

2015 Fire Season Weather Summary

Summary

The summer of 2015 will go down in history as one of the busiest fire seasons ever recorded in Alaska. Total acreage burned was 5.1 million acres, fitting 2015 into second place in fire season history, with only 2004 having more acres burned (6.2M). Interestingly, for many folks who were working for both of those seasons, 2015 created a greater sense of business, due to the numerous rapid fire starts and incredible acreage growth in a short period of time.

At one point in late June, the village of Tanana was surrounded by so much fire and inundated by so much smoke, that it was impossible to fly or drop supplies (or personnel). Instead, a barge was shipped up the Tanana River to get food to the firefighters as well as the villagers, who had been giving up their food supplies to feed the hundreds of firefighters in the near vicinity. Even river navigation was sketchy with the cut-with-a-knife thick smoke that settled over the Interior.

A low snowpack, combined with a very warm spring, set up pre-greened fuels to be extremely dry. Though the snow melted off up to three weeks earlier than normal in some areas, a few periods of scattered showers around the state helped keep fire activity near normal levels through the middle of June.

By June 14th, several days of 80+ degree temperatures and RH values into the teens caused rapid drying of fuels with the long daylight hours. Human-caused fires began popping up in earnest around the 15th of the month, with the Sockeye Fire in the Susitna Valley followed by the Card Street Fire in the Soldotna area suddenly ramping up the need for resources in South Central. But the key to the entire season's high operations tempo was the unprecedented week-long lightning event that began just before the solstice on June 19th, including 3 consecutive days with over 12,000 strikes daily. This seven day period gave rise to nearly 300 fire starts, 90% of which were due to lightning. Burned acreage increased by 3.5 million acres in the two and a half weeks following those starts.

The saving grace for the season was that conditions gradually got cooler and damper in mid-July and August. There was not another heat wave or even a significant drying event through the end of August for most of the state, which meant the incredible number of fires that were still skunking around burned very little acreage after July 15th. This is atypical of Alaska's fire season, which usually sees a late summer increase in activity with warmer and drier weather. This is one of the most significant differences between our top two fire seasons: 2004 started slower but burned significant acreage in July and again in late August, while 2015 saw the bulk of its activity sandwiched in the month from mid-June to mid-July.

Numerous resources were ordered from the Lower 48 and Canada, including an Incident Meteorologist (IMET) specifically to help with the Spot Weather Forecast demand at the Fairbanks Weather Service Office, a local meteorologist who could fill in some mornings to assist with the meteorological workload at the Alaska Interagency Coordination Center (AICC), and teams of Air Resource Advisors to help with smoke and air quality forecasting around the state. Ordering these resources in a timely manner was critical to the success of Predictive Services at AICC in this short, but busy time frame.

Season Forecast

The fire potential outlook for the 2015 fire season was for above normal for much of southern Alaska. That area was expected to remain active for April and May, and then return to normal conditions by mid-June and into July. A low snowpack and warm, dry spring 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, though long range precipitation forecasts have proven unreliable and thus don't enlighten the forecast. These factors led us to forecast an above normal start to fire season, continuing into the busiest fire month, June. As there were no atmospheric factors to indicate anything extraordinary by mid-summer, a normal mid to late season was forecast.



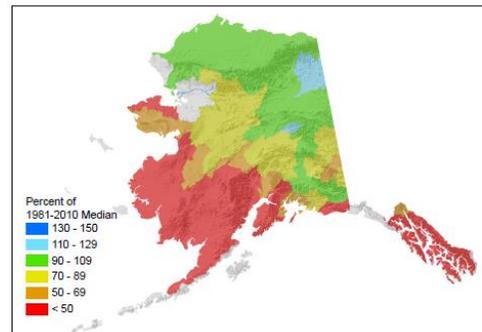
Spring 2015 Fire Season Outlook

Spring Snowpack

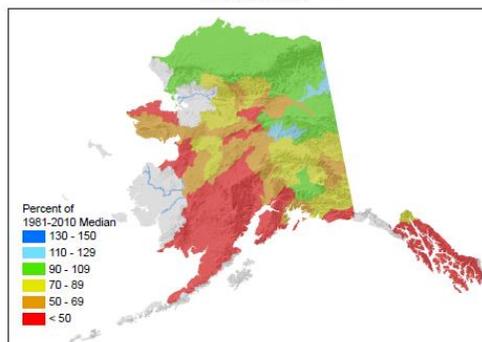
Though precipitation amounts were near normal for the winter, western Alaska, South Central, and Southeast reported less than half their normal snowpack. Like the year before, much winter precipitation had been rain, likely running to low-lying areas, leaving much topography with a springtime moisture deficit. This proved 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 Southwest had a moderate lightning event, igniting almost a dozen fires in one day. There, the Whitefish Lake fire grew to nearly 15,000 acres in the first week of June.

