Spring Forage Conference
Proceedings - Day one

February 23, 2021

Cattle and Beef Market Outlook: Moving Forward in 2021

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Carryover Impacts from 2020

COVID-19 caused enormous disruptions in every possible way in 2020 and cattle and beef markets were no exception. These included supply chain bottlenecks and beef processing reductions resulting in backlogs of fed cattle and ripple effects in feeder cattle markets. Many of the worst impacts were resolved by the end of the year but 2021 does begin with large feedlot inventories and more feeder cattle carried over from the previous year.

Cattle Inventories Decline Slightly

The beef cow herd decreased slightly in 2020 following a peak in 2019 (Table 1). The cow herd and the cattle industry in general seems to be mostly stable at this time with inventories drifting slightly lower. Market developments in the coming year may provide direction for herd changes after 2021. The estimated feeder supply at the beginning of 2021 is about equal to one year ago but smaller calf crops in 2019 and 2020 should result in tighter feeder supplies as 2021 progresses.

Beef Production Expected to Moderate

Disruptions in cattle slaughter in 2020 caused steer and heifer carcass weights to jump sharply. Carcass weights are expected to moderate some in 2021 and that, combined with modest reductions in cattle slaughter is projected to lead to a beef production decrease of 1.0 – 2.0 percent in 2021 (Table 2). Cattle slaughter is projected to decrease 0.5-1.0 percent year over year this year.

Drought and Feed Market Threats

Drought conditions prevailed over much of the intermountain west in 2020 and expanded across the central and northern plains late into early 2021. Drought impacts were significant but limited regionally in 2020. If the current drought map persists into April and May, more significant impacts may be apparent soon in 2021.

Grain and oilseed prices increased sharply in the second half of 2020 with corn prices increasing by roughly 67 percent since last August. Corn prices are currently at the highest levels since 2013. Sharply higher feedlot cost of gain will impact feedlot placement decisions and timing as well as weighing on feeder cattle prices.

Domestic Beef Demand Remains Strong

By most measures, overall beef demand has remained strong since the pandemic began. The food service sector continues with restrictions but retail grocery demand remains robust. With progress in controlling the pandemic expected in the coming months, beef demand is expected to return to more balance between the food service and retail grocery sectors.

Although beef supplies are expected to decrease in 2021, pork and broiler production are projected higher in the coming year (Table 2). Total protein production is expected to reach 106.5 billion pounds, the seventh consecutive year of record protein production in the U.S. Beef demand has remained strong despite ample supplies of competing meats.

<u>Global Beef Trade Improving</u>

Global market disruptions caused a slight decrease in beef exports in 2020 but a modest recovery is projected for 2021. Top beef exports markets continue to be Japan, South Korea, Mexico, Canada and Hong Kong. Beef exports to China increased by 271 percent in 2020 with China accounting for 4 percent of total beef exports and becoming the number seven beef export market. Beef imports are expected to return to pre-COVID levels or lower in 2021 after spiking higher in 2020. Increased beef exports and reduced beef imports will be supportive to cattle and beef markets in 2021.

<u>Modest Price Improvement Likely</u>

Uncertainty continues and volatility is likely but the overall forecast is for modestly higher cattle prices in 2021. Much of the improvement may come in the second half of the year as some of the current struggles may persist through the first half of the year.

Table 1. Cattle Inventory, January 1

	2018	2019	2020	2021	% Change 2020-2021
	1,000 Head				
All Cattle and Calves	94,298.0	94,804.7	93,793.3	93,594.5	-0.2
Beef Cows	31,466.2	31,690.7	31,338.7	31,157.6	-0.6
Beef Replacement Heifers	6,108.2	5,884.9	5,808.9	5,812.1	+0.1
Dairy Cows	9,432.1	9,353.4	9,342.6	9,440.4	+1.1
Dairy Replacement Heifers	4,768.3	4,701.5	4,684.0	4,604.5	-1.7
Feeder Supply	26,124.9	26,553.3	25,714.0	25,662.0	-0.2
Cattle on Feed	14,146.0	14,367.9	14,657.7	14,707.4	+0.3
	2017	2018	2019	2020	
Calf Crop	35,758.2	36,312.7	35,591.6	35,135.5	-1.3

