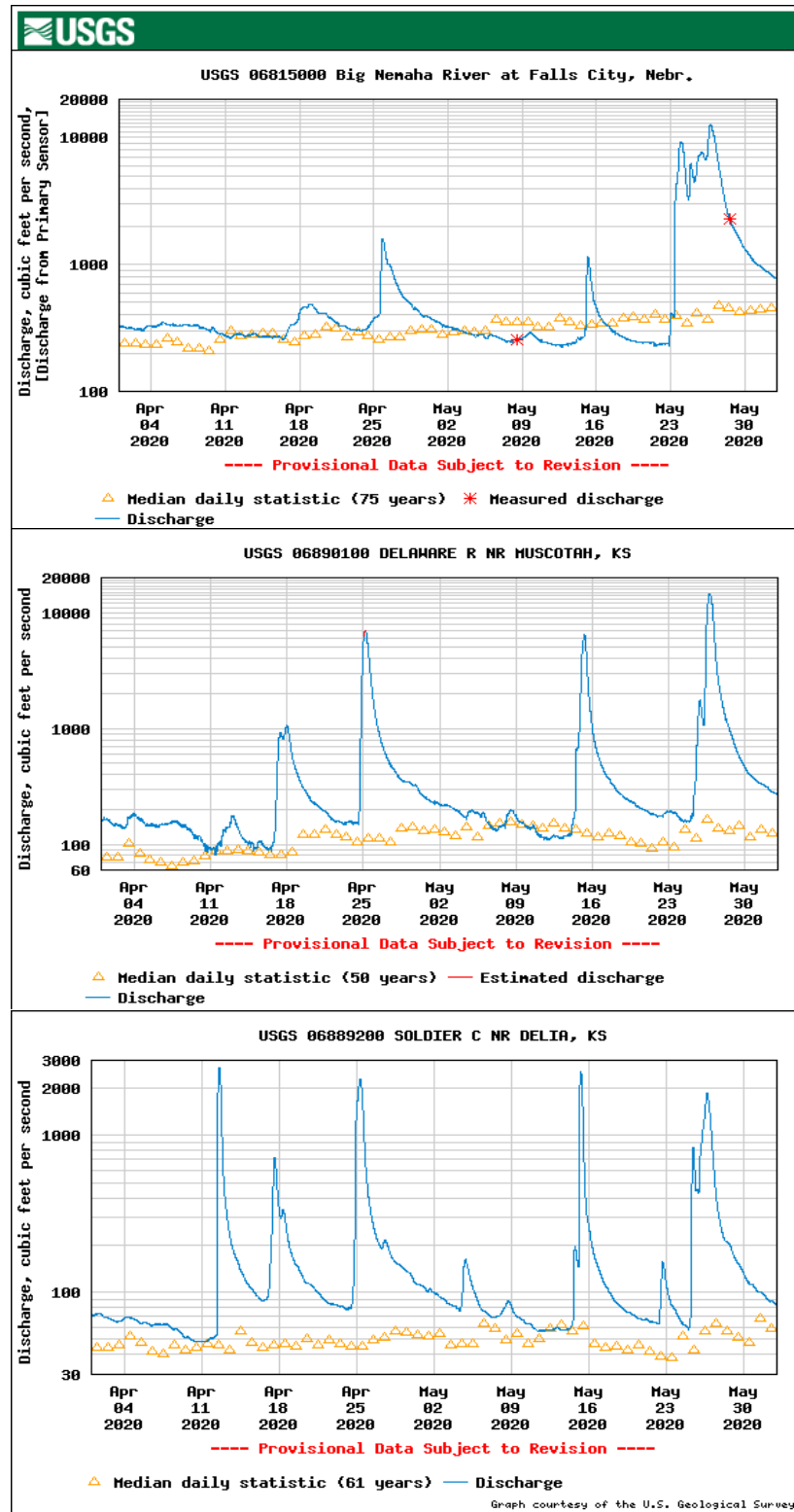


## Rivers and Streams

For most of the year the three major streams in the region have been running above normal. None have left their banks yet and are not forecast to do so. This is in stark contrast to last year at this time where a number of events threatened Tribal and private property in the area. Soil moisture is just now getting below 70% suggesting that we may be drying out. With early abnormally dry conditions evident in counties to the west of us, stream gauges are one way we can identify environmental impacts of a problem that tends to happen in slow motion.