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

Alaska Snowpack as of April 1, 2015
Based on Snow Water Content



Alaska Snowpack as of May 1, 2015
Based on Snow Water Content

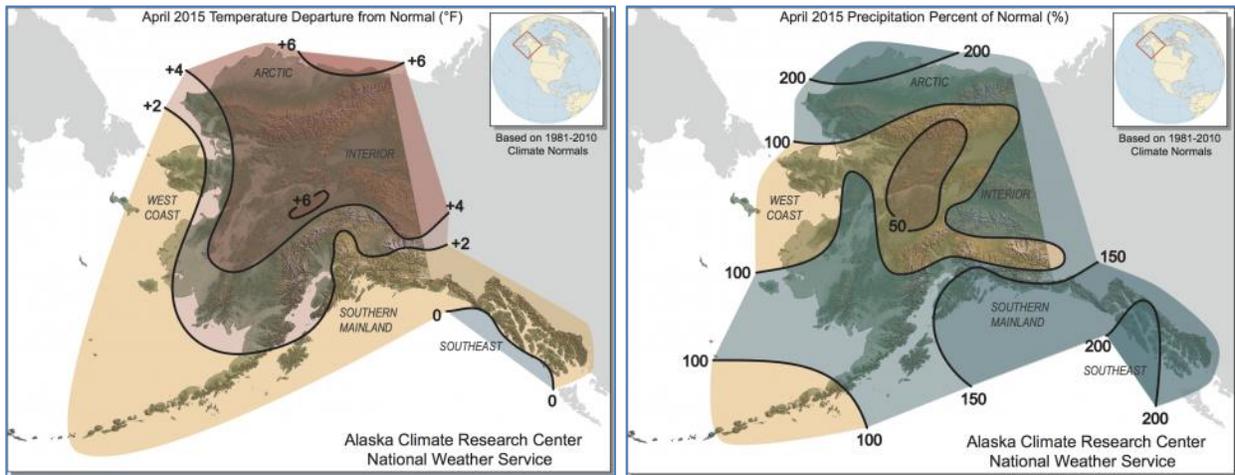


April

April was warmer than normal in most areas, with temperatures around 4-6 degrees above normal for all of the Interior. As with 2014, ice breakup at Nenana was one of the earliest on record, and more than a week earlier than normal. The highest April average temperatures were recorded in Anchorage and Homer.

Precipitation was lowest in the central/western Interior and the Seward Peninsula. Most other areas were close to normal; though since April is generally the driest month for most stations, doubling amounts are not hugely significant in long term soil moisture balances. That said, precipitation was well above normal in the east: records were set for April rainfall amounts both in the Panhandle and in the eastern Interior near Eagle.

The convective season got off to a very early start, with the earliest-ever thunderstorm observed in Anchorage (first one ever in April), recorded on April 10th. Then on April 16th, a strike near Wasilla caused widespread power outages as far north as Fairbanks. And more lightning occurred in the western Interior on Apr 19th, even as the snowpack hadn't left the ground.



April 2015 Temperature Departure from normal (°F) and Precipitation Percent of Normal

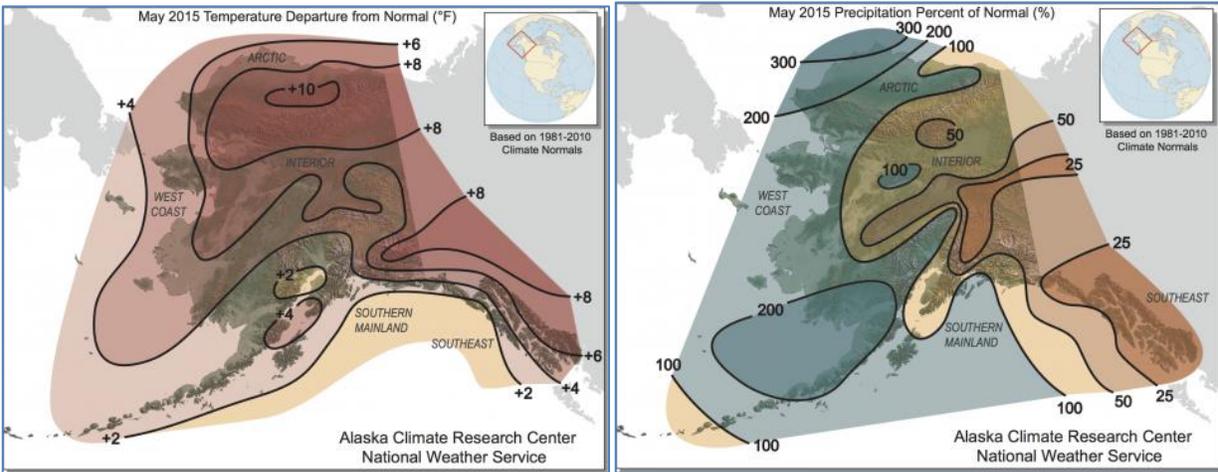
May

May temperatures were well above normal for most of Alaska, with anomalies showing as much as ten degrees above normal along the central North Slope and Brooks Range. High temperature records were broken in the north and in the eastern Interior. The average May temperatures for Kotzebue and Barrow exceeded normal by 8 and 11 degrees, respectively. In the eastern Interior, a number of records were broken, both for daily highs (Eagle exceeded their earliest temperature over 85 by more than a week, while four daily highs were broken at Delta Junction) and for average temperatures (Greely, Gulkana, and Northway) or average high temperatures (Fairbanks).

Much of eastern Alaska experienced well below normal precipitation for this month, though in the north and southwest, twice normal was observed. Juneau experienced its driest May on record, with only 15% of its normal rainfall. Meanwhile, Anchorage came out of its lowest seasonal snowfall on record, with only a third of the normal amount of snow falling from September through May.