Source: NASS

Table 2. Meat Production and Consumption

	Production				Consumption
	2019	2020	2021*	% Change 2020-2019	Lbs. per Capita
	Million Pounds				
Beef	27,155	27,153	26,839	-1.2	56.6
Pork	27,616	28,300	28,723	+1.5	51.1
Broiler	43,435	44,096	44,334	+0.5	94.5
Total	104,797	106,071	106,472	+0.4	220.5

*Forecast

MISSOURI CLIMATE NARRATIVE, TRENDS & 2020 GROWING SEASON

Dr. Wayne Decker, Professor Emeritus, University of Missouri
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Missouri Climate Narrative

CLIMATE OF MISSOURI

Missouri has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade, reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce copious amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over Missouri, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

Missouri experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. Nevertheless, several basic principles help to understand climatic differences in Missouri.

The basic gradient for most climatic characteristics is along a line diagonally crossing the state from northwest to southeast. Both mean annual temperature and precipitation exhibit gradients along this line.

TEMPERATURE (Based on 1981-2010 Normals) - Because of its inland location, Missouri is subject to frequent changes in temperature. While winters are cold and summers are hot, prolonged periods of very cold or very hot weather are unusual. Occasional periods of mild, above freezing temperatures are noted almost every winter. Conversely, during the peak of the summer season, occasional periods of dry-cool weather break up stretches of hot, humid weather.

Temperatures over 100° F are rare, but they have occurred in every section of the state. In the summer, temperatures rise to 90° F or higher on an average of 20 to 30 days in the north, central and Ozark Plateau region and 40 to 50 days in the south. Temperatures below zero are infrequent, but have occurred in every county in Missouri. On average there are 5 to 10 days a year with below zero temperatures in the northern counties, 3 to 5 days in central sections and

1 to 2 days in the southern counties, although there are some winters when temperatures do not go below zero at all.

Mean January minimum temperature follows the northwest-to-southeast gradient, from a low of 13° in the northwest to a high of 26° in the southeast. However, mean July maximum temperature shows hardly any geographic variation in the state. Mean July maximum temperatures have a range of only five or six degrees across the state (86° to 92°), and the central Ozarks averages somewhat cooler July temperatures than other portions of southern Missouri.

All of Missouri experiences freezing temperatures every year. Annually, an average of about 120 days with temperature below 32° F in northern sections, 100 to 110 days across central parts and the Ozark Plateau, 90 to 100 days over southern sections, and about 70 such days in the Bootheel counties.

Missouri's growing season typically runs from April to October and, depending on where you live, can make a big difference when to expect your first or last frost. Missouri's latitudinal variation, the Ozark Plateau, river bottomlands, hills, valleys and populated areas are all factors contributing to frost potential. If you have an established climate record of temperatures for your region, and an idea of how local topography can affect temperature, you can use that knowledge in determining when, on average, to expect your first and last frost.

Typically, the first fall frost (≤ 32°F) occurs over northern and central Missouri by the second and third week of October, respectively. Similarly, the last spring frost occurs over northern and central Missouri by the third and second week of April, respectively. Frosts are more likely to be experienced earlier in the fall or later in the spring over the Ozarks when compared to central Missouri. The reason for this is due to the higher elevation of the Ozark Plateau which causes cooler temperatures in the Ozark region. As the Ozark Plateau transitions to the southeastern lowlands of the Bootheel, the average first fall frost generally occurs between the last week of October and the first week of November. Similarly, the average last spring frost varies from the second week of April to the end of March.

Another item to consider is local terrain where temperatures can be highly variable over small distances due to topography. Minimum temperatures can vary 10°F or higher over a short distance, say, from the bottom of a valley to a nearby hilltop. Cool air, being denser than warm air, moves down the slopes of hills, accumulating in the valleys. This is why low lying areas, such as river bottoms, will likely be colder than their surroundings on clear, calm nights. Therefore, while referring to the data and maps throughout this site, consider your local landscape when determining your average first frost date.

