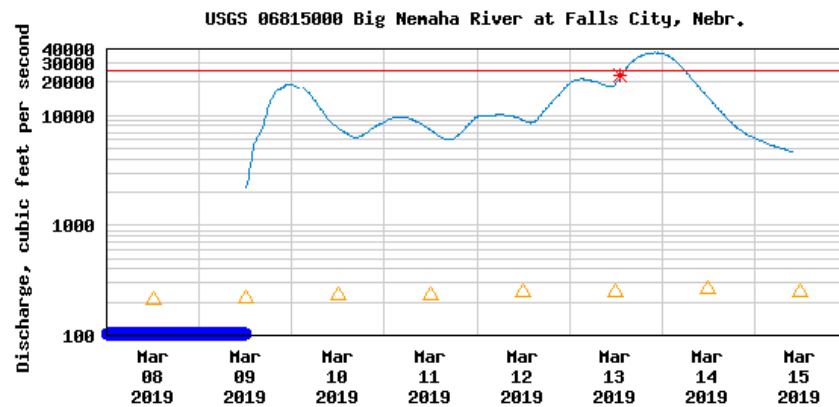
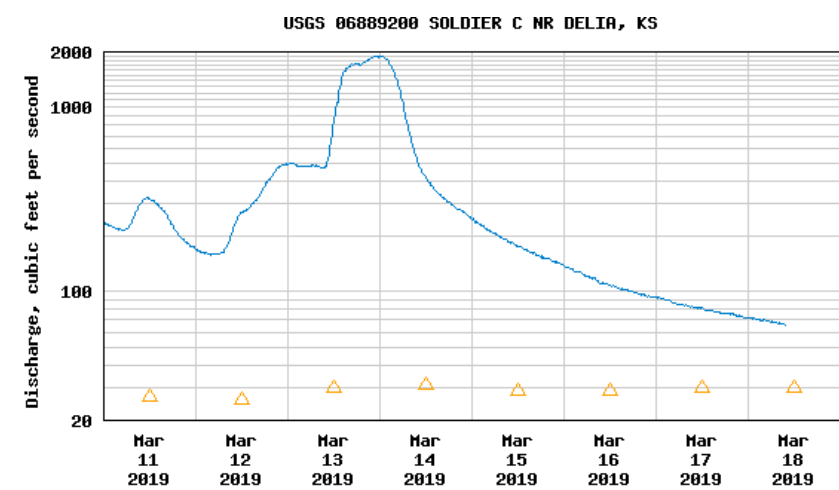
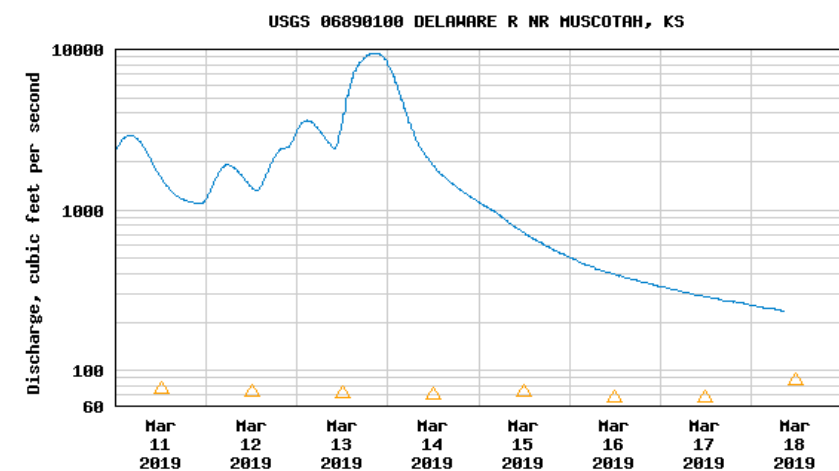


Rivers and Streams

All three of the gauged streams in the region appeared to be trending down after peaking between March 13th and 14th. Unlike the Missouri River, the Nemaha, Delaware and Soldier were not affected as dramatically by the plains snowpack which melted quite quickly or the ice dams that occurred on rivers a hundred miles north on the Platte, Elkhorn and Loup Rivers. However, Tribal lands in Northern Nebraska, especially at Santee and Omaha were threatened and floods caused the loss of lives, destruction of homes, roads, dams, bridges and levees. 50 counties in Nebraska have declared disasters related to flooding. The Niobrara took at least one life after flood water broke the dam at Spencer, NE. Roads and bridges are also closed near Rulo, NE and several federal levees between Rulo and Omaha have been compromised. The Nemaha, Delaware and Big Soldier are still above average and susceptible to flooding should spring rains become extreme.