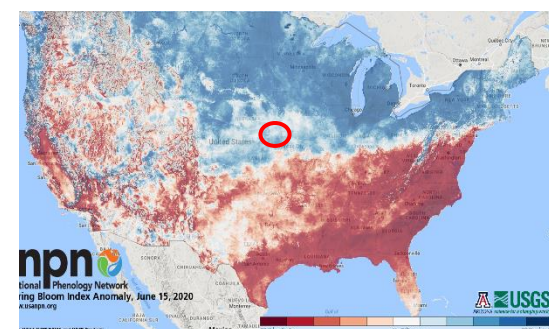
USGS Data Generated June. 15, 2020 at <https://waterdata.usgs.gov/>



Last year's floods have left a scarred landscape in the Missouri River flood plain. This road between Rockport and Watson, MO is a reminder of the devastation.

## Drought Monitoring (cont. from page 3)

Many of these data sets are used to create the climate summaries but others are unique to the DEWS. Stream gauge, drought outlooks, temperature and precipitation data are used in both. The DEWS also looks at soil moisture, the standard precipitation index, evaporative stress and demand, ground water, and trends in phenology like the rate of progress of the spring leaf out and bloom. The blue and red shading in the map below signifies the late or early arrival of spring blooms. We, the red circle, are about 10 days behind our normal progression into spring.



[mark.junker@sacfoxenviro.org](mailto:mark.junker@sacfoxenviro.org)

## Water Planning and Management

### Understanding & using our resources

- Looking at our climate seasonally.
- Analyzing trends.
- Preparing for the future.
- Adapting to changes in the climate.
- Anticipating the future.
- Becoming Resilient.

### Inside this Issue

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### Corona, Climate and Quarantine

For a good portion of the spring many countries and states emitted less greenhouse gasses due to stay at home orders of one form or another. Initial data suggest the reductions are on line with what scientists believe is necessary to keep average global temperatures from rising more than 2.5°F. It shows that we can make a significant impact on the atmosphere and also that it is very difficult to do. For a short time, we were at 2009 emission levels which is one baseline established for combatting climate change. How the reduction impacts climate is yet to be seen but treating the atmosphere as more than a septic tank will benefit everyone.

# 4 Kansas Tribes Climate Summary

Volume 2, Issue 3 Spring/Summer 2020

## At Least We Are Not Flooding



The final frost of winter with a bit of snow Reserve, KS – April 17, 2019

### The Purpose of Knowledge...

Every society needs educated people, but the primary responsibility of educated people is to bring wisdom back into the community and make it available to others so that the lives they are leading make sense.

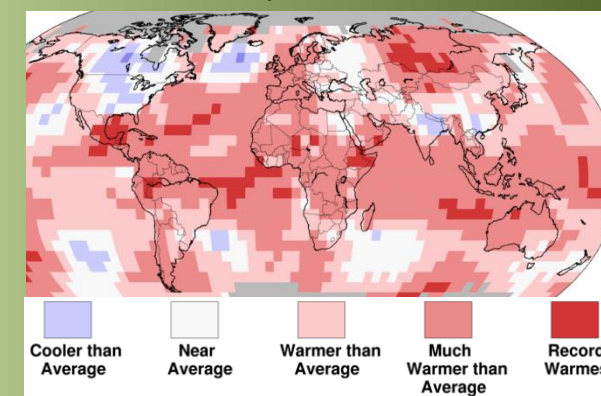
— Vine Deloria Jr. (Lakota)

Recapping Spring 2020 will take some effort. A global pandemic and civil unrest made events like Australian bush fires, Tennessee tornados and Rocky Mountain avalanches seem remote and unimportant while we protected our families, practiced social distancing, educated our children, cared for our elders and secured a year's supply of toilet paper and hand sanitizer. We face new threats and all we know for certain is that we must better understand how everything is connected to each other if we are to meet the challenges before us.