The metropolitan areas of St. Louis and Kansas City exert a significant and measurable effect on their climates. Temperatures are elevated in both regions by a few degrees, an effect known as the "urban heat island." More atmospheric particulates create a "dirtier" atmosphere of less intense light and a greater abundance of condensation nuclei. Somewhat cloudier skies and more hours of very light precipitation may result, although the total amount of precipitation may not be greater than in non-metropolitan areas.

Minimum-recorded temperatures are lowest in northern and western Missouri. The lowest temperature officially recorded in Missouri is -40° at Warsaw on February 13, 1905. The highest temperature officially recorded in Missouri is 118° at Warsaw and Union on July 14, 1954.

PRECIPITATION (Based on 1981-2010 Normals) - Mean annual precipitation varies along the same gradient as temperature, from a low of 34 inches in the northwest to a high of 52 inches in the southeast. Seasonal climatic variations are more complex. In northwestern Missouri, seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages five times greater than January precipitation. In contrast, in southeastern Missouri, seasonality in precipitation is insignificant due to the greater influence of subtropical air masses throughout the year.

Mean January precipitation varies along the gradient from a low of 0.4 inches in the northwest to a high of 3.7 inches in the southeast. However, mean July precipitation is greatest in far northern sections of Missouri, largely the result of high-intensity convectional precipitation (just over 5 inches), and least in southwestern Missouri (3.3 inches). Though much less precipitation falls in northern Missouri in the winter than in the summer, it tends to be seasonally effective precipitation, since temperature and evaporation rates are much lower in winter.

Snow has been known to fall in Missouri as early as October, and as late as May. However, most of it falls in December, January, and February. As one would expect, the northern counties usually get the most snow. For the northern half of Missouri, the winter snowfall averages 15 to 22 inches and the average figure tapers off to 10 to 15 inches in the southern sections to less than 10 inches in the Bootheel. It is unusual for snow to stay on the ground for more than a week or two before it melts. Winter precipitation usually is in the form of rain, or snow, or both. Conditions sometimes are on the borderline between rain and snow, and in these situations freezing drizzle or freezing rain occurs. This does not usually happen more than five times in a winter season.

Spring, summer, and early fall precipitation comes largely in the form of showers or thunderstorms. Thunderstorms have been observed in Missouri during the winter months, but they are most frequent from April to July. Hail also occurs in all regions and may occur throughout the year, but it is much less likely in winter. May has the greatest number of days with hail. Measurable precipitation occurs on an average of about 100 days a year. About half of these will be days with thunderstorms. Occasionally, these produce some very heavy rains.

All of Missouri experiences “extreme” climate events, though infrequent in occurrence and often very geographically restricted, these “disturbances” produce environmental changes that may not otherwise have happened and that may be relatively long lasting in their effect. Among these extreme climatic events are high-intensity rains, protracted drought, heat waves and cold waves, ice storms, windstorms, and tornadoes. These climatic events, in turn, may lead to other environmental disturbances such as floods, fires, landslides, and abrupt changes in plant and animal populations and distributions.

High-intensity precipitation characterizes all regions of Missouri. The town of Holt in northwestern Missouri holds the world record for a high-intensity rain, having received 12 inches within a 42-minute period on June 22, 1947. Once every two years in southwestern Missouri one should expect one precipitation event to produce at least 3.7 inches of rain in a 24-hour period. Over a five-year period, a ten-year period, a twenty-five-year period, a fifty-year period, and a hundred-year period one should expect one precipitation event to produce at least 4.8 inches, 5.6 inches, 6.6 inches, 7.3 inches, and 8.2 inches of rain respectively in a 24-hour period. Probabilities decline to the north and east away from southwestern Missouri.[+]

Table 1 provides information on state precipitation records and significant events.

