

## 2014 Fire Season Weather Summary

### Summary

The summer of 2014 will go down in history as one of the wettest summers ever recorded in Alaska. Sum total precipitation records for the summer (June-July-August) were broken for Fairbanks (11.63”) and Juneau (24.18”), while Anchorage, observing highly variable precipitation around town, measured 155% of normal rainfall at the airport.

The most significant fire of the year, the Funny River Fire, was a human-caused fire that started on the 19th of May, and ended up accounting for 84% of the acres burned in Alaska this season. Driven in extremely dry fuels by gusty northerly winds that reversed direction after several days, it grew to 190,000 acres in a week’s time, threatening numerous residences. Personnel remained on the fire for the next month, until June 25<sup>th</sup>. The 100 Mile Creek Fire, also human-caused, began on May 13<sup>th</sup> and skunked around for two weeks despite breezy westerly winds, then began consuming acreage around May 30<sup>th</sup>, as strong southeasterly wind increased the burned area to nearly 6,000 acres by the beginning of June. The fire continued to grow in fits and starts until about June 18<sup>th</sup>, at which time it received over 3 inches of rain in a 2-day period. As this was only the beginning of the wettest part of the summer, future growth on this fire was limited. In the end, it accounted for 10% of the total acreage consumed for 2014.

A very warm and dry spring set up pre-greened fuels to be extremely dry, and though the snow melted off at least a week earlier than normal in many places, the lack of rainfall prevented greenup from happening in a reasonable time frame. Instead, fuels around most of the state remained cured into the beginning of June. This was a huge factor in the rapid spread rates of the two early season fires described above.

By the middle of June, a change in the weather pattern was afoot. Whereas May and early June had been warm and quite dry, by June 18<sup>th</sup>, the rains began. In the next seven weeks, nearly eight inches of rain fell on the Interior, causing some flooding of homes and infrastructure, and even prompting some evacuations. South Central and Southwest Alaska had less rain, but were still subjected to periods of substantial precipitation. The rain brought a virtual halt to the fire season, and though August and September presented some warmer, drier weather, ignitions failed to spread at a rapid rate and were easy to catch while small. Exceptions were found along the west coast, where a few starts grew 500-1000 acres in fine fuels.

Very little lightning occurred before June 8<sup>th</sup>, and the number of significant lightning events throughout the summer remained low, with only five days exceeding 3,000 strikes. Though the season ended with a fairly normal cumulative amount of lightning, the excessive rain kept the number of remote starts to a minimum, which are typically the culprits of large burned acreage in Alaska. Most fire starts for the season were human-caused and in populated areas where rapid initial attack was able to suppress rapid growth: this resulted in less than 233,000 acres burned, making 2014 a low fire year.

## Season Forecast

The fire potential outlook for the 2014 fire season was for above normal for the Southwest, western South Central, and much of the Interior, as far east as Delta. That area was expected to expand into the eastern Interior for June, with a return to normal conditions by July. A low snowpack and an exceptionally warm April led to an early melt-out and concerns for extremely dry fuels to start the fire season. Long range forecasts indicated the likelihood of a warmer than normal summer, particularly in Southwest Alaska. These factors led us to forecast an above normal start to fire season, continuing through what is normally the busiest fire month, June. As it looked like the second half of the summer would be fairly normal, and there were no large-scale atmospheric changes expected, a normal late season was forecast.

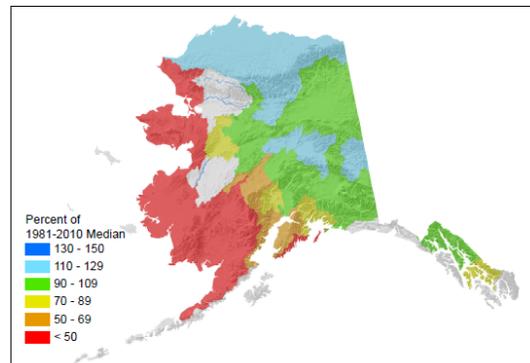


## Spring Snowpack

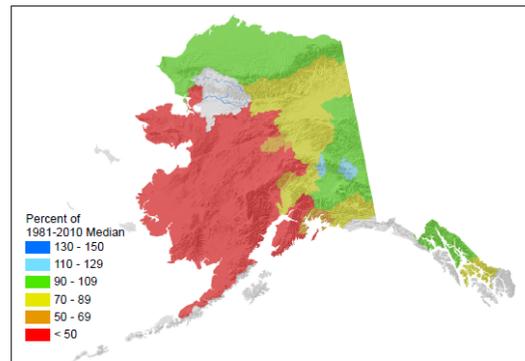
Though precipitation amounts were near normal for the winter, western Alaska and South Central reported only near half of normal snowpack. This indicated that much winter precipitation had been rain, and likely ran to low-lying areas, leaving much topography with a springtime deficit. This proved to be true as May dawned hot and extremely dry for parts of South Central and Southwest: almost all stations in those areas showed Fine Fuel Moisture Codes at all-time high values for mid May. It was during this time that the Funny River Fire ignited and grew at extreme speeds, 20,000 to 30,000 acres daily for a week.

The eastern half of the state, though having a normal snowpack, was not far behind as the warm, dry April caused rapid snowmelt and drying of fuels. By May 1<sup>st</sup>, only the North Slope, eastern Interior, Copper River Basin, and the northern Panhandle held on to a substantial amount of snowpack.

