Western Kansas Rangeland Forage Growth and Precipitation:

In Kansas warm-season grass dominated rangelands, April, May and June precipitation together have the greatest impact on total rangeland forage produced during the growing season. May and June precipitation together are equally important in predicting end of season forage production. In eastern Kansas, July precipitation also has increased importance because of a longer growing season. The further north and further west one travels in the Great Plains, April precipitation also has a significant impact on annual forage production 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 for western Kansas, take a close look at this scenario of precipitation at Scott City, KS. If 0.29 inches was received in April 2022, to achieve the median of 7.45 inches total precipitation in April + May + June, 7.16 inches must be received in May + June (7.45 – 0.29 = 7.16). In the last 30 years, the area received at least 7.16 inches in May + June combined a total of 8 times. That equals a 27% chance to receive the median amount of total spring precipitation if 0.29 inches is received in April, which is tending toward a dry period.

Since 0.70 inches was received in May 2022, then 6.46 inches would be needed in June to achieve the median April + May + June combined precipitation total (7.45 - 0.29 - 0.70 = 6.46). In the last 30 years, the area has received at least 6.46 inches of precipitation in June only 4 times, or 13% of the years. This results in Scott City significantly trending toward a dry year with a high probability of lower rangeland productivity and yield than normal.

June 2022 precipitation was 1.29 inches, well below the 30 year median, and resulted in a spring deficit of 5.17 inches (7.45 – 0.29 – 0.70 – 1.29 = 5.17). This deficit means that the early growing season has received only about 30% of its median total, and July precipitation would have to be 8.20 inches to achieve the total amount of April through July precipitation (5.17 + 3.03 = 8.20), the months with the greatest amount of forage growth. No July in the last 30 years has had more than 8.20 inches of precipitation. The odds are almost non-existent that this region will receive adequate precipitation in July to make up or 'catch up' for the lack of early season precipitation, and forage growth will certainly be well below expected levels at the end of the 2022 growing season.

Forage production peaks in June, and over 2/3 of the total annual production for the Scott City region occurs by July 1. Further west and further north in the Great Plains, even a greater percentage of growth has already occurred by July 1 because cool-season grasses contribute a greater percentage of the forage. So, the low probability of receiving needed precipitation at each monthly period and the growth potential at each of these months lessens the probability that expected average annual forage production will be achieved. In eastern Kansas, July precipitation may also help to provide some yield increase because of a longer growing season than western Kansas, however deficits are still hard to overcome through July precipitation alone. Current and historic average county precipitation data for Kansas can be found at the KSU Climate Hub, https://climate.k-state.edu/precip/county/.

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Scott City, KS Precipitation										
Year	Apr	May	Jun	Jul	Annual			Apr+May+Jun		May+Jun
1992	0.14	2.41	7.86	1.97	22.29			10.41		10.27
1993	0.75	2.04	5.05	4.85	28.23			7.84		7.09
1994	1.82	1.60	3.14	3.68	18.59			6.56		4.74
1995	1.74	5.24	1.84	3.03	17.69			8.82		7.08
1996	0.75	3.55	2.75	4.89	25.13			7.05		6.30
1997	1.21	1.96	2.71	3.71	21.02			5.88		4.67
1998	0.65	1.97	1.97	6.17	18.41			4.59		3.94
1999	2.20	2.20	2.04	3.39	18.66			6.44		4.24
2000	1.53	0.82	0.87	3.32	17.52			3.22		1.69
2001	2.22	7.22	0.52	3.12	17.85			9.96		7.74
2002	2.59	0.70	2.39	0.84	13.18			5.68		3.09
2003	1.86	3.55	5.05	1.32	17.02			10.46		8.60
2004	2.64	0.26	7.38	2.44	22.61			10.28		7.64
2005	1.29	3.61	1.64	2.51	22.37			6.54		5.25
2006	0.54	2.78	3.25	1.55	21.77			6.57		6.03
2007	2.62	1.13	3.09	2.00	18.56			6.84		4.22
2008	2.02	2.25	1.71	1.66	17.95			5.98		3.96
2009	4.45	2.52	1.36	2.69	19.41			8.33		3.88
2010	5.31	3.57	1.11	4.32	21.53			9.99		4.68
2011	1.91	1.03	2.07	2.94	17.44			5.01		3.10
2012	1.88	0.32	0.36	0.80	11.05			2.56		0.68
2013	0.49	1.67	3.66	3.82	20.18			5.82		5.33
2014	0.45	0.23	7.26	2.30	20.22			7.94		7.49
2015	1.47	9.08	1.56	3.92	24.10			12.11		10.64
2016	4.75	2.31	3.00	3.73	19.47			10.06		5.31
2017	5.79	2.44	4.69	2.45	29.32			12.92		7.13
2018	1.02	2.00	10.13	3.33	26.26			13.15		12.13
2019	0.27	5.99	1.60	2.19	20.72			7.86		7.59
2020	0.07	1.03	2.65	5.13	14.20			3.75		3.68
2021	0.52	7.26	0.50	1.95	18.06			8.28		7.76
mean	1.83	2.80	3.07	3.02	20.14			7.70		5.87
median	1.74	2.25	2.39	3.03	19.83			7.45		5.32
2022	0.29	0.70	1.29	2.90				2.28		1.99
	-7.16	-6.46	-5.17	-8.2						
	8/30	4/30		0/30						
	27%	13%		0%						