The low snowpack led to a mild river breakup around much of the state, as the ice tended to rot in place. However, up on the North Slope, the extremely warm temperatures caused rapid snowmelt and led to

flooding on the Dalton Highway, causing it to be closed for nearly 20 days at the end of May and beginning of June. Ft Yukon experienced some minor flooding as they were one of the only areas to have an above normal snowpack.



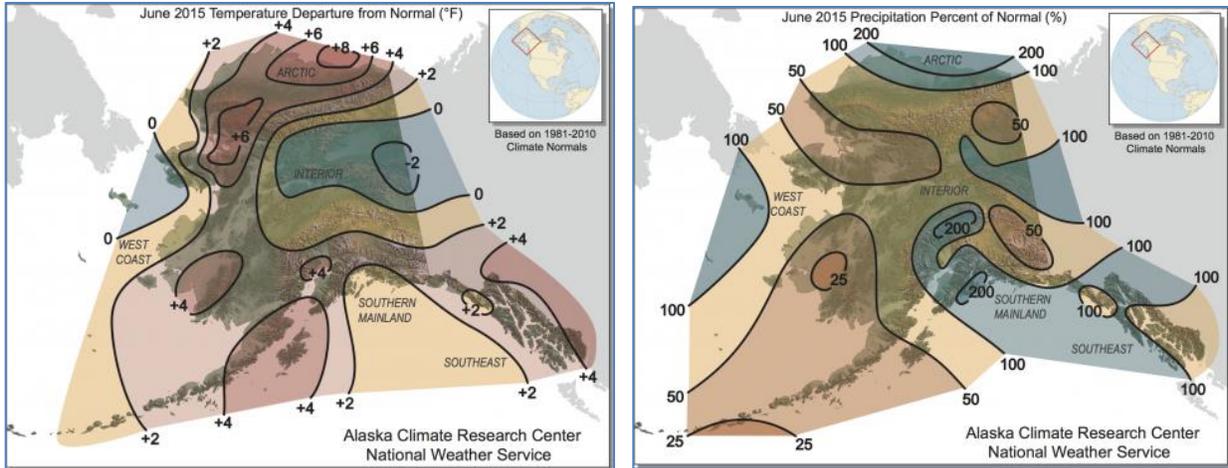
May 2015 Temperature Departure from normal (°F) and Precipitation Percent of Normal

June

June opened up with a brief cold spell in Interior Alaska, with a number of stations reporting near or below freezing temperatures on June 1st. Delta Junction had about one inch of snow that morning, the first time any snow accumulation has been reported there in June. Though conditions moderated a bit, temperatures remained cool; Bettles reported its latest frost ever on June 12th, breaking the old record by about two weeks. Temperatures started to warm in the south on June 13th then began heating up in the north the next day. Overall, the month was cooler than normal only in the very central and eastern Interior. The rest of the state had a warmer than normal month, particularly in the north and northwest. In the south, Anchorage had its warmest June on record as well as its hottest day, Kodiak saw its earliest 80 degree day ever, and King Salmon suffered its worst and longest heatwave in over 60 years.

Despite the cooler start to the month, some very low relative humidities were reported around the Interior and South Central, setting up very dry fuels as the temperatures started to warm. On June 14th, the Sockeye Fire began in the Susitna Valley, quickly growing to over 7,000 acres with gusty north winds. The Card Street Fire began on the Kenai Peninsula the next day. Both of these fires were characteristic "early season" fires, located along the populated corridor and started by humans.

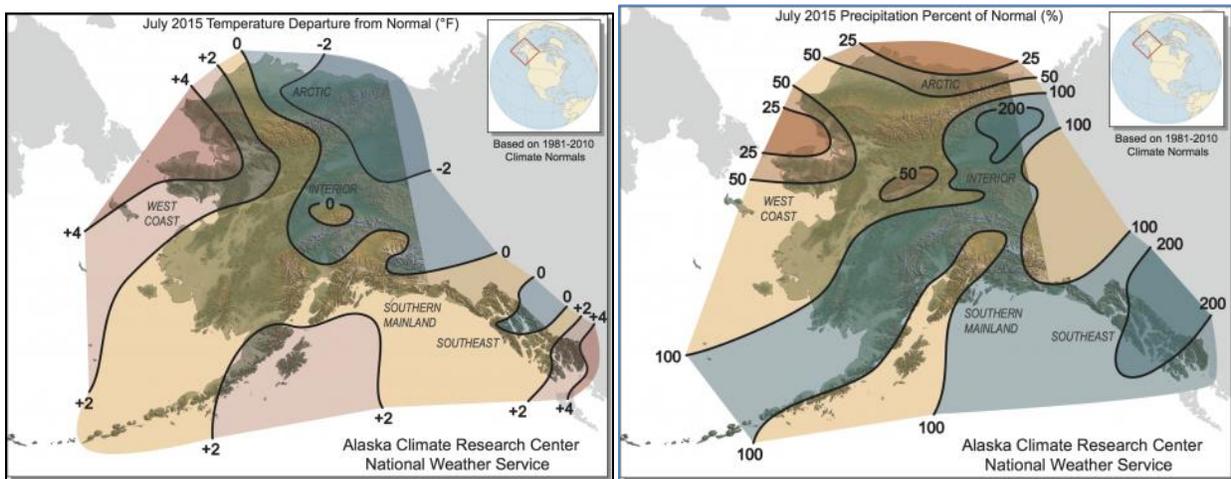
The season quickly transitioned to the mid-summer natural starts as an unprecedented lightning event began on June 19th and lasted through the 26th, bringing more than 65,000 strikes to the state. Though some of these storms were wet, they showed little movement and the peripheries that picked up lightning saw numerous ignitions; of about 300 new fires that week, 270 were due to lightning. Reports of new fires came in so quickly that the GACC ran out of resources daily and had to carefully parse out where to send crews, jumpers, and aircraft. During the next three weeks, acreage burned around Alaska grew at a rate of around a million acres every week. Even long-time Alaskan firefighters commented this was the busiest they'd ever seen.