## Climate Highlights

For the month of April our region was one of very few that was actually cooler than normal. However, our region was warmer than normal for the winter months and we received near normal precipitation. This aligns with what had been forecast. The 2020 Winter/ Spring Summary had forecast an equal chance of having either above, below or normal temperature and precipitation. With a forecast like that it is really tough to be wrong. However, the warm winter across the northern hemisphere was actually the second warmest on record going back to 1880. 2015-2016 was number one. The trend is troubling.

### Observed Global Temperatures April 2020



Created by the Sac and Fox Environmental Department

### Precipitation Summary

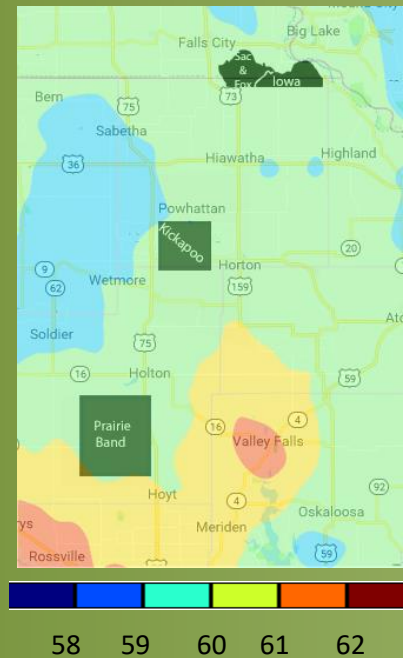
From north to south in our region:

- Salem, NE (5SW) -2.12
- Falls City, NE (Brenner) -5.11**
- Horton, KS -0.97
- Holton, KS 2.05**
- Valley Falls, KS -0.87

Most of the sites reported below average precipitation for the first five months of 2020. The exception is Holton, KS where they are at two inches above normal. Falls City, NE checked in at over five inches below normal. The 2010 -2020 averages as well as minimum and maximum precipitation for these sites are listed below:

	AVG	MIN	MAX
Salem	12.43	6.88	23.15
Falls City	11.21	4.65	19.21
Horton	13.44	7.84	21.24
Holton	12.84	7.46	19.75
Valley Falls	13.96	7.19	25.09

### Mean Maximum Temperature from March 15 – May 1, 2020



### Upcoming Events

- Movie Night!, *Pow Wow Highway*, June 27, Sac and Fox Park, Reserve, KS 7:30 PM
- Brown County LEPC at Reserve, KS July 29 at 6:00 PM
- Tribal Lands Forum Virtual Gathering, Aug 17 - 20
- National Tribal and Indigenous Climate Conf. Minneapolis, Aug 31- Sep 3

### Temperature

A warm spring was punctuated by a 45-day cold spell. In a typical year, temperatures are two to three degrees warmer for the region for the period of mid-March through May 1. Daytime highs were generally between 59 and 61 degrees this year which made it one of the top 20 coolest Aprils on record. It should come as no surprise then that we had an unusually late frost this year. The 28° F recorded at Holton on April 18 was the 2<sup>nd</sup> latest freeze in the last 10 years. (April 25 in 2013 is 1<sup>st</sup>.) The average last hard freeze day (28°) is April 7<sup>th</sup>. The all-time record happened on May 6, 1944. This year we were almost two weeks past that. Impacts from the late frost were minimal here but western Colorado lost much of their peach crop.