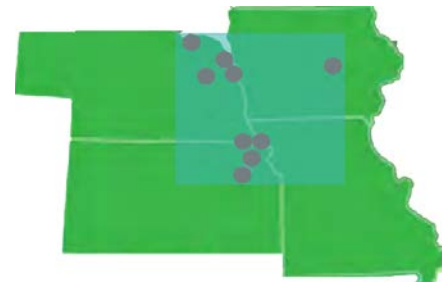
Roads are impassable due to high water at Rulo on March 15, 2019. At least a dozen homes were evacuated as flood waters reached record levels.



Data Generated Mar. 18 at <https://waterdata.usgs.gov/>

Climate Summaries Expanding

The Four Kansas Tribes Climate Summary will be growing this spring to include all of the Tribes in Nebraska and Iowa. We will welcome the Sac and Fox of the Mississippi, Ponca, Santee Sioux, Winnebago and Omaha Tribes to our efforts to build resilience to changing weather patterns and extreme events. Additionally, the US Geologic Service has come on board as we look to better understand our groundwater and the hydrology of our systems. This new group will focus on the Lower Missouri Basin which we loosely define as the region from where the Niobrara enters the Missouri above Lewis and Clark Lake to Topeka in the south, and extending east to Tama, IA.



Water Planning and Management

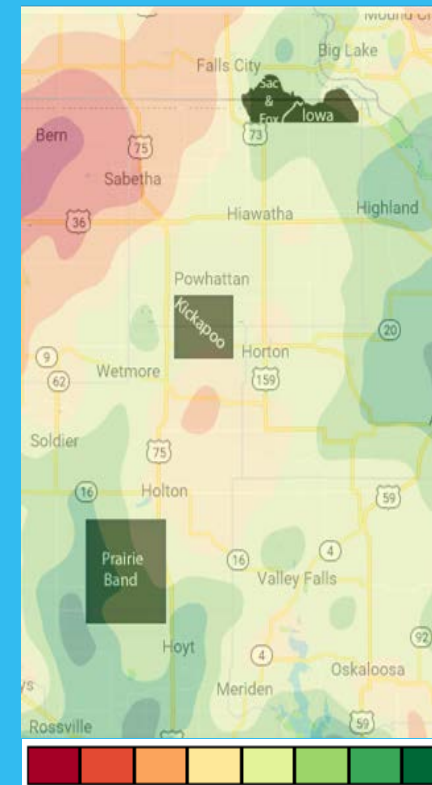
Understanding & using our resources

- 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

- Snowfall and Rainfall.....2
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- Rivers and Streams.....4
- Expanding Climate Summaries.....4