June 2015 Temperature Departure from normal (°F) and Precipitation Percent of Normal

July

After a brief respite, the hot and dry weather of June reemerged in the first week of July. Daily high temperature records were broken from Barrow to Anchorage to Annette and Hyder on one or more days from the 5th through 7th of the month. And both Anchorage and Kotzebue experienced one of their warmest early summers on record, from May through early July. By the second week of the month, temperatures moderated a bit, and more showers started appearing around the state. Around the 15th, a more widespread rain event moved through, though temperatures remained warm. With periods of drying in between the rain, fires continued to burn, but at much slower rates. The western Interior and Northwest Alaska remained the driest with well below normal precipitation, but even there, fire activity was significantly reduced. From this point forward, the acreage burned crept up only very slowly.



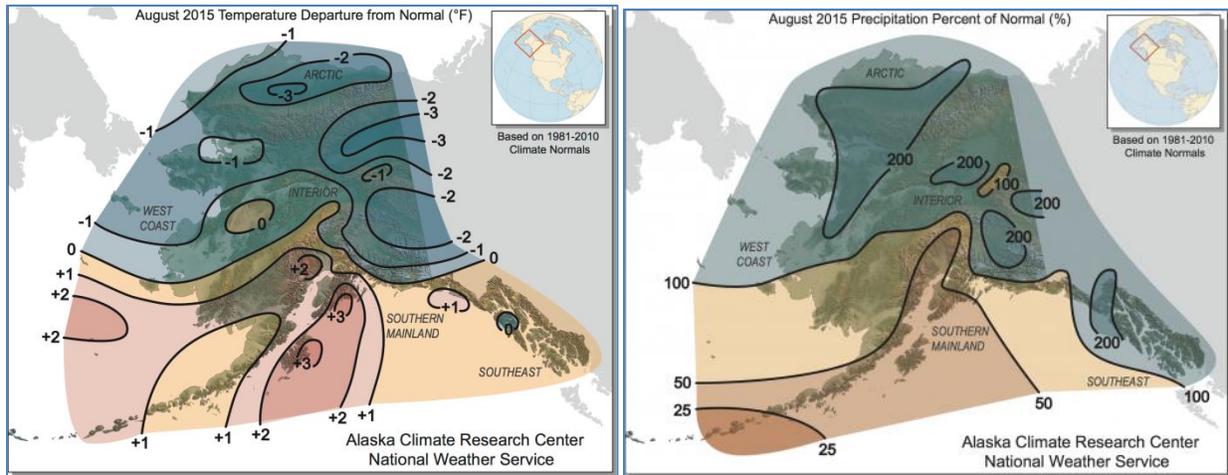
July 2015 Temperature Departure from normal (°F) and Precipitation Percent of Normal

August

August kicked off with another warm period, as Anchorage, King Salmon, Cold Bay, and McGrath reported record highs in the first week of the month. Instability is not usually an issue by August, but there were a number of thunderstorms reported this month, with one severe storm on the 17th bringing one-inch-

diameter hail to the Susitna Valley. Overall, the month was a bit cooler and damper than normal, especially in the north, where many higher elevations saw significant snowfall by August 30th.

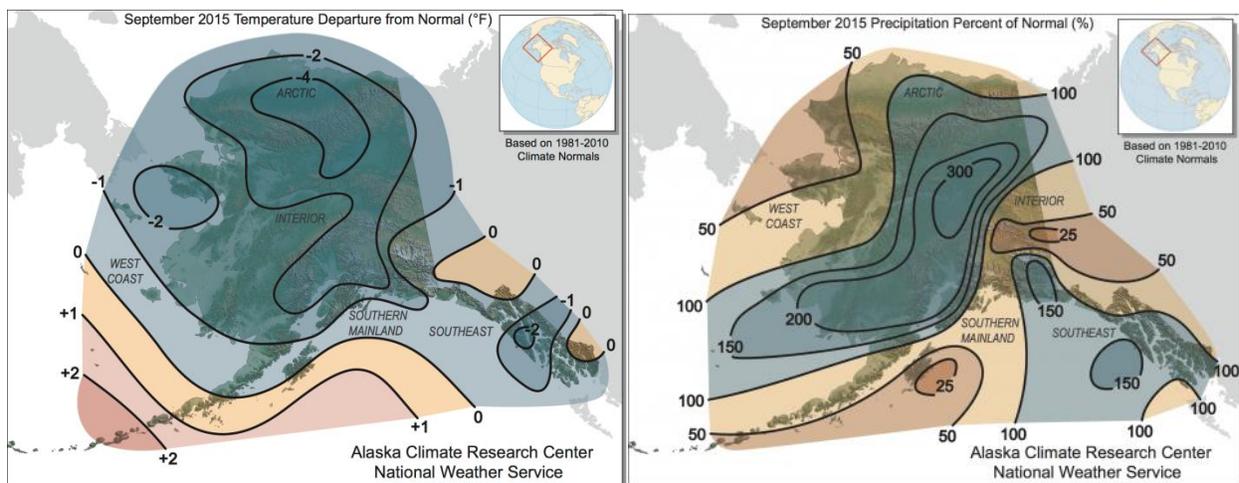
The area of interest was in Kodiak, where the second warmest and very dry summer led to extremely dry fuels which spawned a raging wildfire on August 27th. Strong winds raced the fire through heavy logging slash and grass; it grew to almost 5,000 acres by the next day. Elsewhere in Alaska, the season was winding down.



