	11.1	23.7	38.0	39.9	46.7	45.1	35.4	19.9	20.4	18.3	27.4
Period of Record Average	8.5	9.3	8.5	22.7	35.7	43.6	47.2	44.9	36.1	22.2	8.5	10.5	24.8

Fire RAWS sites in Wrangell-St. Elias

May Creek: Located in a cleared area at May Creek camp.

	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	1	93	15	23	43	-5	
Feb-14	0	77	4	-7	31	-35	
Mar-14	2	143	25	17	49	-16	
Apr-14	2	204	19	34	57	-8	
May-14	3	230	<u>29</u>	49	73	23	
Jun-14	2	225	19	51	75	27	3.05
Jul-14	1	216	18	56	80	32	2.02
Aug-14	1	193	19	53	78	28	1.52
Sep-14	1	195	23	43	67	17	
Oct-14	1	181	14	24	50	-9	
Nov-14	0	139	11	8	35	-22	
Dec-14	0	68	0	9	32	-22	

Chisana: Located on the west side of the Chisana Airstrip.

	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	1	94	20	17	47	-11	
Feb-14	0	343	10	-9	39	-43	
Mar-14	1	127	19	7	42	-26	
Apr-14	1	149	14	28	53	-14	
May-14	2	253	<u>28</u>	45	68	18	
Jun-14	2	169	25	47	71	20	3.96
Jul-14	1	131	20	53	78	26	2.16
Aug-14	2	149	21	50	77	22	1.31
Sep-14	1	104	19	39	69	9	
Oct-14	1	119	16	19	51	-16	
Nov-14	0	81	19	3	32	-26	
Dec-14	0	348	12	0	32	-22	

Klawasi: Located in the Copper River Valley west of Mt. Drum and east of Glenallen

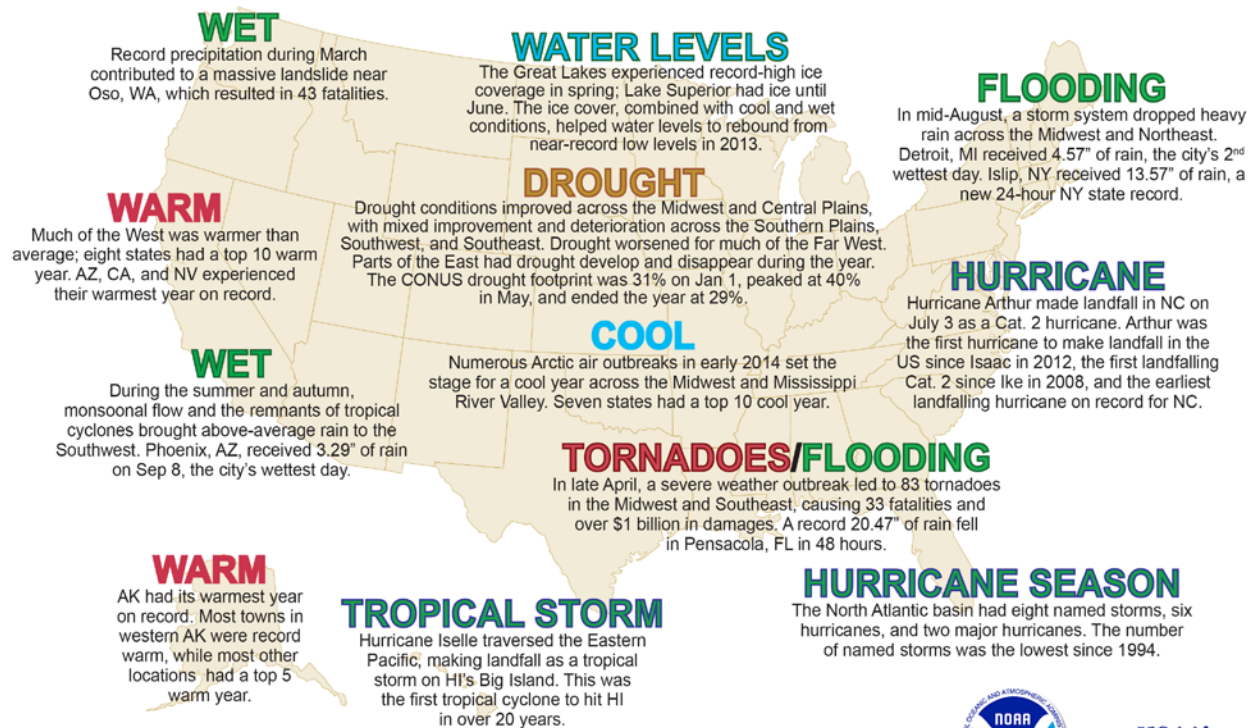
	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	11	141	<u>65</u>	26	47	-6	
Feb-14	4	132	37	3	40	-21	
Mar-14	9	135	53	18	39	-4	
Apr-14	8	156	40	31	50	-6	
May-14	10	154	45	46	65	27	
Jun-14	11	165	44	48	69	30	1.05
Jul-14	9	171	40	54	77	38	2.27
Aug-14	10	162	45	52	69	37	3.89
Sep-14	10	142	62	43	64	18	
Oct-14	5	136	50	23	46	-3	
Nov-14	6	118	54	20	43	-9	
Dec-14	8	120	55	19	40	-2	

Chitina: Located in the town of Chitina on the north side of the road.