Precipitation from Dec. 1, 2018 – Mar. 6, 2019



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

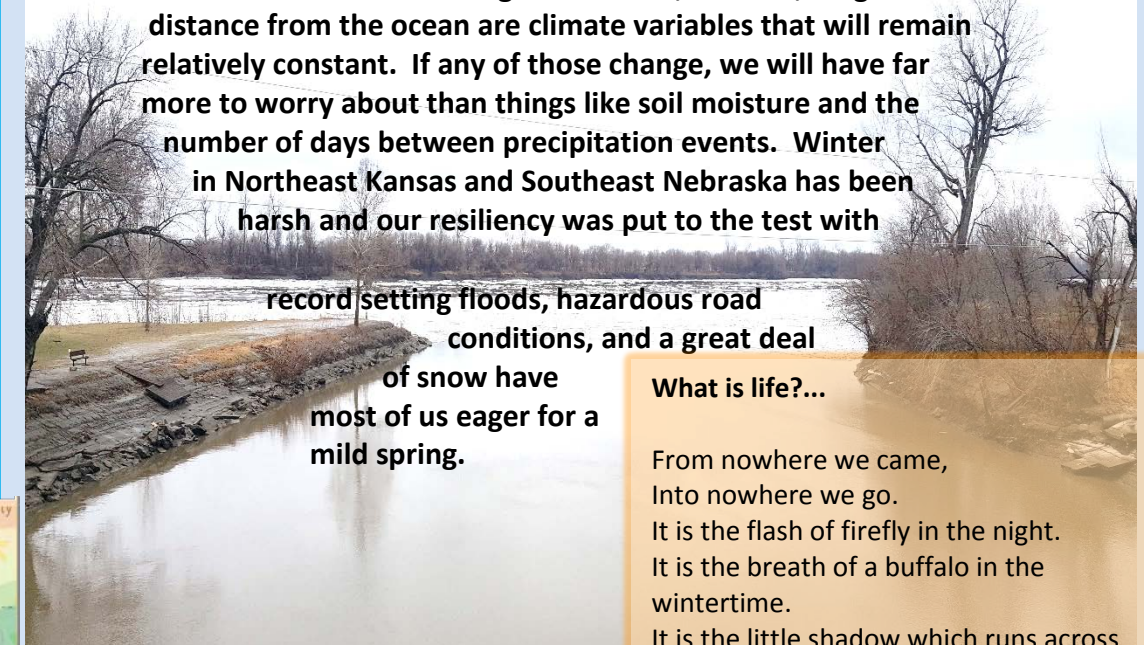
4 Kansas Tribes Climate Summary

Volume 1, Issue 4

Winter 2019

Winter Solstice

The coming of winter marks the time when we begin to look at how our past year's weather will be evaluated in terms of climate and if we can continue to see trends that might help us better prepare for the future. There are some climate variables that do not change. Elevation, latitude, longitude and the distance from the ocean are climate variables that will remain relatively constant. If any of those change, we will have far more to worry about than things like soil moisture and the number of days between precipitation events. Winter in Northeast Kansas and Southeast Nebraska has been harsh and our resiliency was put to the test with



record setting floods, hazardous road conditions, and a great deal of snow have most of us eager for a mild spring.

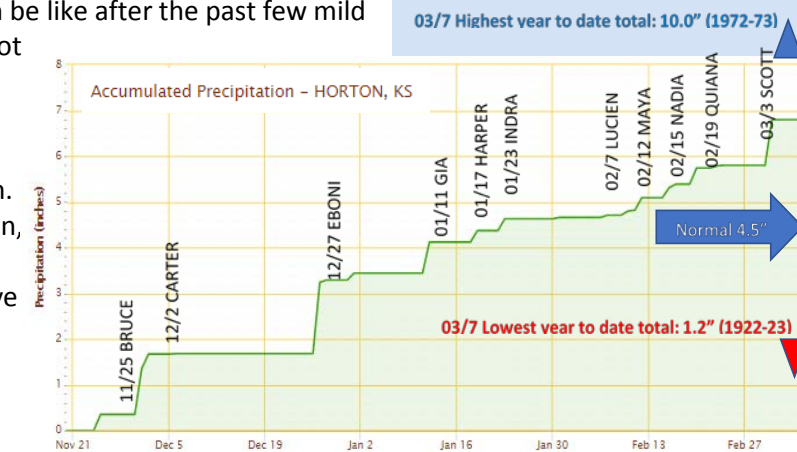
What is life?...

From nowhere we came,
Into nowhere we go.
It is the flash of firefly in the night.
It is the breath of a buffalo in the wintertime.
It is the little shadow which runs across
The grass and loses itself in the sunset.

-Crowfoot (Blackfoot Chief)

Climate Highlights

From November 25 until March 3, 11 winter storms reminded us what winter can be like after the past few mild ones. Snowfall totals were not recorded at many sites and the historic record is often lacking data points that would allow easy comparison. The weather station at Horton, KS shows that since Nov. 28, 2018 we are nearly 2.5" above normal for precipitation. Most of the region received Between 5.4" and 6.4" from Dec. 1st to Mar. 6th.



Snowfall & Rainfall

It is generally accepted that it takes about 10" of snow to equal one inch of rain. The best records for snowfall in the region are at Valley Falls, KS where the continuous historical record goes back to 1949. This has been the sixth snowiest winter for the period and five of the top ten snowfall totals have occurred since 2008. The amount of precipitation is in line with what we normally receive but in the past few years that precipitation fell as rain rather than snow. The snow shovel was used more this year than the past three years combined in many neighborhoods.

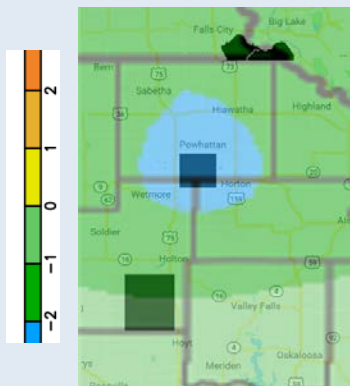
Lincoln, NE received 55.5" of snow this winter making it the 2nd snowiest of all time. The record is 59.5 in the winter of 1914-1915. (Source: High Plains Regional Climate Center.)



A late November snowfall brought a snow day and the season's first opportunity for sledding in Falls City. (Nov. 26th 2018)

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

Variation from Normal Temperatures in Degrees



<http://hprcc.org>

Temperature

Temperatures from November 1, 2018 – March 1, 2019 were between 1° and 2° below normal. The coldest zone was actually centered around the Kickapoo Reservation. Moving farther south towards Topeka temperatures were closer to normal for the time period.