August 2015 Temperature Departure from normal (°F) and Precipitation Percent of Normal

September

September started cold, particularly in southern Alaska, where low temperature records were broken at Annette, Sitka, and King Salmon in the first two days of the month. The cooler temperatures continued to dominate, making way for snow to come in earnest, bringing significant amounts even to the Anchorage Hillside by the middle of the month. Indeed, Anchorage experienced its wettest September on record. In the Interior, several significant snow events made this one of the snowiest Septembers on record, with Fairbanks getting two big dumps of snow in the last week of the month, pushing it to second place (1992 remains the snowiest).



September 2015 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 across the state. Though the anomalies show lower than normal heights over much of Alaska, this cooler air doesn't appear to have been reflected at the surface.

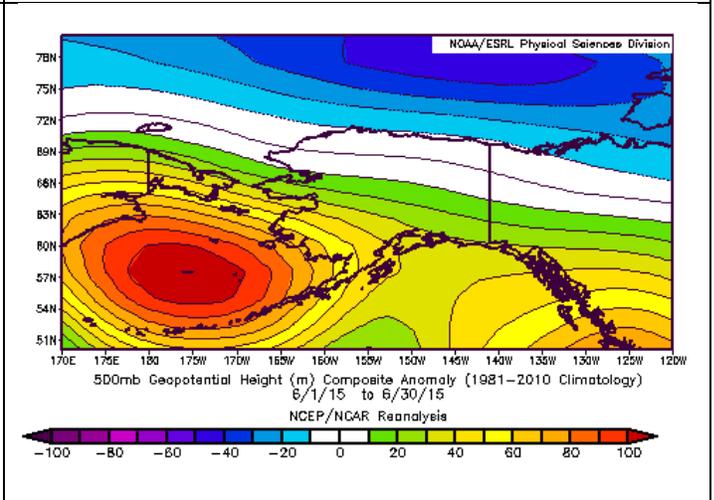
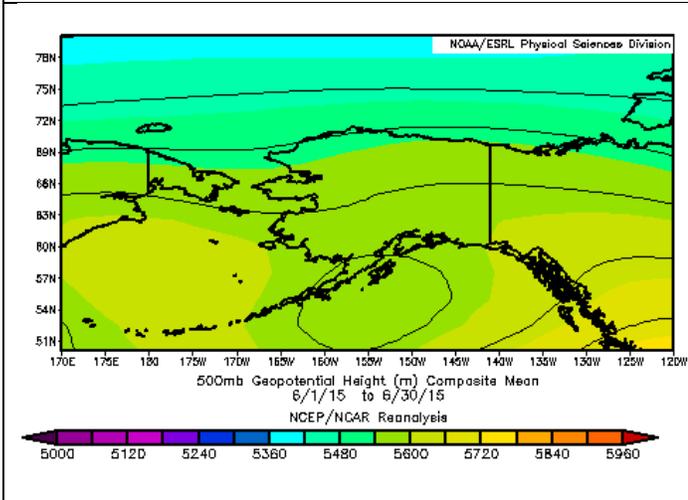
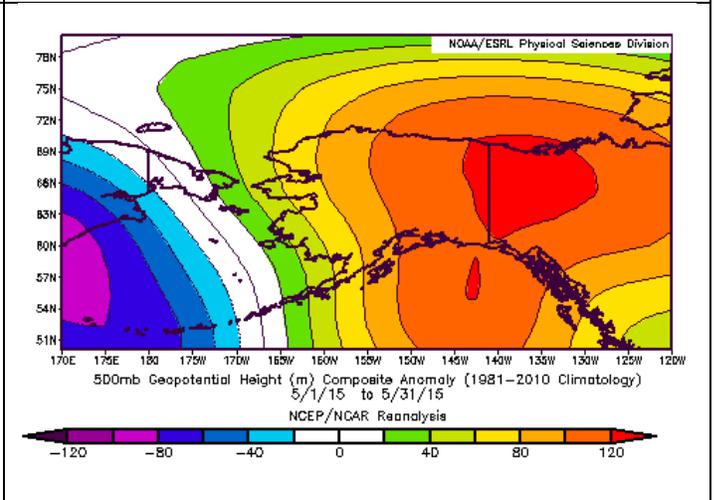
