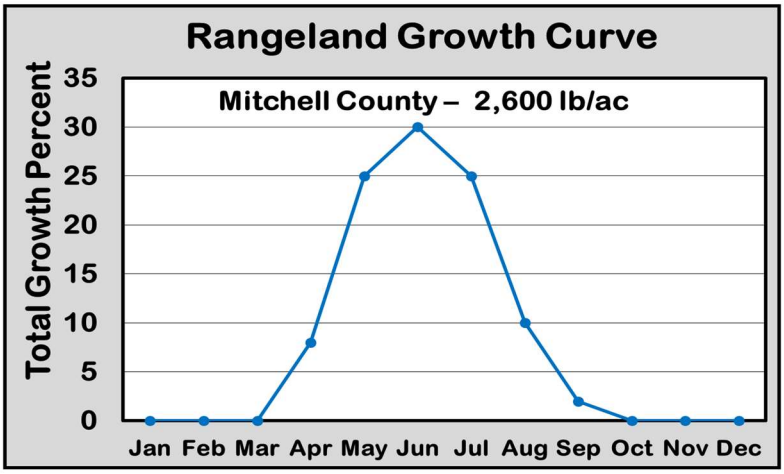
North Central Kansas Rangeland Forage Growth and Precipitation:

In Kansas warm-season grass dominated rangelands, May and June precipitation together have the greatest impact on total rangeland forage produced during the growing season. April precipitation can also have a significant impact on annual forage production, especially the further north and further west one travels in the Great Plains because of a greater abundance of cool-season grasses. As an example of how to use long term precipitation data and annual forage production data together, take a close look at this possible scenario of precipitation at Cawker City, KS. If 0.30 inches was received in April 2022, to achieve the median of 9.26 inches total precipitation in April + May + June, 8.96 inches must be received in May + June (9.26 – 0.30 = 8.96). In the last 30 years, the area received at least 8.96 inches in May + June a total of 9 times. That equals a 30% chance to receive the median amount of spring precipitation if only 0.30 inches is received in April. Since 5.52 inches was received in May 2022, then the April + May total equaled 5.82 inches. In order to receive the median April + May + June precipitation, June precipitation needed to reach a total of 3.44 inches (9.26 – 5.82 = 3.44). In the last 30 years, the area has received 3.44 inches in June a total of 16 times, or 53% of the years. The chance to receive the median amount of spring precipitation was just over 50%, about equal chances of getting above or below the median amount of precipitation.

June precipitation was only 1.27 inches, well below the 30-year median of 3.52. That resulted in an April+May+June deficit of 2.17 inches below the 9.26 inch median. This means forage production for the year would most likely be less than average at the end of the growing season because forage production peaks in June, and 2/3 of the total annual production for the Cawker City region occurs by July 1. The probability of 'catching up' in July is greatly reduced, as only 30% of the years have received the amount of rainfall needed to cover the April+May+June deficit and the median amount received in July combined (-2.17-3.45=-5.62). So, the lack of precipitation in April through June, the reduced growth curve potential remaining after a dry spring period, and the low probability of 'catch up' rains in July greatly increases the risk that expected average annual forage production will be short. Average county precipitation data for Kansas can be found at https://climate.k-state.edu/precip/county/.



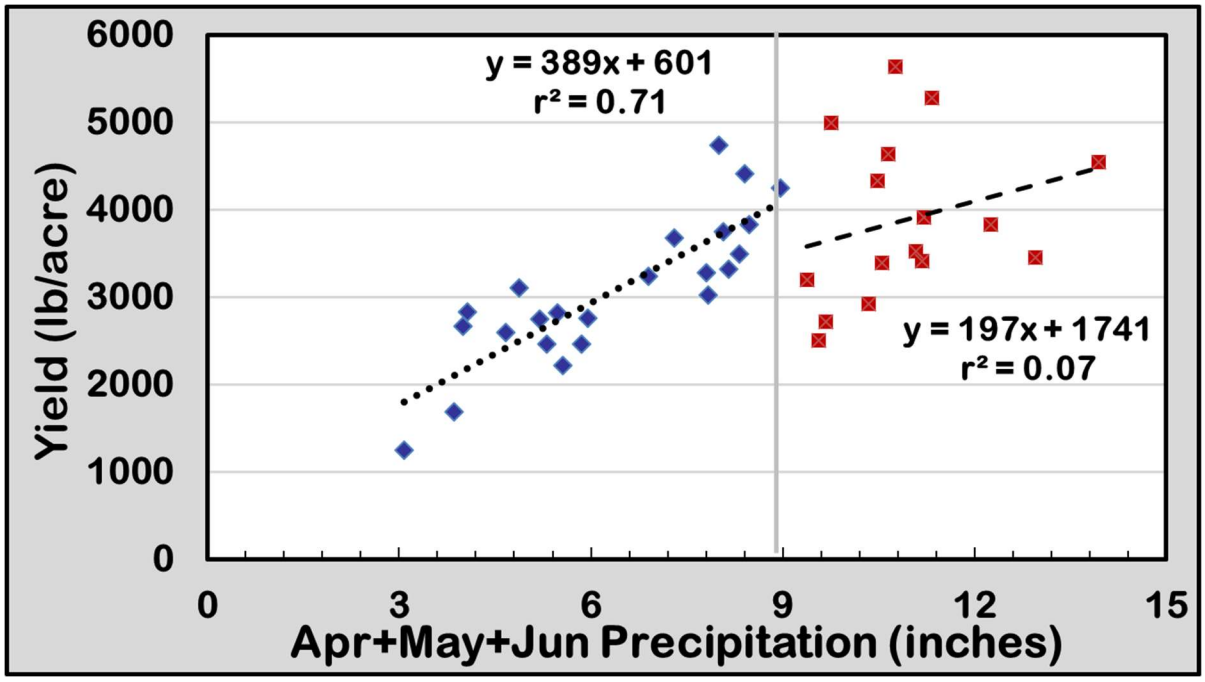
Prepared by Keith Harmoney, Rangeland Scientist, Agricultural Research Center-Hays, April 4, 2023
Office -785-625-3425 x221; Cell – 785-623-9499; kharmone@ksu.edu