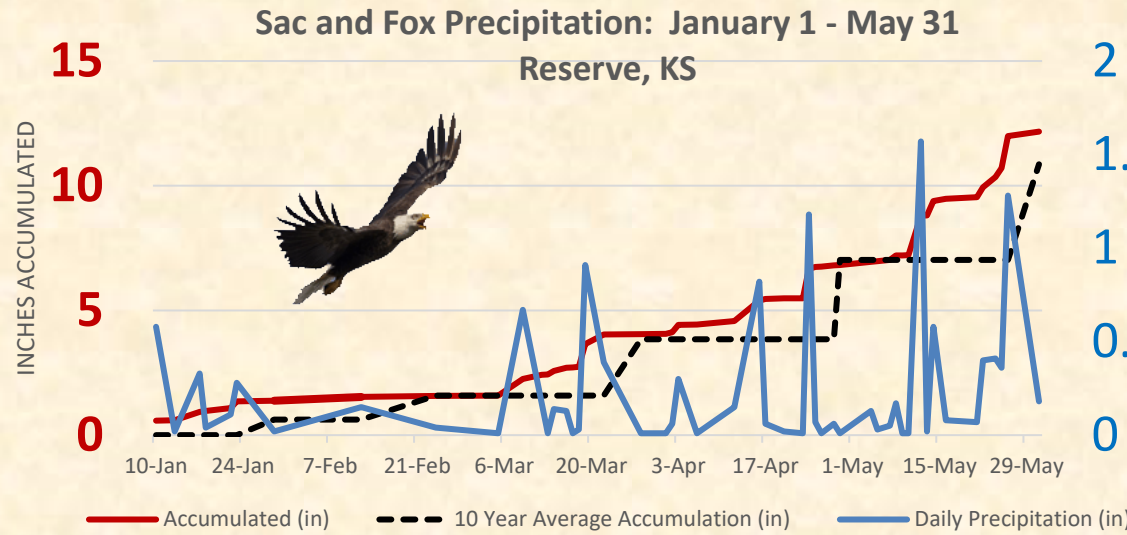
<http://scacis.rcc-acis.org/>

### Top 18 Late Hard Freeze Dates Horton, KS (Since 1891)

RANK	YEAR	DATE	TEMP
1	1944	6-May	28
2	1976	3-May	28
3	1961	2-May	27
4	1909	1-May	27
5	1903	30-Apr	28
6	2005	30-Apr	26
7	1958	29-Apr	27
8	1950	26-Apr	24
9	2013	25-Apr	27
10	1956	24-Apr	27
11	1967	24-Apr	25
12	1984	43944	28
13	1986	22-Apr	25
14	1966	21-Apr	19
15	1982	21-Apr	25
16	1953	20-Apr	21
17	2018	19-Apr	26
18	2020	19-Apr	28

<http://scacis.rcc-acis.org/>

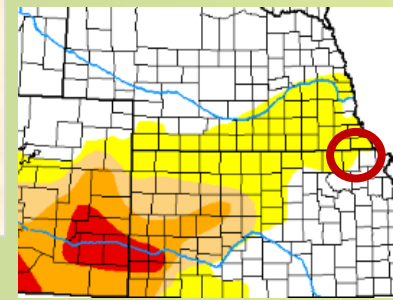
<http://scacis.rcc-acis.org/archive>



Localized data is a key part of being able to make decisions that benefit from climatological knowledge. The Sac and Fox Environmental Department benefits from a historical record dating back to 2007 for precipitation data. The red line on the chart above illustrates what has so far been an average year in regard to how much moisture we accumulated from Jan 1 through May 31<sup>st</sup> of 2020 as measured by the scale on the left. The dashed line --- uses the same scale to show our monthly average accumulation and the blue line — uses the scale on the right to look at the daily precipitation totals.

### Drought Outlook and Monitoring

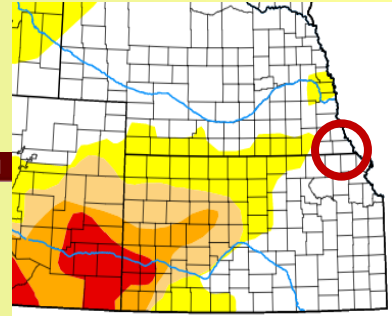
Abnormally dry conditions developed and expanded across northern Kansas and southern Nebraska throughout the Spring. The May 19th release of the U.S. Drought Monitor had parts of the reservation lands in the abnormally dry conditions category. But, heavy rains over the following week alleviated those conditions. This early phase arrived in reservation lands on the Kansas- Nebraska border on the morning of May 21. However, by the afternoon rains had already begun to fall and by the next week the area received over four inches of precipitation and drought status was removed. Drought continues to linger just to the west of us though as it did throughout most of the spring. In November of 2019 the Santee Sioux hosted a Drought Early Warning Systems (DEWS) Workshop and Tribes began developing their own data sets for monitoring drought. While the US Drought Monitor is a component of the DEWS, it is just one of 12 climate variables made up of 26 different data sets that are comailed weekly by Tribal Environmental Departments to track local conditions