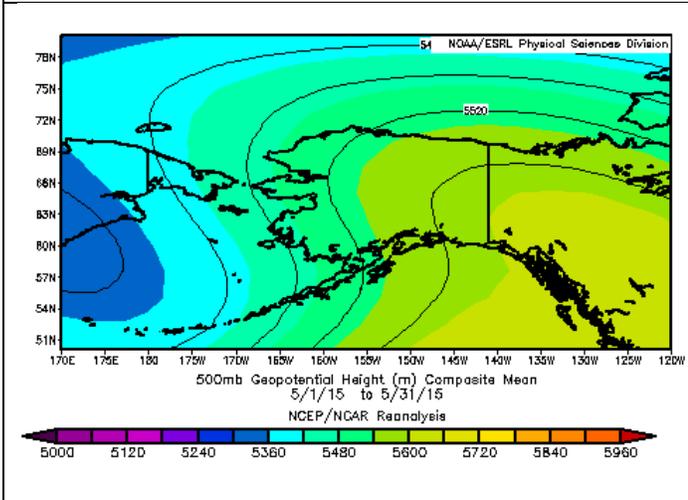
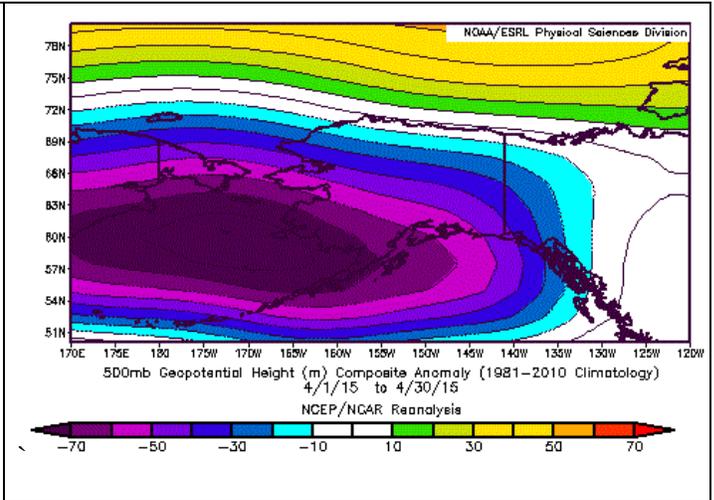
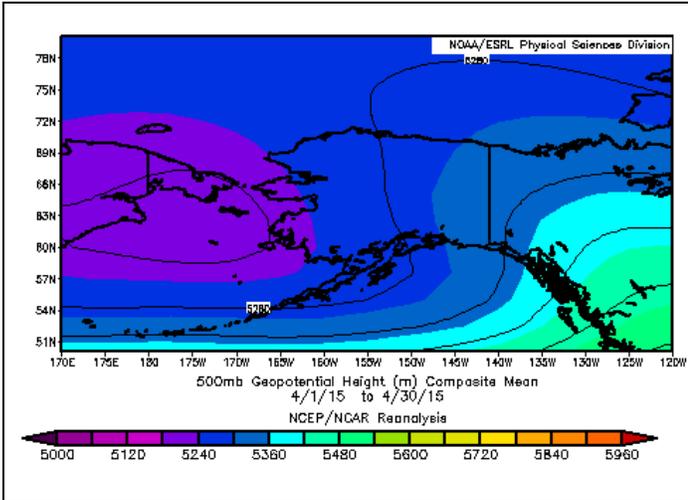
May's composite mean 500 mb map shows ridging has only intensified over Canada and northwestward into Alaska. This kept the warmth and brought a drier air mass over the eastern half of the state, and is further reflected in the higher than normal geopotential heights for eastern Alaska and into Canada on the corresponding anomaly map. This was evidenced by new high temperature records in the eastern Interior and South Central, and record dry conditions in Southeast. This pattern is what helped set the very dry fuels for the mid-summer lightning ignitions.

June's 500 mb composite mean shows weak zonal flow in the north, with a low in the Gulf of Alaska keeping the long wave trough focused on central Alaska. This provided the instability for the near daily lightning activity in the second half of the month. Meanwhile, the very high anomalies over the Bering Sea helped ensure the warmer and drier conditions in southwest and South Central Alaska, where record heat was being observed.