Upcoming Events

- Prescribed Burning Workshop, Reserve, KS, March 22
- Earth Day Celebration, Reserve, KS, April 18
- National Adaptation Forum, Madison WI, April 23-25
- FEMA Mitigation Workshop, Kansas City, MO April 23-25
- Tribal Technical Teams Workshop, Reserve, KS, June 18-19

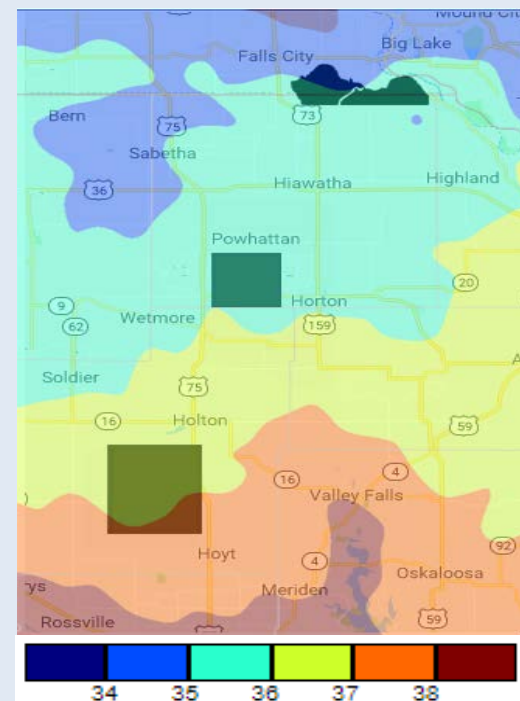
Valley Falls Maximum Snowfall Totals for Nov. 1st - Mar. 7th

Rank	Year	Total Snowfall
1	2010	46.3
2	1962	37
3	2011	33.4
4	2008	32.1
5	1960	31.5
6	2019	27.2
7	1959	26.8
8	2014	25.9
9	1953	24
-	1952	24

Period of Record from 1945

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

Mean Max Temperature Dec. 1, 2018 – Mar. 1, 2019

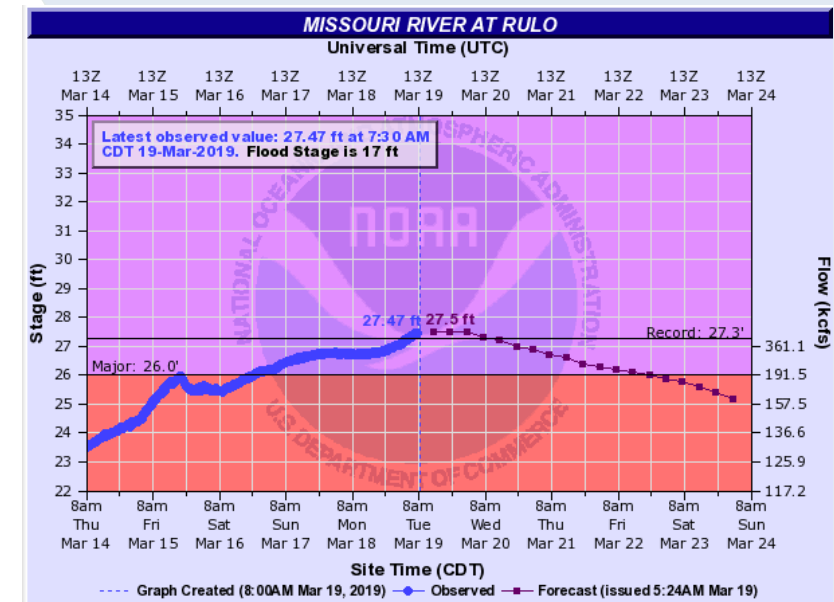


<http://scacis.rcc-acis.org/>

In January and February of 1895, the temperature in Horton, KS never got above freezing for 24 consecutive days.

Flooding

At 1:00 PM on March 19th the Missouri River at Rulo broke its record flood levee when it rose to 27.5 feet. Winter flooding has had a devastating impact in the region. Over a dozen homes were evacuated on March 14th. Further north three deaths have been caused due to flooding. The cause of the flooding can be attributed to quickly melting snow pack in Northern Nebraska and the Dakotas, ice jams, heavy rain in Nebraska and much greater than anticipated releases from Gavin's Point Dam. On Tuesday, March 12 the dam was releasing 17,000 cubic feet per second. By Friday afternoon on the 15th the discharge was up to 90,000cfs. The Army Corps of Engineers increased the flow to match flood water coming into Lewis and Clark Lake. Near the Santee Reservation a bridge was carried away by the Niobrara River after it had burst the dam at Spencer Nebraska on March 14th.