Precipitation	**Year/Month(s)**	**State Average Precipitation (In.)**
Wettest Year:	1973	57.13
Driest Year:	1953	25.12
Wettest winter:	1949-50, Dec-Jan-Feb	11.11
Driest winter:	1962-63, Dec-Jan-Feb	2.36
Wettest spring:	1973, Mar-Apr-May	21.61
Driest spring:	1936, Mar-Apr-May	6.07
Wettest summer:	1951, Jun-Jul-Aug	20.17
Driest summer:	1936, Jun-Jul-Aug	3.88
Wettest autumn:	1941, Sep-Oct-Nov	18.90
Driest autumn:	1897, Sep-Oct-Nov	3.97
Wettest month:	1993, September	11.31
Driest month:	1986, January	0.10

Wettest Year:	Individual location: 1957, Portageville; 92.77 inches
Driest Year:	Individual location: 1910, Conception; 14.37 inches
Wettest day:	1965, July 20; 18.18 inches in Edgerton
Snowiest month:	1960, March; State average snowfall: 20.6 inches
Max month snowfall:	1960, March; 38.5 inches in Concordia
Deepest snow depth:	1960, March 19-20; 36 inches in Union
Latest heavy snowfall:	1907, May 3; 8 inches in Fairport
World record rainfall:	1947, June 22; 12 inches in 42 minutes in Holt

Table 1.

Flash flooding along minor streams following heavy thunderstorm rains, occur most frequently in the spring and early summer, April to July, but may occur during any month. Serious flooding occurs less frequently along the main stems of the Missouri and Mississippi Rivers and usually occurs during the spring and early summer. Main stem flooding may be caused by prolonged periods of heavy rains, ice jams, or upstream flood crests synchronized with high tributary discharge. There are several flood control structures in the Missouri Basin above Kansas City, which may be expected to reduce upstream: flood crests in the future.

The Ozark region gets abundant rainfall in an average year, and has numerous streams and many springs. Several large lakes have been created by damming up streams, and these are centers for a growing tourist and vacation industry, besides providing electric power and flood control. In the northern counties, underground water is not as readily available as in other sections. More use is being made of small dams and farm ponds to impound surface water during seasons with abundant rainfall.

During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Nearly every year some areas have short periods of drought in Missouri. There have been occasional years when the soil moisture has been depleted, arid when rains have failed to replace the water lost by evaporation and transpiration for prolonged periods. These conditions have caused widespread distress. With increasing population and more competition for the use of water, wise water management is becoming more important.

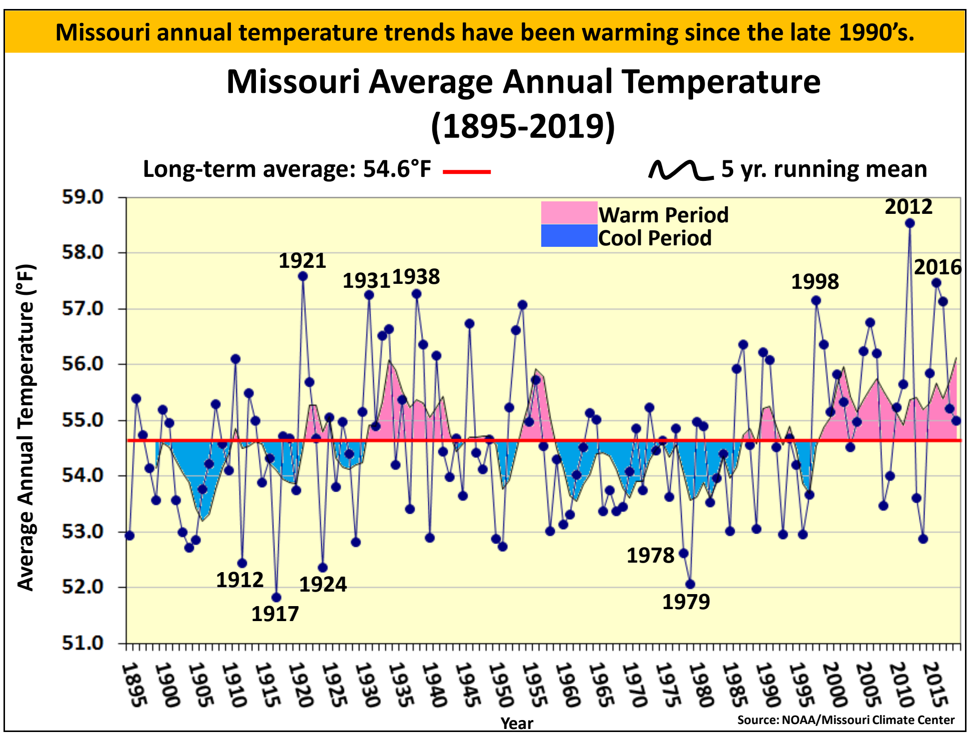
Drought may be conceptualized in different ways. Meteorological drought, based on precipitation records, is different from agricultural or soil-moisture drought and the physiological drought of plants. Drought is commonly thought of as a growing season phenomenon, but precipitation deficiency during colder months does affect moisture abundance during the following warmer months. Drought directly affects plant and animal life by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects life by increasing plant and animal susceptibility to disease and the probability of fire and the severity of any fire.