← The short-lived dryness of May 2020 was anticipated by data collected through the Sac and Fox Drought Early Warning System which began monitoring conditions in December of 2019.

**Dry Moderate Severe Extreme Exceptional**

The US Drought monitor to the right shows drought conditions on June 2. This is very similar to where drought was before it emerged. Notice the expansion of drought severity in eastern Colorado.



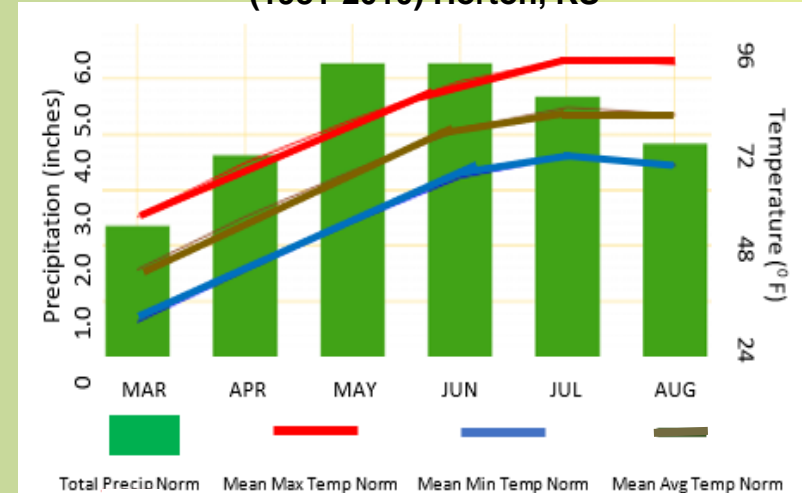
<http://www.drought.gov>

### Summer Outlook

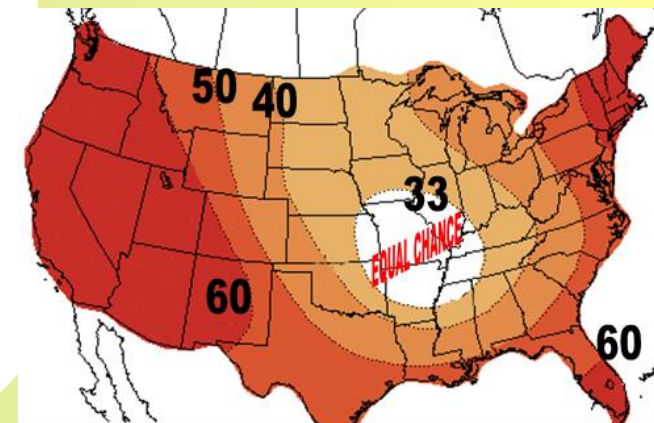
The two maps to the right look at potential temperature and precipitation trends for July, August and September. “Equal Chances” means that there is a 33 percent chance that temperatures will be above normal, normal or below normal. This is true for the precipitation map as well. There are areas where above normal temperatures are thought to have 40, 50 and 60% chances of occurring. We are in a region where it appears that there is equal chance to 40% chance of temperatures and precipitation, both being above normal.

The chart below looks at a 30-year period from 1981-2010 and displays normal temperature and precipitation in Horton, KS for the months of March - August. This can help us anticipate what to expect in the upcoming months. Since we are no longer in an El Niño or La Niña, weather pattern accurate predictions become more difficult. There is however, the potential for a La Niña to develop in the fall.

### Monthly Spring -Summer Climate Normals (1981-2010) Horton, KS



### July – September Temperature Outlook



### July - September Precipitation Outlook

