



# Weather and Climate

## Wrangell-St. Elias Fall 2014 Weather Summary



### Fall Temperatures 2014

In Gulkana, September temperatures were near normal for most of the month with the exception of a warm spell at the end of week two. Both September 13<sup>th</sup> (70° F) and 14<sup>th</sup> (68° F) set daily record high temperatures. The last week of the month was cooler than normal and included the monthly minimum of 17° F on the 26<sup>th</sup>. Overall, the September mean of 44.3° F was 1.0° F warmer than normal. October was cold with an average temperature of 22.4° F, 4.2° F below the 1981-2010 normal. Gulkana had the greatest negative deviation in the state for October. Temperatures warmed back up the second week of November with a monthly high of 41° F on the 10<sup>th</sup>. Temperatures didn't drop below freezing on the 10th, which is rare for Gulkana for any day in November. The normal low for the 10<sup>th</sup> is 0° F. Overall, Gulkana was one of the few places in the state with a cooler than normal seasonal average temperature in fall 2014 (Figure 1, Table 1).

In Yakutat, the monthly mean temperature for September was 51.2° F compared to a normal of 48.4° F. The monthly high (65° F) and low (30° F) were on the same date (September 24). A rare spell of clear weather allowed for the exceptional diurnal range. October was near normal with a monthly mean temperature of 41.7° F compared to 41.0° F. Minimum temperatures fell below freezing 21 out of 30 days. November's monthly average was 34° F; normal is 32.3° F. The monthly minimum was 13° F on November 28. Overall, the average fall season temperature in Yakutat of 42.3° F was 1.7° F warmer than normal. (Figure 1, Table 3).

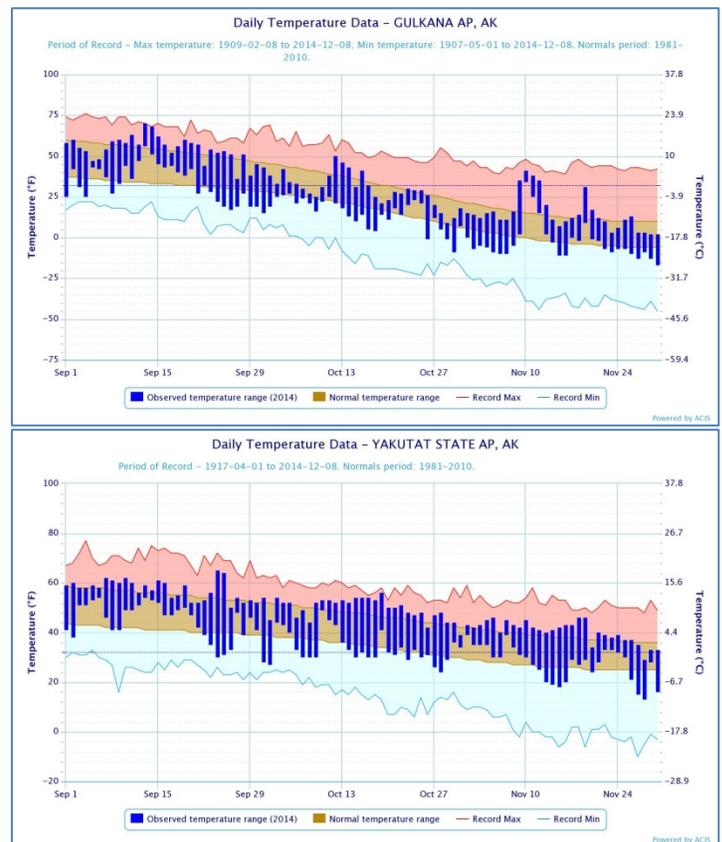


Figure 1. Fall 2014 daily temperatures at Gulkana, Nabesna, and Yakutat showing record maximum (red), record minimum (blue), normal (brown) and 2014 observed daily range (blue).