[+]**Reference:** Huff, Floyd A., and James R. Angel. Rainfall Frequency Atlas of the Midwest. Illinois State Water Survey, Champaign, Bulletin 71, 1992.

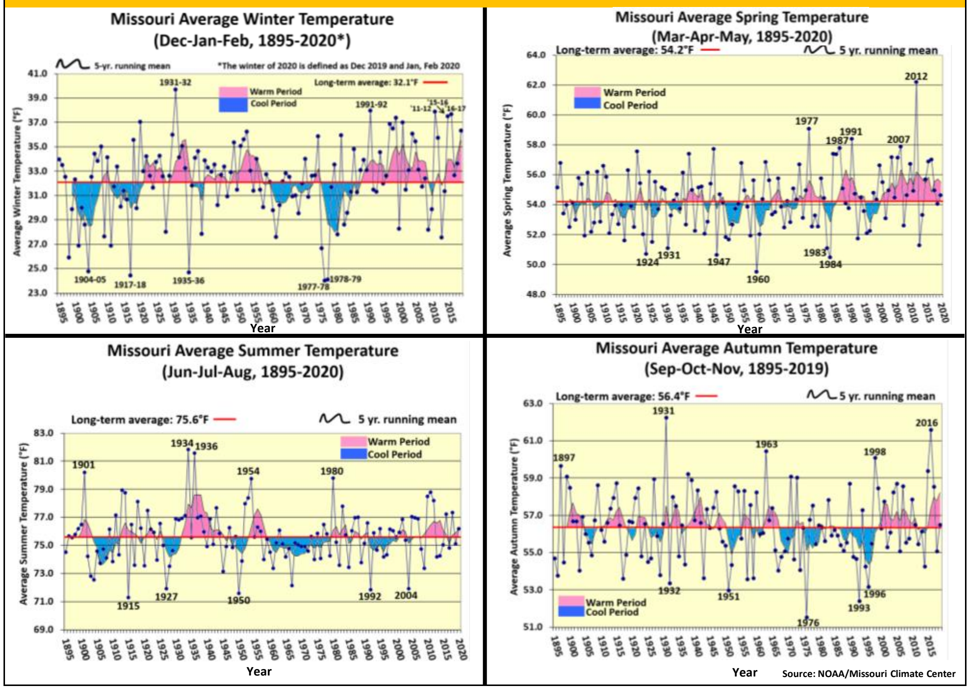
TOPOGRAPHIC INFLUENCES -Superimposed upon the basic statewide climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on sideslopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Fog, heavy dew, and higher humidities are more common in low-lying areas. Deep sinkholes often have a microclimate significantly cooler, moister, and shadier than surrounding surfaces, a phenomenon that may result in a strikingly different ecology. Microclimate is also expressed by different wind speeds due to differences in the exposure of surfaces such as bluff faces. Higher daytime temperatures of bare rock surfaces and higher albedo (reflectivity) of unvegetated surfaces may create distinctive environmental niches such as glades and balds. Slope orientation (direction) is an important topographic influence on climate. South-and-westfacing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest is measurably different from the climate of adjacent open areas where most standard weather stations are located.