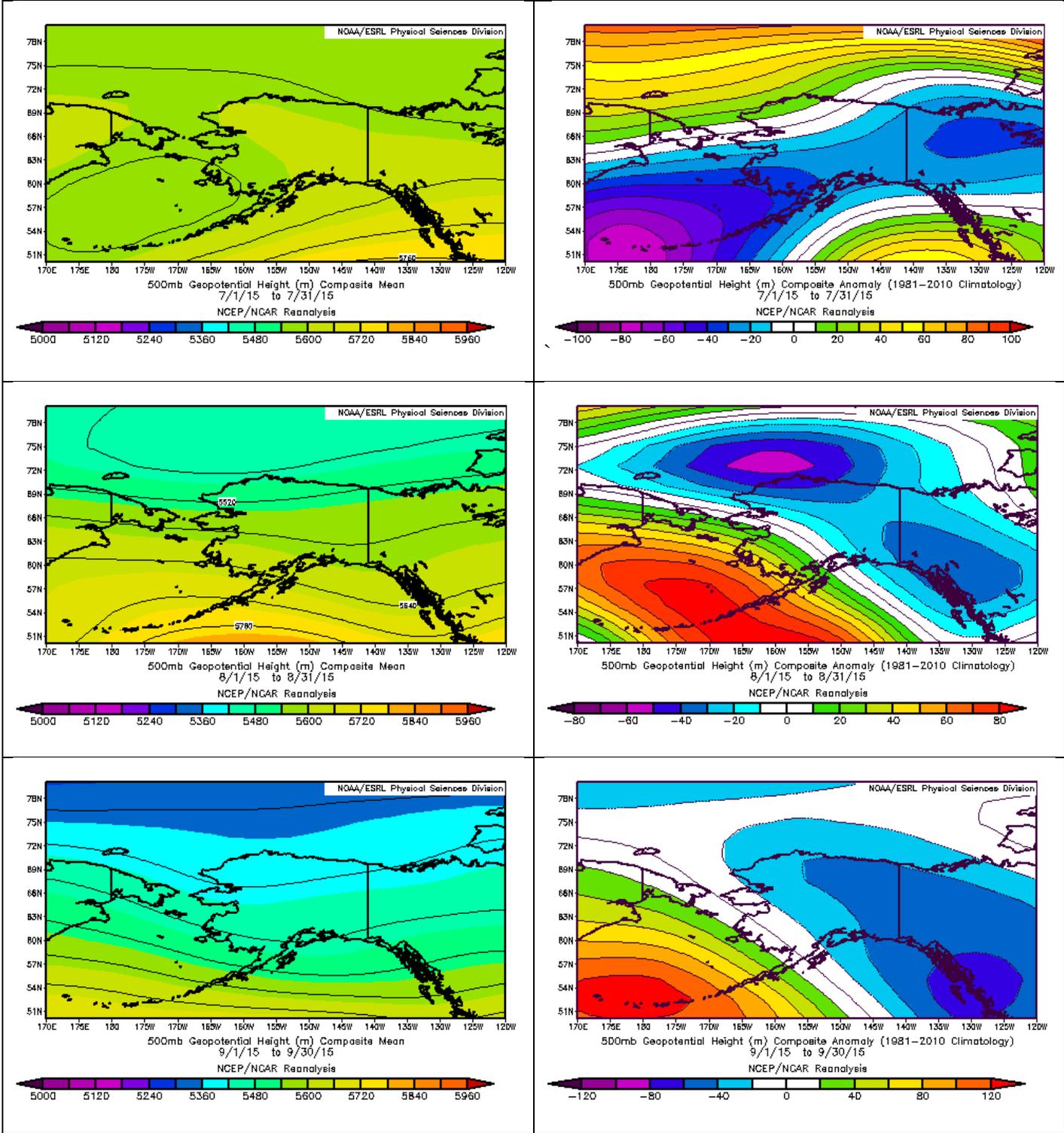
In July, the mean 500 mb long wave trough shifted westward over the Bering Sea. Much of the state had a weak southwesterly flow. This is what prevented more intense warming and drying, as the damp southwesterly fetch, though minimal, kept more moisture available for shower activity. Anomalies for this month show somewhat lower values which helped keep temperatures cool, but overall, upper level heights were not significantly off normal.

In August, the Arctic Ocean was dominated by low pressure at 500 mb. This helped provide support to waves of moisture that dropped into northern Alaska from the north and west. The anomalies at that height show the colder pool of air associated with that low. This strong and persistent system to the north was reflected in the early season snows in the north and at higher altitudes even into the Alaska Range. The higher anomalies over the Aleutians and Alaska Peninsula were certainly seen in the warm and dry weather of Kodiak, and contributed to ripe conditions for the end of month fire there.

September's 500 mb composite mean shows westerly flow dominating for the month. This kept conditions damp, preventing any last minute resurgence of fire activity. The lower than normal height anomalies focused on Southeast Alaska were reflected in the wetter and cooler weather observed there and as far westward as Anchorage.



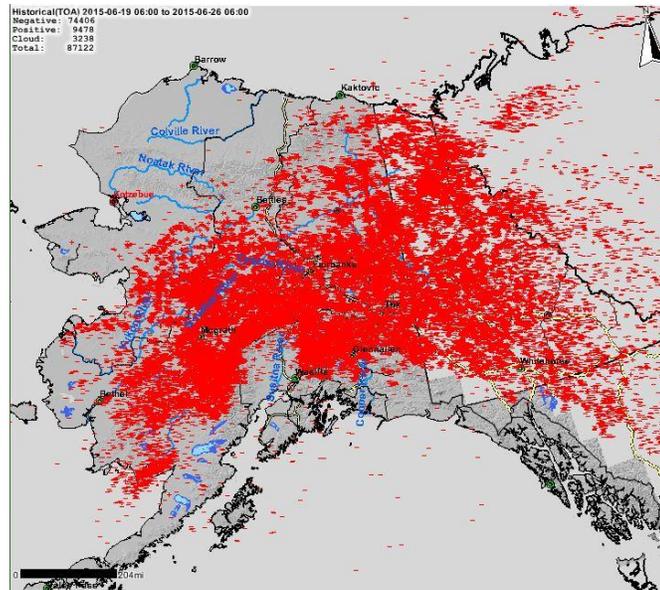
Composite Mean Analyses and Anomalies of 500 mb Geopotential Heights (m) for April, May, June 2015