## Fall Precipitation 2014

In Gulkana, September started off wet with 1.51 inches of precipitation recorded September 2-6. The total for the month was 2.06 inches, 130% of normal. October was much wetter than normal with a total of 2.21 inches of precipitation. At 218% of normal, 2014 was the third wettest October since 1949. Only 1987 (2.29 inches) and 1965 (2.42 inches) had more precipitation. The tables turned in November with only 2 days of measureable precipitation. 0.01 inches were recorded on the 1<sup>st</sup>, and 0.08 inches on the 29<sup>th</sup>. This is not unheard of – 1964, 1975, 2001, and 2004 also had Novembers with less than a tenth of an inch of precipitation. Despite the dry November, seasonal precipitation totaled 4.36 inches, 132% of normal. The wettest fall on record is 2000, with 5.79 inches. (Figure 2, Table 1)

In Yakutat, the total precipitation in September was 19.81 inches compared to a normal of 21.11 inches. 5.07 inches of rain fell on the 5<sup>th</sup>, a record for the date. More than one inch of rain fell on 12 separate days in September. October is typically the wettest month with 21.98 inches of precipitation expected. 2014 ended up at 68% of normal for the month with “only” 14.91 inches. A trace of snow was recorded on Halloween and was the only recorded snowfall for the month. Normally, 2.5 inches of snow falls in October. November ended up at 65% of normal with 9.37 inches of precipitation. Measureable snow was recorded on November 27 (0.3 in.), 28 (0.3 in.), and 30 (4.7 in.) for a total of 5.3 inches in the month. Normal is 18.2 inches. Fall precipitation ended up at 44.09 inches, 77% of normal. (Figure 2; Table 3)

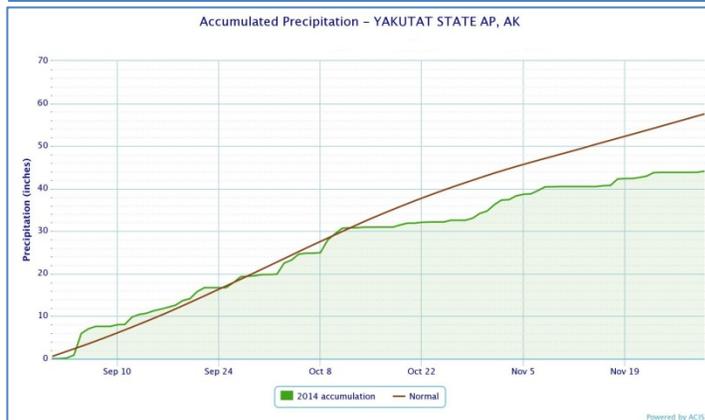
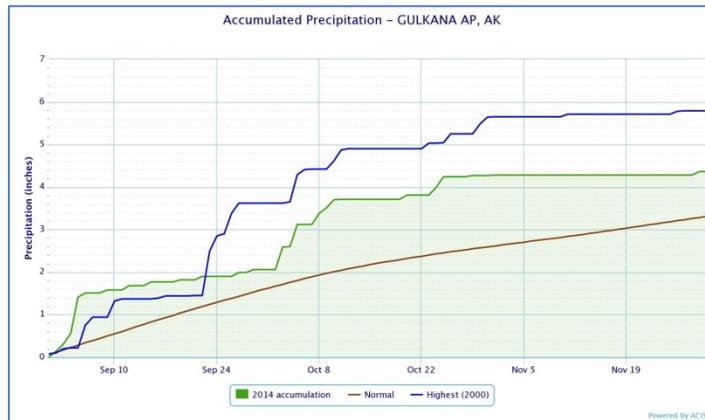


Figure 2. Fall **2014** accumulated precipitation at Gulkana (top), and Yakutat (bottom) compared to **normal** (brown line). The **wettest fall** at Gulkana (2000) is shown in blue.