Alaska Snowpack as of April 1, 2014  
Based on Snow Water Content



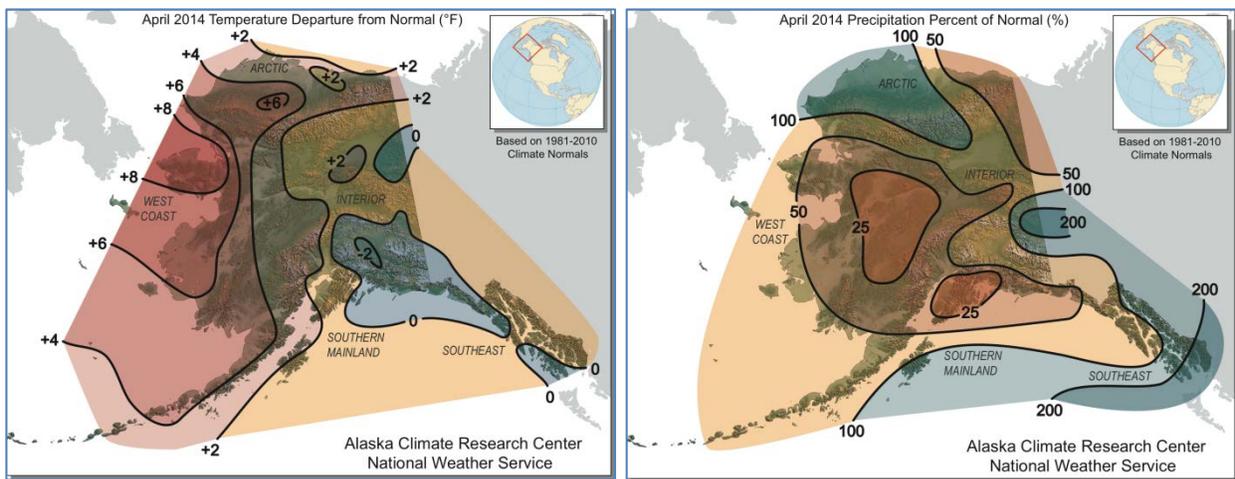
Alaska Snowpack as of May 1, 2014  
Based on Snow Water Content



## April

In a drastic turn from 2013, April was warmer than normal in most areas, with the western Brooks Range and west coast signaling 6 to 8 degrees warmer than normal, while the east was just a couple of degrees above average. Ice breakup at Nenana was one of the earliest on record, and more than a week earlier than normal. Daily record highs were set for several stations along the west coast, while sea ice extent was well below normal, with the pack ice never reaching the Pribilof Islands for the entire winter. The only below normal area was the eastern Alaska Range south to the eastern Gulf of Alaska.

Precipitation was less than 50%, for the majority of the state: Anchorage recorded only 0.04" of precipitation for the month, leading to their driest April since 1978. Though the northwest Arctic and easternmost Tanana Valley had near normal precipitation, the wettest area was the southern Panhandle, where a three day rain event led to one of the wettest Aprils on record for Annette and Ketchikan.



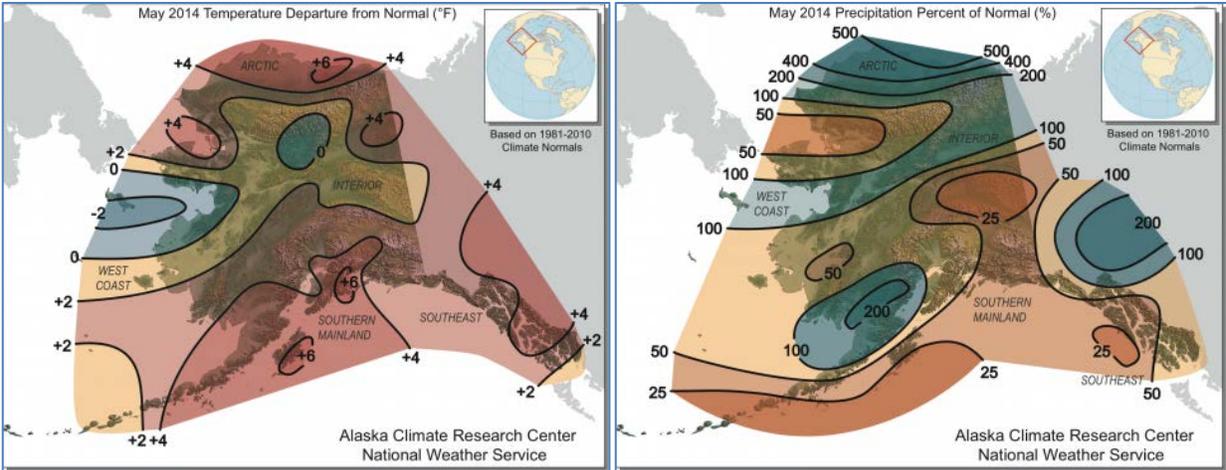
**April 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

## May

May was also on the warm side, particularly south of the Alaska Range. Many daily high temperature records fell, even in the northern Panhandle. It was the warmest May on record for King Salmon, Homer, Kodiak, and Anchorage.

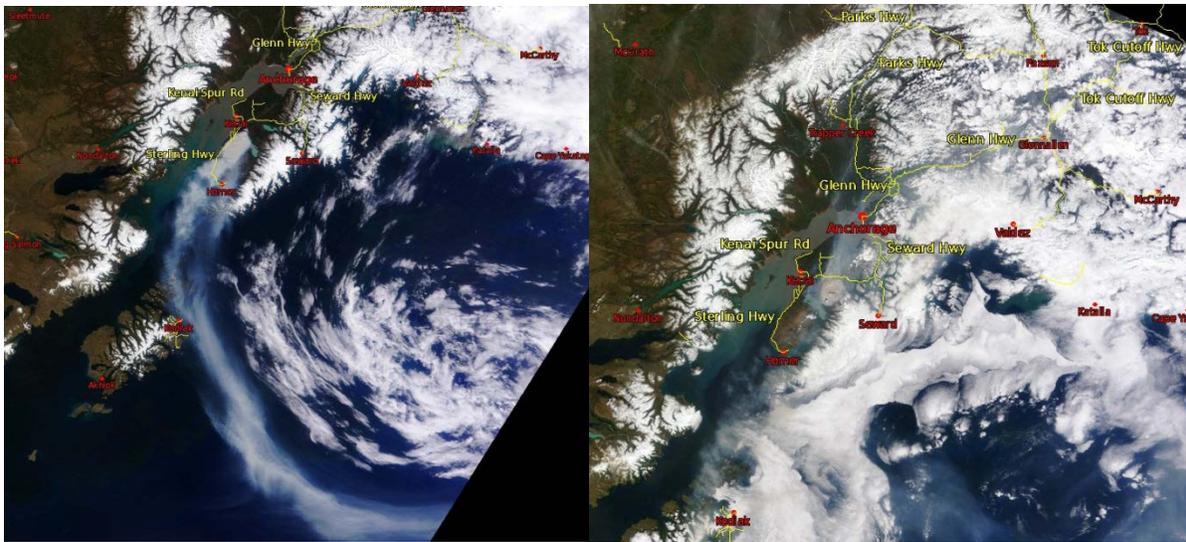
Precipitation remained minimal across the southern Interior and much of eastern South Central and the Panhandle. Meanwhile, record rainfall was observed in Barrow at five times normal May precipitation, and heavy rains in the southern Panhandle led to an unofficial observation of 7 inches from one event.