	Wind Speed	Wind Direction	Wind Gust	Temperature			Summer Rain
Date	mph	Deg	mph	Deg F			In.
	Ave.	Ave.	Max.	Ave.	Max	Min	Total
Jan-14	2	164	30	24	44	-6	
Feb-14	1	7	12	-7	19	-33	
Mar-14	2	149	<u>38</u>	19	48	-10	
Apr-14	4	172	27	35	62	4	
May-14	4	169	29	52	78	28	
Jun-14	4	170	22	54	78	31	2.8
Jul-14	4	176	27	58	85	38	0.78
Aug-14	3	171	23	55	75	38	1.9
Sep-14	2	156	33	46	63	21	
Oct-14	1	30	20	27	49	0	
Nov-14	1	2	17	12	39	-11	
Dec-14	1	285	25	13	39	-13	

Appendix B. 2014 National Summary

Preliminary Significant U.S. Weather and Climate Events for 2014



NOAA's
National Climatic Data Center

Graph courtesy of NOAA (NOAA 2015a).

Appendix C. 2014 Global Climate Anomalies

Land & Ocean Temperature Departure from Average Jan–Dec 2014 (with respect to a 1981–2010 base period)

Data Source: GHCN–M version 3.2.2 & ERSST version 3b

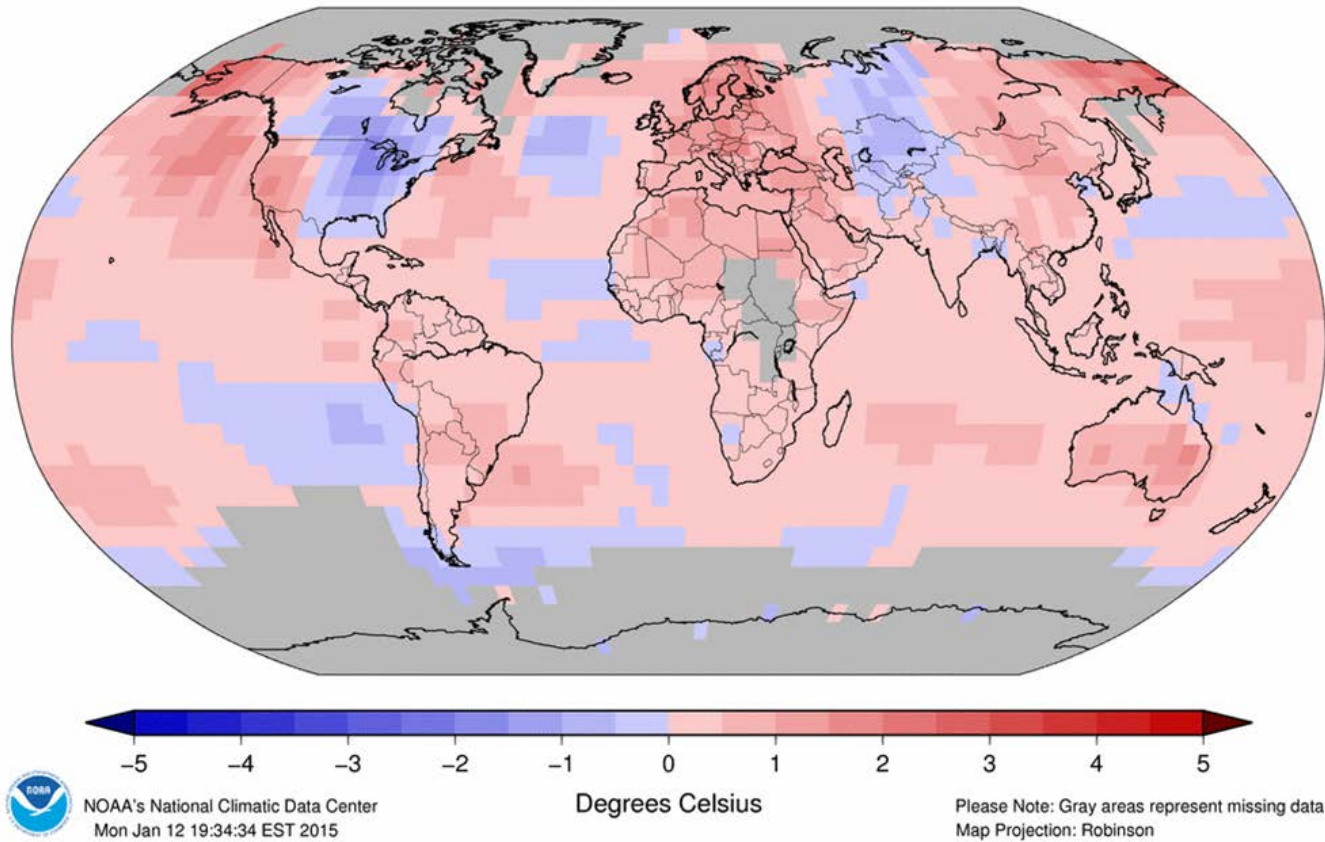
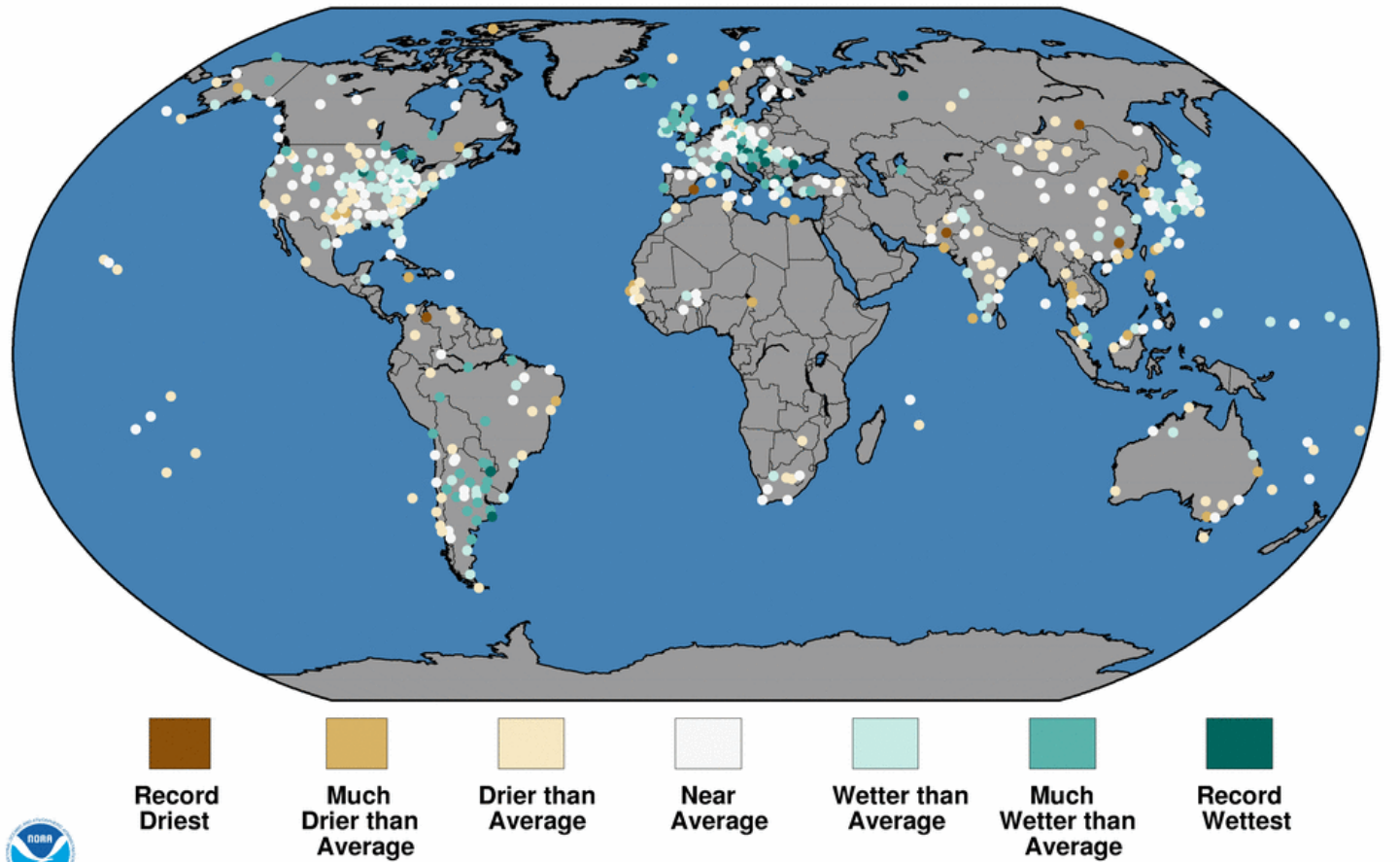


Figure courtesy of NOAA (NOAA 2014c).