The various combinations of climate, terrain, and soil in Missouri have made possible several major types of farming. In the prairies of northern and west-central Missouri a combination of grain and livestock is most common. In the Ozarks, a large forest products industry is occurring. Farms in the Ozarks are usually small and quite varied in their products. In the southwestern counties there are numerous dairy, fruit, and vegetable-producing areas. The rich deep soil, abundant rain, and warm temperatures of the Bootheel section in southeastern Missouri have made possible a highly intensive kind of farming. Major crops are cotton, corn, and soybean. This area produces a large share of the cash value of all crops in Missouri each year.

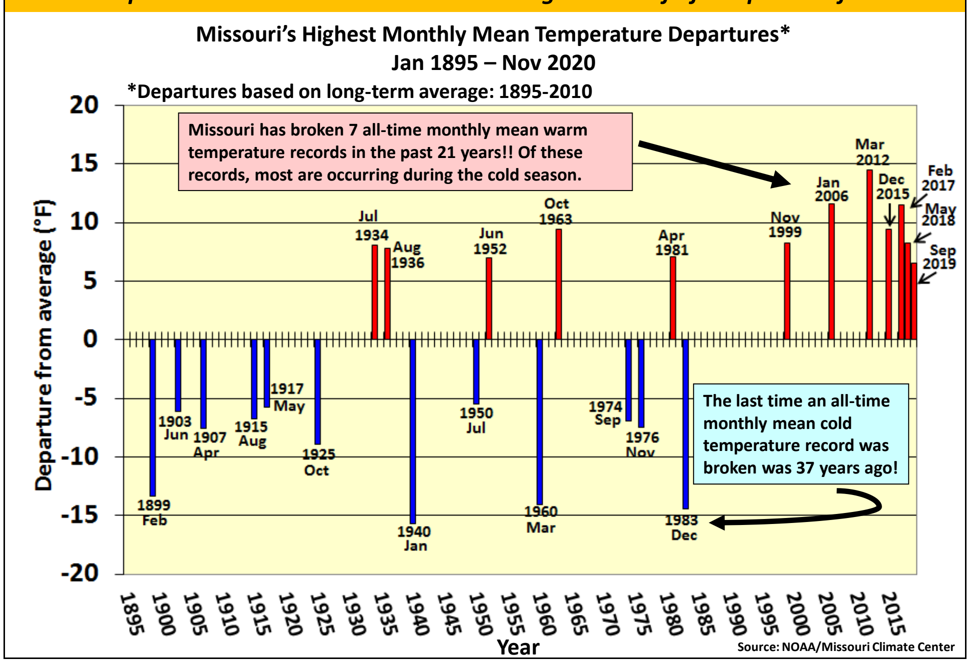
Missouri Climate Trends



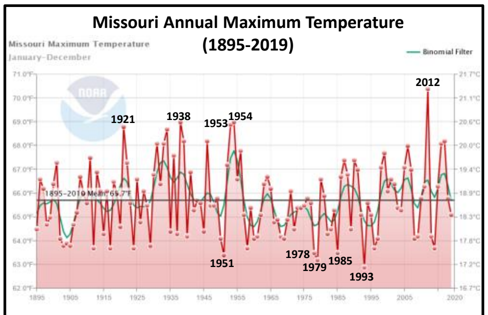
Missouri’s strongest seasonal warming has been occurring in winter & spring.



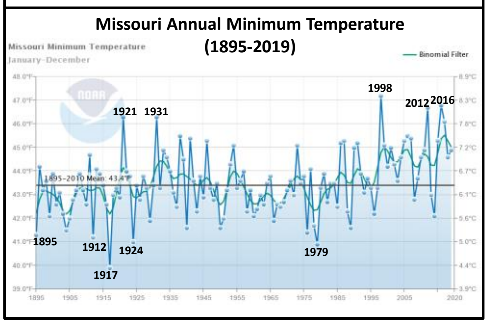
What are climatic impacts from these warmer trends? ***-Breaking more monthly warm temperature records than cold ones during latter half of the period of record.***



Missouri maximum and minimum annual temperature trends have been warming but the rate of warming has been faster with minimum temperature.