The early snowmelt and warm, dry weather led to an extended period of extremely dry fuels as greenup of vegetation was delayed due to little precipitation. This setup extreme fire conditions, which was realized with the Funny River Fire, a human-caused fire just south of Soldotna that started on May 19<sup>th</sup>. Strong winds caused rapid spread rates for several days, creating the largest fire on the Kenai Peninsula since 1947.



**May 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

Smoke from this fire reached as far north as Fairbanks, though closer locations such as Anchorage and Kodiak received the brunt of the smoke. Imagery below shows satellite imagery from two dates: on the 20<sup>th</sup>, a long band of smoke stretched south over the Gulf of Alaska, and by the 24<sup>th</sup>, winds had changed direction and blown into Anchorage, as seen by the gray cloud over that area in the second image.



**Smoke on Satellite Imagery from Funny River Fire on May 20 and May 24, 2014**

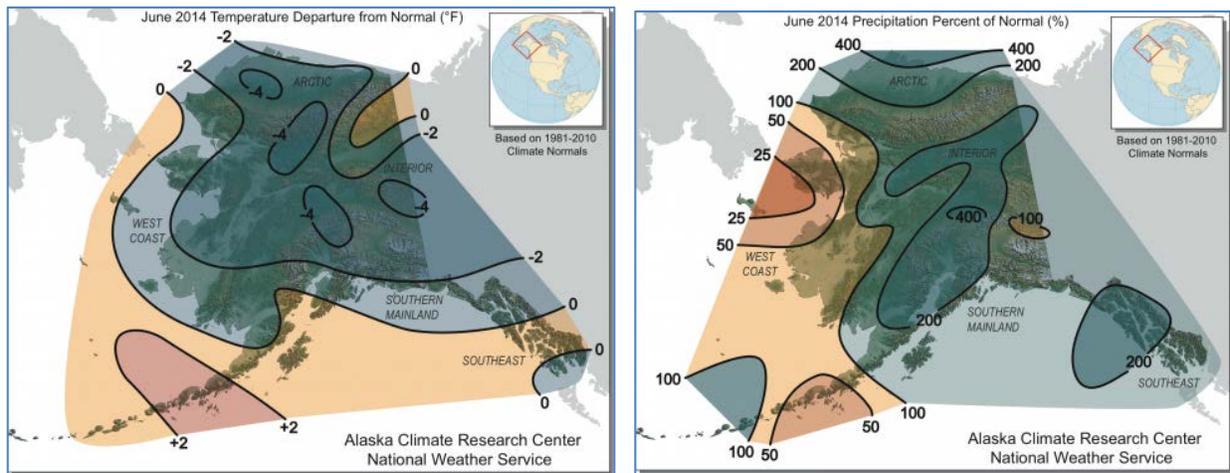
## June

June started a drastic pattern change that was to last for most of the rest of the summer. Below normal temperatures prevailed for virtually the entire state, with a late season frost recorded in and around Fairbanks on June 12<sup>th</sup>.

The weather change also brought copious amounts of rain! Anchorage received 3.33 inches of precipitation for the month, making this their second greatest June rainfall. Parts of the Panhandle set record precipitation records for June, with Juneau leading the pack at 7.48 inches, with 230% of normal rainfall. But the Interior is where the rain hit the hardest. Fairbanks and Eielson both observed record-breaking amounts of rainfall for the month, most of which came in the last two weeks of June. Though the

Fairbanks airport reported only 3.56 inches, locations in the hills north of town reported higher amounts, with Granite Tors Campground east of Fairbanks observing 7.78 inches, and nearly 11 inches reported south of Chena Hot Springs! And while most June precipitation typically comes in the form of instability showers and thunderstorms, almost all of this rain came from easterly waves of low pressure moving in from Canada, much larger-scale, steady precipitation events than convective activity.

Though the cold temperatures were frustrating, it was the precipitation that was not only depressing for many, but also caused damage for a number of homeowners and government agencies due to flooding and washouts. Though most trouble was in the river basins east and south of Fairbanks (such as the Salcha, Chena, and Goodpasture), Denali Park also saw extensive rain, forcing evacuations from the Kantishna area after three inches fell in just over 12 hours.