Land-Only Precipitation Percentiles Jan-Dec 2014

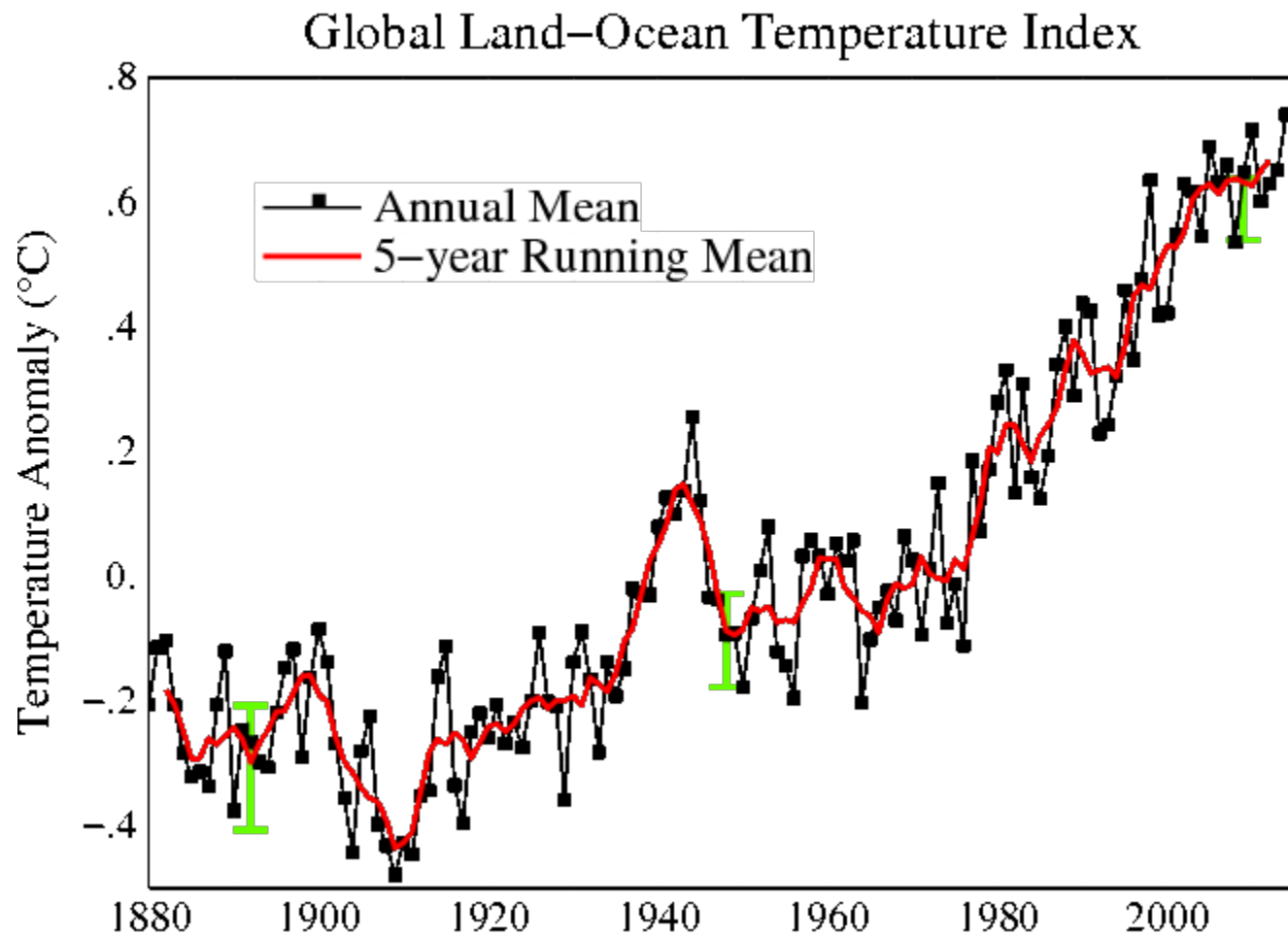
NOAA's National Climatic Data Center

Data Source: GHCN-M version 2



Tue Jan 13 14:11:48 EST 2015

Figure courtesy of NOAA (NOAA 2015c).



Global mean annual temperature departure (°C) from the 1951–1980 normal (the reference period used by NASA Goddard Institute for Space Studies [GISS]). Graph courtesy of GISS (GISS 2015).

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