Composite Mean Analyses and Anomalies of 500 mb Geopotential Heights (m) for July, August, September 2015

Lightning

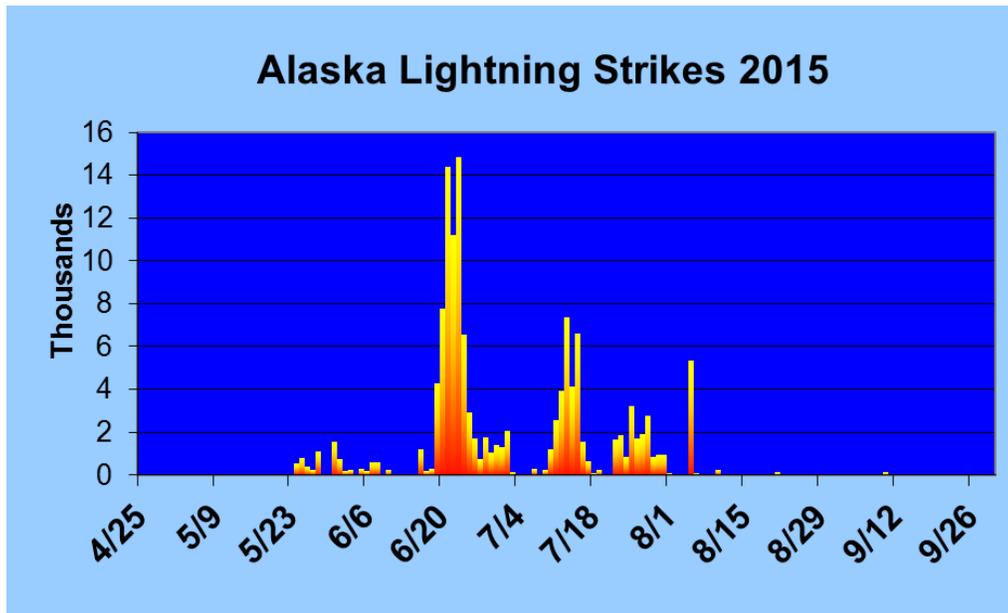
Though it seems there has been a lot of improvement since it was installed in 2012, the Alaska Lightning Detection System, ALDS, continues to pose some challenges. At times, the system reports strikes in places that are cloud-free, and other times it misses strikes associated with thunderstorm cells, where lightning is observed by the naked eye. Reported errors were significantly fewer than the last few years, but will continue to be documented and investigated. Sensors have all been upgraded since 2014, and outfitted with the latest software.



Lightning Strikes in AK from 6/19-26/2015

2015's convective season began quite early, with lightning observed several times in April, including parts of South Central by the 10th of the month, and the western Interior by the 19th. From May 23rd through June 10th there was some lightning activity; June 1st had about 1600 strikes focused in Southwest Alaska that ignited 11 new fires. A brief hiatus kicked in, until June 19th, which began an unprecedented lightning event that pummeled much of the mainland for the next week. From June 19th through the 26th, nearly 60,000 lightning strikes were observed in Alaska, with at least 10,000 more strikes immediately east, over the Yukon Territory. Though many of these storms were wet, they were also stationary, and the heavy rains were confined directly under the cells while lightning ignited the extremely dry fuels around them. Of the nearly 300 new starts during this week-long period, 90% were lightning caused. And even after the largest part of the outbreak, the lightning didn't stop. Lightning continued to approach the 2,000 strikes per day mark through July 2nd, then after a week of more stable air, had another increase beginning on the 9th and lasting until the 17th; two of those days peaked well over 6,000 strikes each. After a brief ramp up at the end of the month, lightning activity finally died down to unremarkable levels, though one last severe storm in mid-August brought large hail to the Susitna Valley.

Keep in mind that comparisons to previous years are difficult due to periodic upgrades to the system. Regardless, 135,424 observed strikes is one of the highest summer lightning totals on record for Alaska. This exceptional number of lightning strikes, with more than one week of June than all of last season, is what made the summer of 2015 a fire season for the record books.



Lightning Strikes in Alaska for 2015 Fire Season

Conclusion

2015 will be remembered as the busiest fire season in Alaskan history. Though it did not exceed the number of acres burned in 2004, most of the fire activity was compressed into a much shorter window, with almost 40% of the season’s fire starts observed in one week in June. The low snowpack across southern Alaska, compounded by a very warm, dry spring, led to a fairly busy early season and the prepping of fuels to be extremely burnable when the lightning hit during the long days surrounding summer solstice. Fortunately, Mother Nature provided a big assist by moderating the hot and dry early summer with increasing shower activity in both July and August. With so much fire on the ground in mid-July, it seemed unlikely that there wouldn’t be a large resurgence in fire activity later in the summer. But the cooler, damper late summer prevented that from happening.

Coming off one of the wettest summers on record in 2014, Alaska’s intense fire season of 2015 seemed quite extreme. The fact is it **was** extreme, and will go down in the history books as the second biggest fire season in Alaska.

Contacts

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