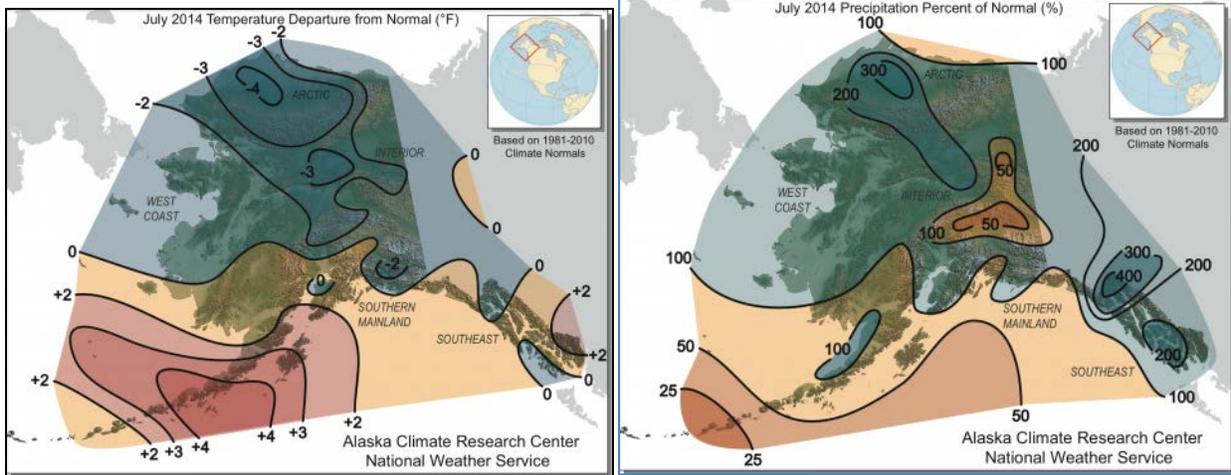


**June 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

## July

July continued the cooler than normal trend for most of the state, with coldest anomalies reported along the North Slope. Tanana dropped to 31F on July 27<sup>th</sup>, breaking their all time low for that date, though below freezing temperatures have been recorded there in July, the last time in 2000. The only parts of the state to remain on the warm side were Southwest and some of South Central, and the Alaska Peninsula and Aleutians where warmer weather led to a new daily high at King Salmon and a monthly warm record at Cold Bay.

Though heavier than normal rains fell for much of the state, there was a pocket focused over Tok that stayed drier. However, right next door, near record rains again hammered the central Interior, with Fairbanks reporting 2.83 inches of rain in a 24-hour period between July 1<sup>st</sup> and 2<sup>nd</sup>. This is the second highest rainfall recorded in Fairbanks for any one 24-hour period. Though Fairbanks didn't quite break the monthly record, it was the second-wettest with 5.78 inches of rain, and over 7 inches observed at many stations in the hills around town. Again, these rain events were not convective, but due to frontal system movement. Farther south, Juneau reported the wettest June ever with 15.65 inches of rain for the month. Of the biggest three cities, only Anchorage escaped the drenching pattern somewhat, with rainfall amounts of 3.23 inches more than an inch below the record, but quite a bit above the 1.83 inch average for July.



**July 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

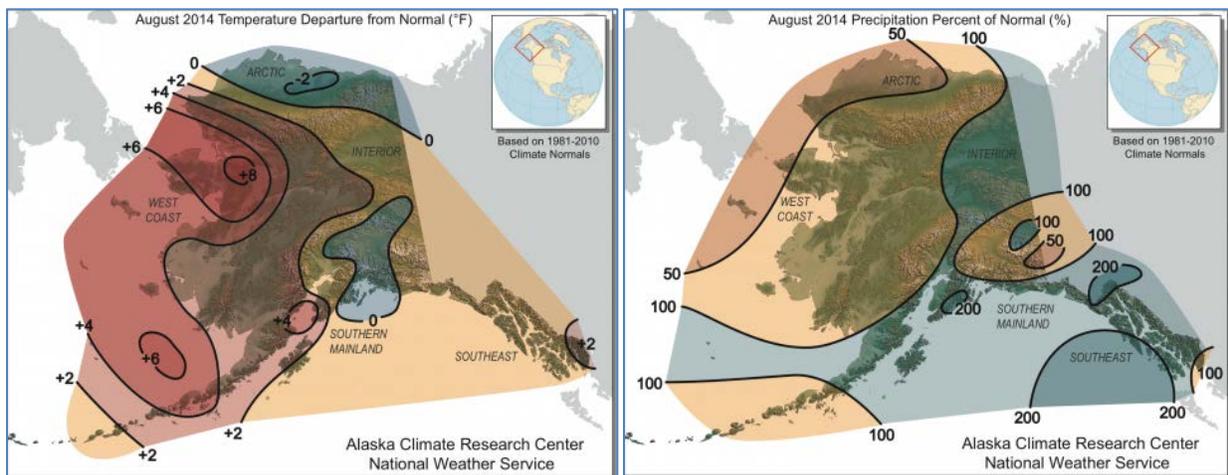
**August**

August temperatures were near normal in the east, but warm weather moved into the west, particularly over the Seward Peninsula, where anomalies showed about 8 degrees above normal.

Conditions also began to dry out, with very little rainfall in the northwest. The warming, drying trend in western Alaska allowed some lightning activity to crop up and ignite a few fires in the northwest and southwest. Longer nights and higher humidity kept fires from rapidly spreading, but the sudden increase in activity, though small, did keep firefighters on their toes late into the low-key season.

Despite the drier month, Fairbanks achieved the much-coveted record of the wettest summer (June-July-August) on record of 11.63 inches of rain. The old record from 1930 was 11.59 inches, half of which fell in August that year. This year, only 2.29 inches fell for August, not much above the monthly average: most of the damage was done in June and July. In the Panhandle, both Haines and Juneau also reported the wettest summer on record, Juneau blowing away the old record of 21.57 inches with 24.18 inches!

Ironically, Cold Bay observed the warmest average summer temperature on record at 54.1 F. This was more than four degrees warmer than normal, and beats the previous warm record of 52.4 F, set in 1977.