Cawker City, KS Precipitation

Year	Apr	May	Jun	Jul		Total	Apr+May+Jun	May+Jun
1992	2.78	2.37	7.94	7.49		37.82	13.09	10.31
1993	1.76	3.16	7.45	20.74		52.70	12.37	10.61
1994	2.77	1.56	3.41	8.78		25.27	7.74	4.97
1995	2.15	8.59	2.76	2.96		25.76	13.50	11.35
1996	1.71	4.06	1.50	6.07		26.34	7.27	5.56
1997	2.40	0.83	3.54	1.59		19.74	6.77	4.37
1998	3.56	1.68	2.82	3.27		26.23	8.06	4.50
1999	4.08	7.19	3.52	1.59		23.52	14.79	10.71
2000	0.96	2.67	2.25	1.56		17.56	5.88	4.92
2001	1.32	8.23	3.23	2.88		28.08	12.78	11.46
2002	1.57	3.37	1.74	1.63		18.64	6.68	5.11
2003	3.34	3.16	3.53	1.47		24.03	10.03	6.69
2004	1.06	0.93	3.79	7.53		M	5.78	4.72
2005	2.72	1.00	3.90	7.16		28.10	7.62	4.90
2006	2.42	3.65	2.31	1.53		24.18	8.38	5.96
2007	3.29	4.92	3.03	3.45		27.48	11.24	7.95
2008	2.88	4.61	3.59	4.18		35.58	11.08	8.20
2009	2.25	1.28	4.60	3.45		22.05	8.13	5.88
2010	3.82	4.56	4.92	7.14		31.23	13.30	9.48
2011	2.05	8.28	5.02	4.29		29.61	15.35	13.30
2012	4.02	0.09	1.94	1.10		19.73	6.05	2.03
2013	1.85	2.56	3.95	8.54		25.76	8.36	6.51
2014	2.90	1.74	7.96	1.17		21.73	12.60	9.70
2015	1.47	5.91	2.82	5.53		27.83	10.20	8.73
2016	4.48	7.80	0.48	4.14		31.34	12.76	8.28
2017	2.37	5.44	1.87	2.20		20.86	9.68	7.31
2018	0.92	3.56	5.34	3.03		34.41	9.82	8.90
2019	0.83	7.93	3.50	1.43		32.97	12.26	11.43
2020	0.95	2.59	4.27	8.32		25.71	7.81	6.86
2021	2.37	4.05	1.36	3.19		24.13	7.78	5.41
Avg.	2.37	3.93	3.61	4.58		27.19	9.91	7.54
Median	2.37	3.37	3.52	3.45		26.23	9.26	6.89
2022	0.30	5.52	1.27	3.79			7.18	6.79
	-8.96	-3.44	-2.17	-5.62	-1.83			
	9/30	16/30		9/30				
	30%	53%		30%				

Prepared by Keith Harmoney, Rangeland Scientist, Agricultural Research Center-Hays, April 4, 2023
Office -785-625-3425 x221; Cell – 785-623-9499; kharmone@ksu.edu

Data from tracking 39 years of forage production and precipitation amounts at the Kansas St. University Ag. Research Center in Hays shows that when spring precipitation in April, May, and June combined is below average (just under 9.0 inches), that forage production by the end of the year is directly related to the amount of precipitation received in those early months. When precipitation is greater than the average for those three months, forage production is more difficult to predict because runoff likely occurs so that the amount of rainfall doesn't directly translate into soil water used for forage growth. However, when precipitation is below average for those early months, it is more easily predicted whether or not enough precipitation has fallen and infiltrated into the soil to convert into forage production. Therefore, the amount of precipitation received in April, May, and June are a good indicator of whether or not enough forage will be present in a pasture for the stocking rate set at the start of the growing season. The precipitation received at the end of each of these months is a good indicator to determine if stocking rates may need to be adjusted downward so that a pasture is not overutilized by the end of the growing season. With dry soil conditions entering the growing season, Hays research data shows that the percentage reduction in forage production is approximately equal to the percentage reduction from average precipitation in April + May + June combined. Soil moisture status for multiple locations across Kansas can be found through the Kansas Mesonet https://mesonet.k-state.edu/agriculture/soilmoist/. The Grass-Cast website is another tool that also helps predict how much forage will be present at the end of the growing season if future precipitation for the growing season is above average, similar to average, or below average, (https://grasscast.unl.edu/Outlook.aspx). Satellite imagery also estimates current accumulated growth for specific pasture areas in Kansas by using a mapping unit feature within the Rangeland Analysis Platform website (https://wlfw-um.shinyapps.io/production-explorer/). At this site, select the pasture area you want to explore, and then click on the 'current year production' heading towards the top of the page to get production estimates of 16-day growth periods of the current year.



Prepared by Keith Harmoney, Rangeland Scientist, Agricultural Research Center-Hays, April 4, 2023
Office -785-625-3425 x221; Cell – 785-623-9499; kharmone@ksu.edu