Table 1. Gulkana fall 2014 Temperature and precipitation compared to the 1981-2010 normal.

| Gulkana Fall 2014 | Average Monthly Temp °F | 1981-2010 Normal °F | Departure from Normal °F | Monthly High °F / Date | Monthly Low °F / Date |
|-------------------|-------------------------|---------------------|--------------------------|------------------------|-----------------------|
| September         | 44.3                    | 43.3                | +1.0                     | 70 / Sep 13            | 17 / Sep 26           |
| October           | 22.4                    | 26.6                | -4.2                     | 50 / Oct 12            | -9 / Oct 30           |
| November          | 6.0                     | 5.8                 | +0.2                     | 41 / Nov 10            | -17 / Nov 30          |

Fall Season Temperature Departure from Normal: -1.0°F

| Gulkana Fall 2014 | Total Monthly Precip. in. | 1981-2010 Normal in. | Departure from Normal in. | Greatest 24 -hr. total in. / Date | # Days with >=0.01 in. water |
|-------------------|---------------------------|----------------------|---------------------------|-----------------------------------|------------------------------|
| September         | 2.06                      | 1.58                 | +0.48                     | 0.85 / Sep 5                      | 12                           |
| October           | 2.21                      | 1.01                 | +1.20                     | 0.53 / Oct 3                      | 11                           |
| November          | 0.09                      | 0.72                 | -0.63                     | 0.08 / Nov 29                     | 2                            |

Fall Season Temperature Departure from Normal: +1.05 inches (132% of normal)

Table 2. Yakutat Fall 2014 Temperature, Precipitation, and Snowfall compared to the 1981-2010 normal.

| Yakutat Fall 2014 | Average Monthly Temp °F | 1981-2010 Normal °F | Departure from Normal °F | Monthly High °F / Date | Monthly Low °F / Date |
|-------------------|-------------------------|---------------------|--------------------------|------------------------|-----------------------|
| September         | 51.2                    | 48.4                | +2.8                     | 65 / Sep 24            | 30 / Sep 24           |
| October           | 41.7                    | 41.0                | +0.7                     | 56 / Oct 19            | 24 / Oct 28           |
| November          | 34.0                    | 32.3                | +1.7                     | 46 / Nov 5, 18, 19     | 13 / Nov 28           |

Fall Season Departure from Normal: +1.7°F

| Yakutat Fall 2014 | Total Monthly Precip. in. | 1981-2010 Normal in. | Departure from Normal in. | Greatest 24 -hr. total in. / Date | # Days with >=0.01 in. water |
|-------------------|---------------------------|----------------------|---------------------------|-----------------------------------|------------------------------|
| September         | 19.81                     | 21.11                | -1.30                     | 5.07 / Sep 5                      | 24                           |
| October           | 14.91                     | 21.98                | -7.07                     | 2.96 / Sep 9                      | 22                           |
| November          | 9.37                      | 14.45                | -5.08                     | 1.52 / Nov 18                     | 21                           |

Fall Season Departure from Normal: -13.45 inches (77% of normal)

| Yakutat Fall 2014 | Total Monthly Snowfall in. | 1981-2010 Normal in. | Departure from Normal in. | Greatest 24 -hr. snowfall total in. / Date | Cumulative snowfall since 1-July in. |
|-------------------|----------------------------|----------------------|---------------------------|--|--------------------------------------|
| September         | 0                          | 0                    | 0                         | - -  | 0                                    |
| October           | Trace                      | 2.5                  | -2.5                      | T / Oct 31                                 | Trace                                |
| November          | 5.3                        | 18.2                 | -12.9                     | 4.7 / Nov 30                               | 5.3                                  |

Table 3. Summary of weather statistics from WRST climate stations. All data are preliminary and subject to review.

| Site          | Elev. (ft) | Average Temp °F |      |      | Extreme High<br>(°F) | Extreme Low<br>(°F) | Peak Wind<br>(mph) | Sept. Rain<br>(inches) | Average Temperature<br>Fall Season<br>(°F) |
|---------------|------------|-----------------|------|------|----------------------|---------------------|--------------------|------------------------|--|
|               |            | Sept.           | Oct. | Nov. |                      |                     |                    |                        |  |
| Chicken Creek | 5420       | 36.0            | 21.4 | 21.8 | 56                   | -6                  | 34                 | 1.14                   | 26.4                                       |
| Chisana       | 3318       | 38.6            | 18.7 | 2.9  | 69                   | -26                 | 19                 | 1.43                   | 20.1                                       |
| Chititu       | 4616       | 38.2            | 25.3 | 25.4 | 52                   | 0                   | 47                 | 2.53                   | 29.6                                       |
| Gates Glacier | 4060       | 39.2            | 27.0 | 27.3 | 53                   | 1                   | 26                 | 8.96                   | 31.2                                       |
| Klawasi       | 3045       | 42.6            | 23.4 | 20.5 | 64                   | -9                  | 62                 | 3.04                   | 28.8                                       |
| May Creek     | 1600       | 43.3            | 24.4 | 8.0  | 67                   | -22                 | 23                 | 3.52                   | 25.2                                       |
| Tana Knob     | 3739       | 41.8            | 26.6 | 25.8 | 56                   | 0                   | 28                 | 3.28                   | 31.4                                       |
| Tebay         | 2000       | 43.5            | 27.7 | 17.6 | 59                   | -6                  | 12                 | 5.17                   | 29.6                                       |