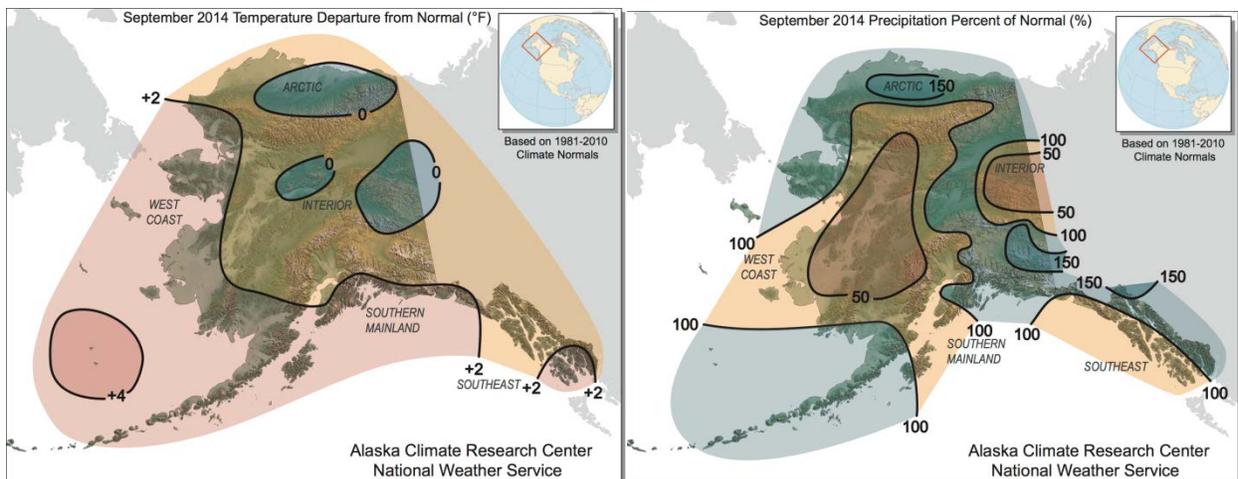
**August 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

## September

Temperatures in September were very near normal for most of the mainland, though out over the Bering Sea and many coastal areas, warmer than normal temperatures exceeded averages by 2 to 4 degrees. These were likely influenced by very warm sea surface temperatures over the Bering Sea. High temperature records were set for several locations in or along the Bering Sea, where the warmest September on record was observed for both Cold Bay and Saint Paul.

Precipitation was widely varied. Throughout most of the western half of the state, drier than normal conditions prevailed, with much of the western Interior receiving only half its normal rainfall. In the eastern Interior, similar conditions were observed. On the opposite end of the spectrum, wetter than normal conditions prevailed on the North Slope and through the Wrangell - St. Elias Mountains. Fairbanks and Ketchikan recorded their heaviest known September rainfall.

Though September seemed to bring a drying trend for much of the Interior, the summer rain had done its work. Poor Interior hay harvests were attributed to the wet summer, and the lack of fires during the wet summer meant there was virtually no fire growth during this month that typically sees existing limited option fires expand with a few dry or windy events.



**September 2014 Temperature Departure from normal (°F) and Precipitation Percent of Normal**

### 500 mb Patterns:

The following series of maps show the mean 500 mb height pattern for each month in the left-hand column, followed by the monthly anomalies, or difference from normal, in the right hand column. While the mean shows the general pattern that dominated for the month, the anomalies show us where the biggest differences from a normal pattern occurred.

The first mean 500 mb pattern shows that April began the season with ridging from Canada tilting northwest into Alaska. This is typically a warm, dry pattern, which was the case as shown in observations of above normal temperatures and lower than normal precipitation across the state.

May's composite mean 500 mb map shows strong high pressure in the North Pacific Ocean, and coincides with higher than normal geopotential heights for much of the state on the corresponding anomaly map. This