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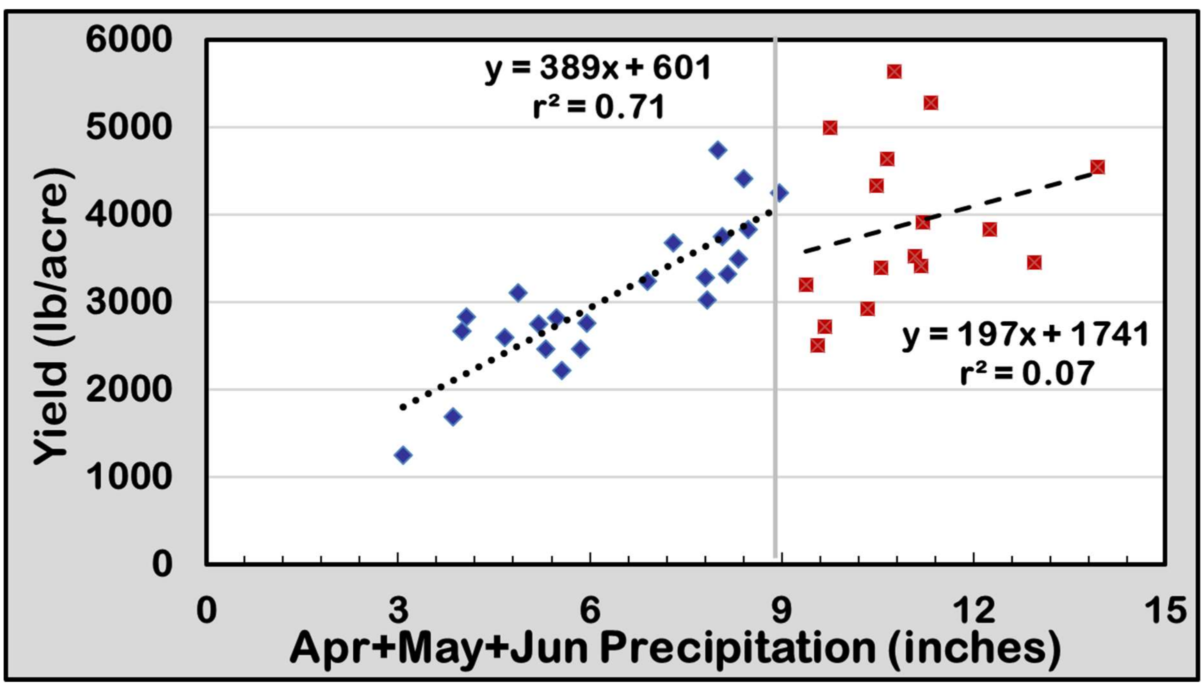
Data from tracking 39 years of forage production and precipitation amounts at the Kansas St. University Ag. Research Center in Hays shows that when spring precipitation in April, May, and June combined is below our Center average (just under 9.0 inches), that forage production by the end of the year 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.



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