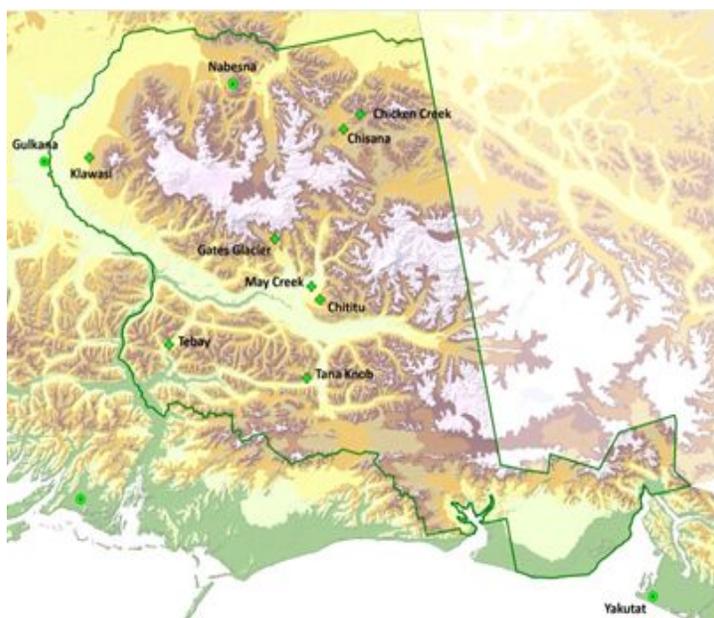


Figure 3. Map of NPS stations in Wrangell-St. Elias National Park and Preserve.

**Interesting notes from RAWS stations:**

- Once again, the difference in September precipitation between Gates Glacier (8.96 inches) and May Creek (3.52 inches) was significant in 2014. In 2013, the difference was also substantial with 4.86 inches more precipitation recorded at Gates Glacier.
- Most ridge-top / high-elevation sites were extraordinarily warm in November. Chicken Creek, Chititu, and Gates Glacier were all warmer in November than in October!
- Although only separated by 10 miles, the average difference in November temperatures between Chicken Creek (5420 ft.) and Chisana (3318 ft.) is 12.3° F for the 2004-2013 period. However, this year, Chicken Creek was an impressive 18.9° F warmer than Chisana for the month. This persistent, strong, and warm inversion pattern occurred throughout much of interior Alaska in November 2014.



Figure 4. Select photos from Gates Glacier timelapse camera (Fall 2013).

## Climate Monitoring in Wrangell-St. Elias National Park and Preserve

The NPS climate stations in Wrangell-St. Elias are approaching the 10-year mark for climate monitoring (Figure 3). The NPS stations complement long-term records available from the National Weather Service stations in Gulkana and Yakutat. The NPS stations are providing critical data at higher elevations which helps characterize climate gradients and patterns affecting resources in Wrangell-St. Elias National Preserve. Table 3 summarizes the fall weather data for NPS sites.

We have added a phenology camera to the Gates Glacier station. This camera captures images four times per day; the images are downloaded once a year. Select images in Figure 4 provide a glimpse of senescence in September and the onset of snow in October. The images are used to help quantify the snow season, green-up period, and other basic phenologic information.