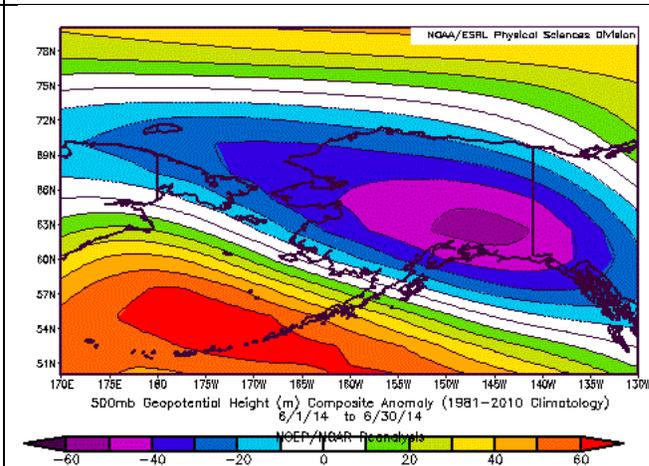
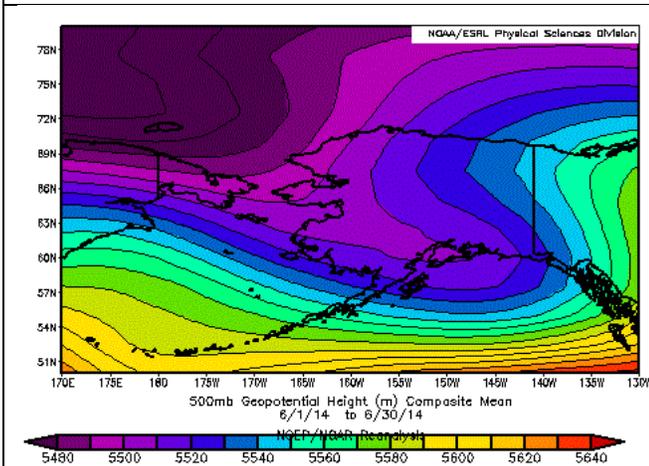
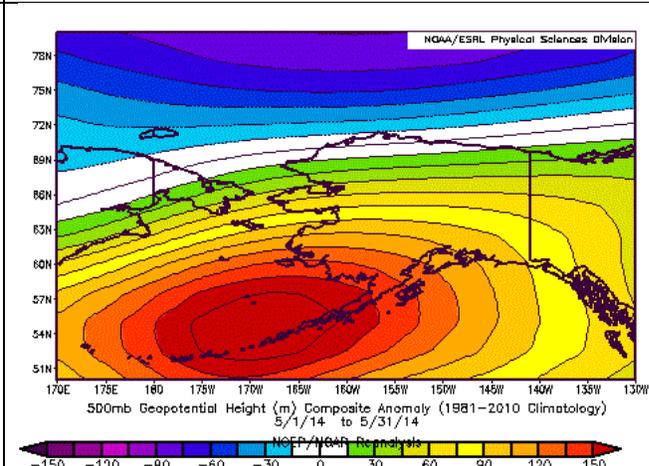
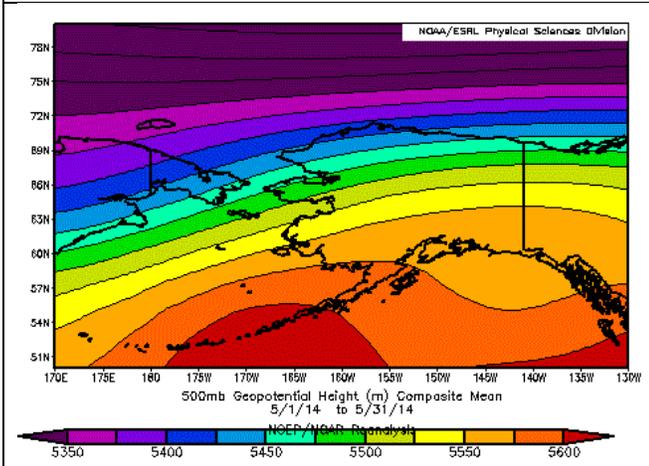
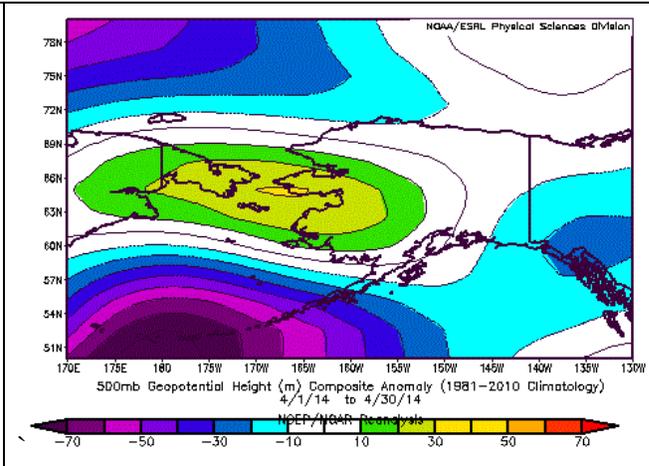
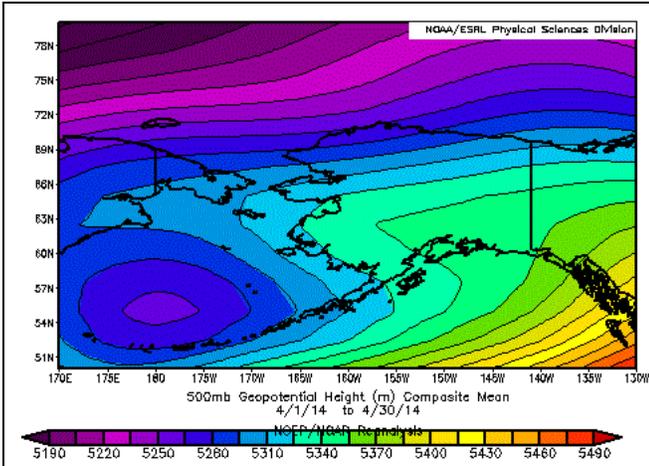
was evidenced by the continuance of warm weather, but with the focus moving to the southern part of the state. The strong gradient between the high and the low pressure over the Arctic Ocean also supports the strong wind events that took place through parts of South Central, driving the Funny River Fire at the end of the month.

June's 500 mb composite mean shows a long wave trough focused over the western portion of the state, with ridging over Canada that was unable to work its way into anything but far northeastern Alaska. The angle of the trough allowed easterly flow into eastern Alaska, which was expressed as the very wet easterly waves that brought heavy rain to much of the state in the second half of the month. Meanwhile, the negative anomalies over the Alaska Range indicate that cooler weather was present, as shown by statewide June surface observations. Note the high positive anomalies over the Aleutians, lending to the warm temperatures in Cold Bay.