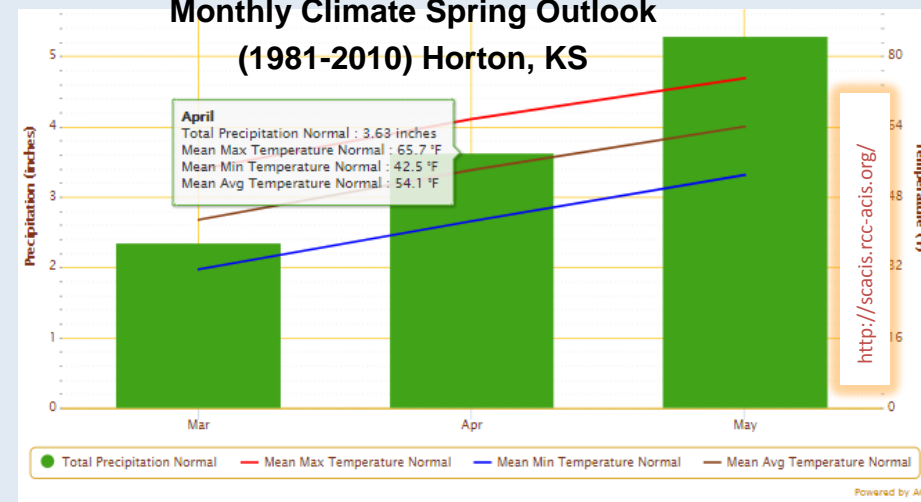
<https://water.weather.gov/ahps2>

NOAA.gov

Spring Outlook

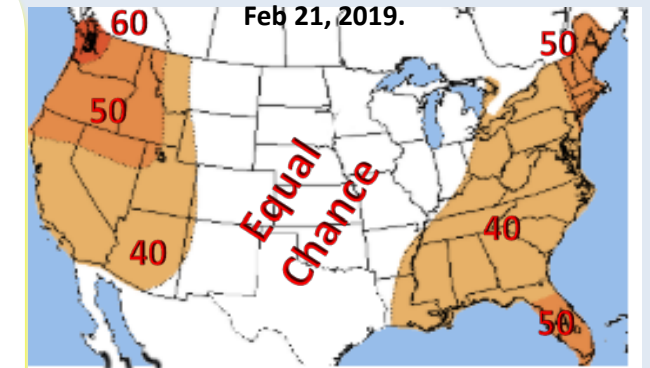
The two maps to the right look at potential temperature and precipitation trends for the next three months. "Equal Chance" means that there is 33 percent chance that temperatures will be above normal, normal or below normal. This is true for the precipitation map as well. There are areas where above normal temperatures are thought to have 40, 50 or even 60% chance of occurring. We are also near the line marking the division of the Equal chance and 40 % chance of higher than normal precipitation. The chart below looks at a 30-year period from 1981-2019 and displays average precipitation for March, April and May in Horton, KS. While last spring precipitation over the three-month period ranged 4" in the north and 8" in the south; in the three years prior to that the region averaged from 11" in the north to 18" in the south.

Monthly Climate Spring Outlook (1981-2010) Horton, KS

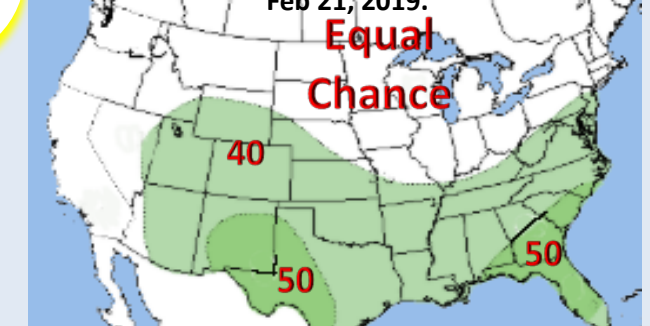


Month	Total Precipitation Normal (inches)	Mean Max Temperature Normal (°F)	Mean Min Temperature Normal (°F)	Mean Avg Temperature Normal (°F)
March	2.36	54.2	31.5	42.8
April	3.63	65.7	42.5	54.1
May	5.29	75.0	53.0	64.0

Temperature outlook for March, April, May: issued Feb 21, 2019.



Precipitation outlook for March, April, May: issued Feb 21, 2019.



A Sine of the Season