### Long-term Fall Temperature Trends

At Gulkana, the average fall temperature for 2014 was 24.2° F, which is 1.0° F cooler than the 1981-2010 normal (the latest climate normal period) and 1.3° F degrees cooler than the long-term average (1949-2014). Average fall temperatures show great variability with a range between 18.8° F in 1996 and 35.0° F in 1979.

At Gulkana, there is no long-term trend in fall seasonal temperatures based on a simple linear regression ( $p=0.90$ ). Figure 5 shows the high variability of fall seasonal temperatures from 1949-2014.

At Yakutat, the average fall temperature for 2014 was 42.3° F, which is 1.7° F warmer than both the 1981-2010 normal (the latest climate normal period) and the long-term average (1949-2014). Fall temperatures show great variability with a range between 35.1°F in 1985 and 45.1° F in 1957.

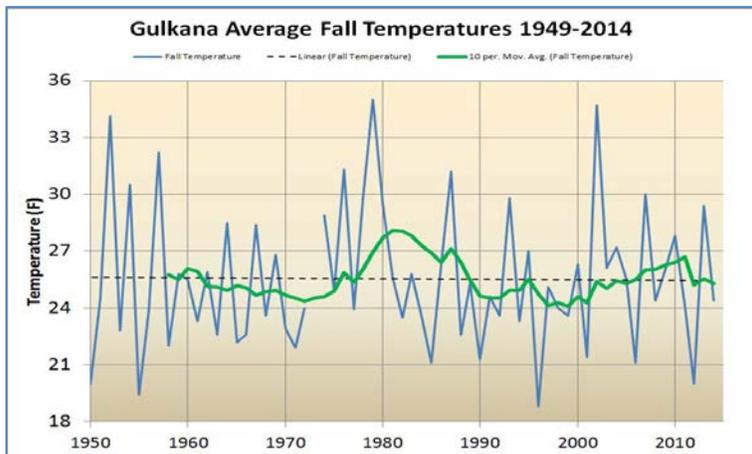


Figure 5. Average fall (September, October, November) temperatures in Gulkana since 1949. The green line shows the 10-year moving average. The dotted line shows a simple linear regression trend.

At Yakutat, there is no statistically significant trend in fall temperatures based on a simple linear regression ( $p=0.42$ ). The 10-year moving average shows the coolest period in the mid-1970s (Figure 6).

### Connecting Further

- New paper published – [Consistency and lack thereof in Pacific Decadal Oscillation impacts on North American winter climate.](#)
- Previous weather summaries and other climate monitoring documents on the [Central Network web portal](#)
- Access near real-time data from [Western Regional Climate Center](#) and [MesoWest](#)
- Statewide summary of weather highlights in the latest [Alaska Climate Dispatch](#) from the Alaska Center for Climate Assessment and Policy
- [Map](#) of projected temperature and precipitation changes for Wrangell-St. Elias National Park and Preserve.

### More Information

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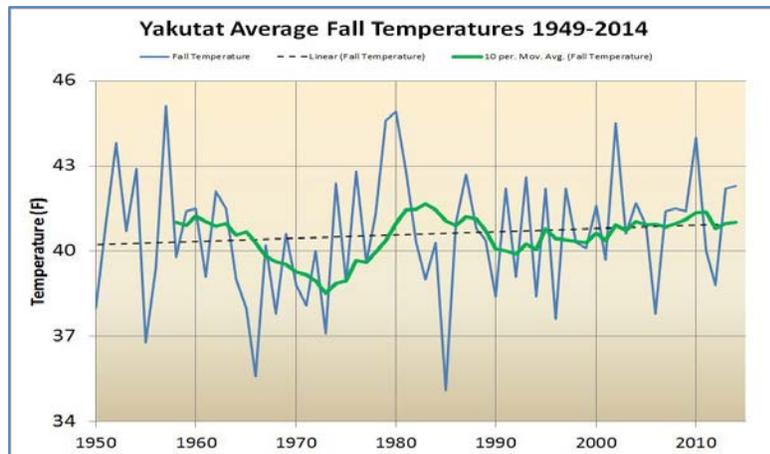


Figure 6. Average fall (September, October, November) temperatures in Yakutat since 1949. The green line shows the 10-year moving average. The dotted line shows a simple linear regression trend.