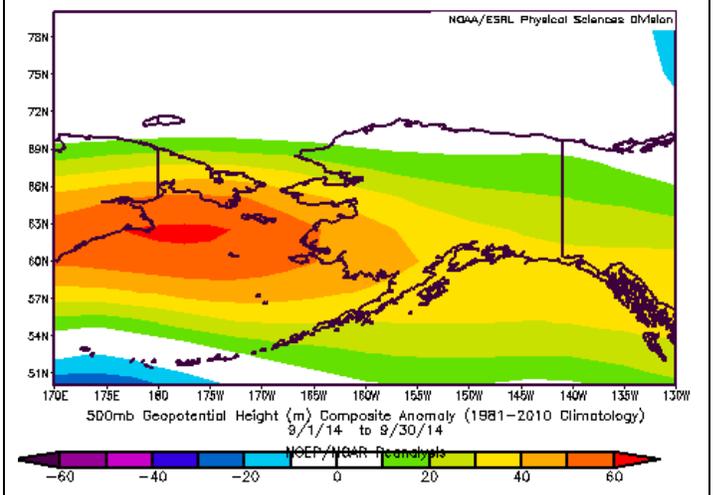
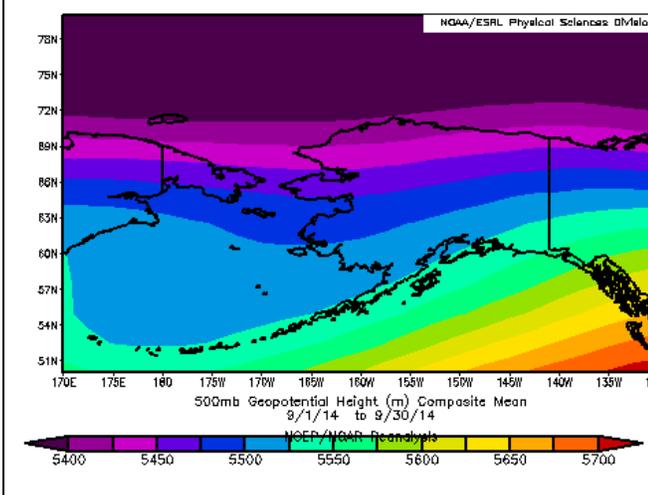
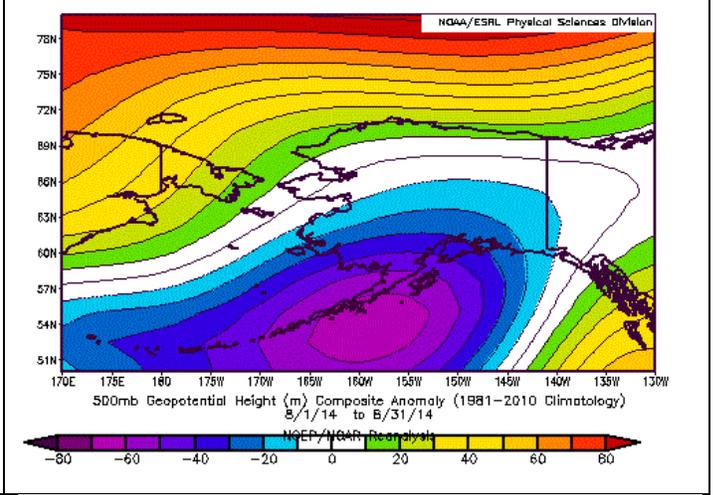
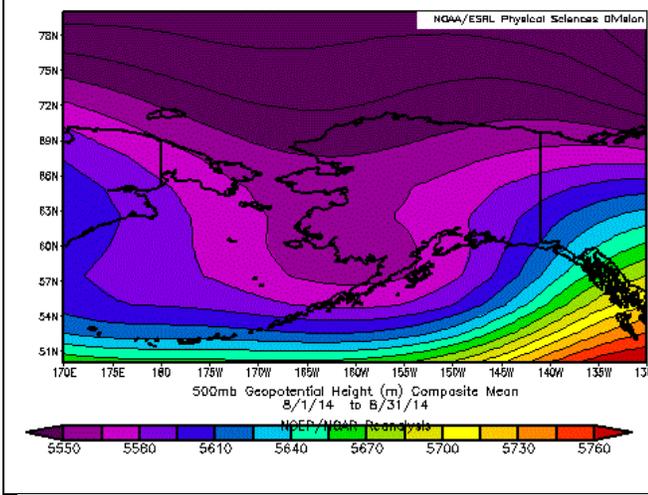
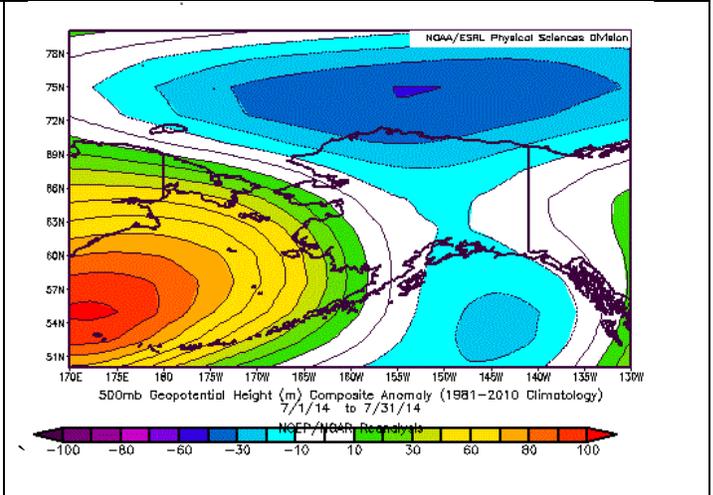
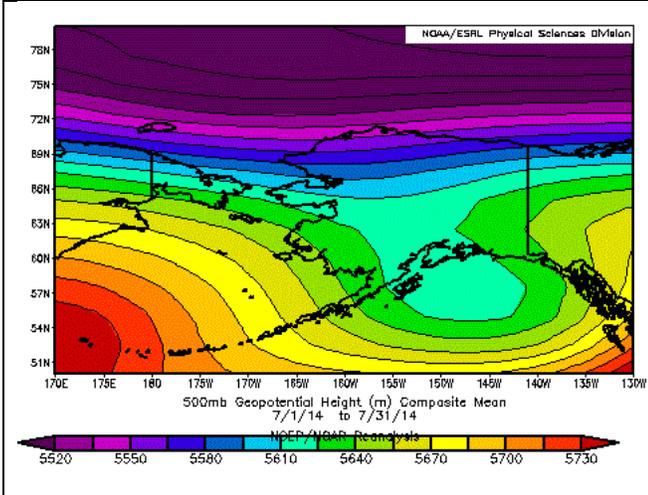
In July, the mean 500 mb long wave trough shifted eastward over the middle of the state. This prevented more easterly waves from rolling through, but the strong westerly flow across northern Alaska let plenty of moisture advance inland from the Bering and Chukchi Seas, bringing that very wet weather across the northern mainland, while the southern part dried a bit, at least between lows moving through the Gulf. Anomalies for this month show somewhat cooler temperatures, but overall, upper level heights were not significantly off normal.

In August, the mean 500 mb long wave trough shifted westward again, but the ridge over Canada did not present the same easterly flow back into the state (fortunately) and instead allowed more of a southerly flow over eastern Alaska. This created a drier, Chinook-like pattern for the Interior, keeping most precipitation confined south of the Alaska Range. Since August is a month of transition, the lower height anomalies over the north Pacific do not correlate with surface temperature as well, but they do indicate that low pressure dominated that area more than normal. Though rainfall wasn't heavy, places like Anchorage had a lot of clouds and mist, reporting 21 days of the month with light rain. Similar rain day counts were observed around southwestern Alaska for the month. This indicates the likely presence of low pressure for many days that month.

Though September's 500 mb composite mean shows troughing was dominant in the Bering Sea, the higher than normal height anomalies indicate that any low pressure systems that moved through were much weaker than normal. (September typically has several strong storm systems move through the Bering Sea, bringing ample rainfall to the west coast). This would explain the lower than normal rainfall in the western part of the state, and the above normal temperatures in the Bering Sea.



Composite Mean Analyses and Anomalies of 500 mb Geopotential Heights (m) for April, May, June 2014



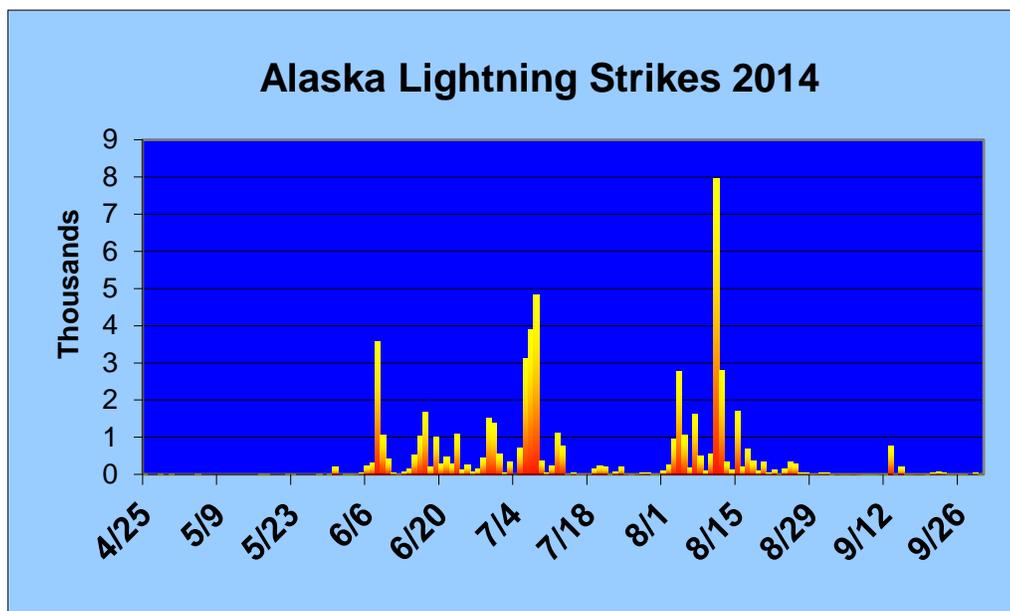
Composite Mean Analyses and Anomalies of 500 mb Geopotential Heights (m) for July, August, September 2014

## Lightning

The new Alaska Lightning Detection System (ALDS), which went operational in 2012, continues to pose challenges, many like the old system presented at its inception. Based on satellite imagery, eyewitness reports, and natural fire starts, it is believed that some lightning strikes are still not observed by the ALDS. At times, the system continues to report strikes in places that are cloud-free, and other times it misses strikes associated with thunderstorm cells, where lightning is observed by the naked eye. Reported errors are being documented and steps taken to remedy problems. Several sensors were upgraded last year, and IT personnel are working to acquire a program that would allow analysis of the raw data, instead of just receiving the processed data.

2014 had near average lightning activity when compared to data from the last 25 years, keeping in mind that several upgrades to the system over that time make true comparisons difficult. Convective activity began later than normal, with the first lightning event occurring June 8<sup>th</sup> with 3,574 strikes, mainly focused in the central and northeastern Interior. For the rest of June and early July, most days had some lightning, though there were none exceeding 2,000 strikes and only six that exceeded 1,000. This is fairly low, and helps to confirm the analysis that most of this summer's rain did not come from instability showers. The second big event was over three days from July 6-8, with almost 12,000 strikes. Most activity was in the eastern and northern Interior. The rest of July had minimal lightning, again indicating little convection. In August, activity picked up with a pattern change, with six days exceeding 1,000 strikes. The biggest day of the summer was on August 10<sup>th</sup>, with nearly 8,300 strikes spread across the Interior, extending southward into the northern Kuskokwim Mountains and Susitna Valley. This is unique in that the biggest lightning days typically occur much earlier in the summer. Lightning activity continued to occur daily, but generally for the rest of the season. No lightning event produced particularly large numbers of fires on any day this season, likely due to the wet conditions enveloping most of the state by the end of June.

For this exceptionally cool, wet summer, 59,053 strikes were observed (May 1<sup>st</sup> – September 30<sup>th</sup>). This was only about 11,000 strikes more than last season, which was one of the hottest and driest on record. These two years of data seem to indicate that lightning activity is quite independent of temperature and precipitation.



Lightning Strikes in Alaska for 2014 Fire Season

## **Conclusion**

2014 will be remembered as one of the wettest summers on record in Alaska. Though a warm, dry spring led to near catastrophic fuel conditions for the Funny River and 100 Mile Creek Fires at the end of May, fuels quickly moderated and then became saturated as wave after wave of moisture came across the state first from the east, then from the west. Those two fires contributed to most of the area burned for the season (94%), and almost all of the total acreage had burned by the middle of June. Though there were some short dry spells and areas that received less rain, the heavy, wetting rains kept new fires to slower spread rates, allowing ample time for Initial Attack, or even Mother Nature, to prevent significant fire growth.

Coming off one of the hottest summers on record in 2013, Alaska's wet summer of 2014 seemed quite extreme. The fact is it **was** extremely wet, and fire activity was minimal as a result.

## **Contacts**

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