Missouri Annual Maximum Temperature (1895-2019)



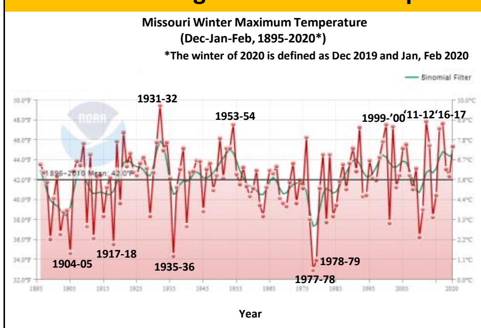
Missouri Annual Minimum Temperature (1895-2019)

For 15 out of the past 22 years (1998-2019), annual max temp has been above average, 68%.

For 18 out of the past 22 years (1998-2019), annual min temp has been above average, 82%.

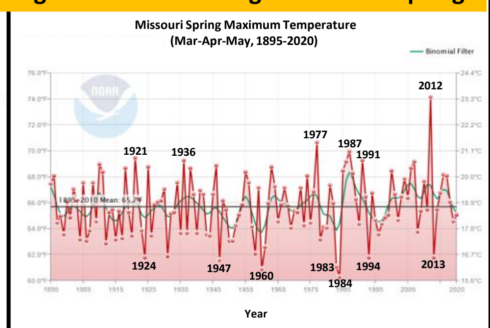
www.ncdc.noaa.gov/cag/

Missouri's strongest maximum temp warming has been occurring in winter & spring.

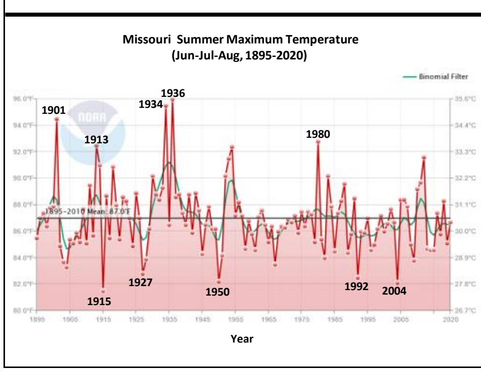


Missouri Winter Maximum Temperature (Dec-Jan-Feb, 1895-2020*)

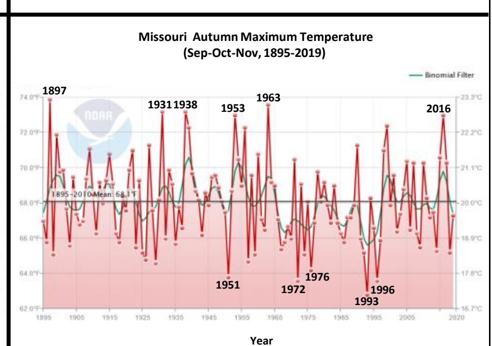
*The winter of 2020 is defined as Dec 2019 and Jan, Feb 2020



Missouri Spring Maximum Temperature (Mar-Apr-May, 1895-2020)



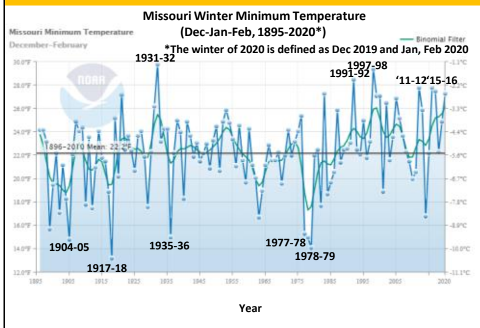
Missouri Summer Maximum Temperature (Jun-Jul-Aug, 1895-2020)

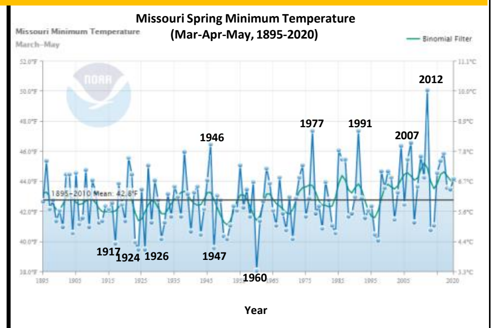


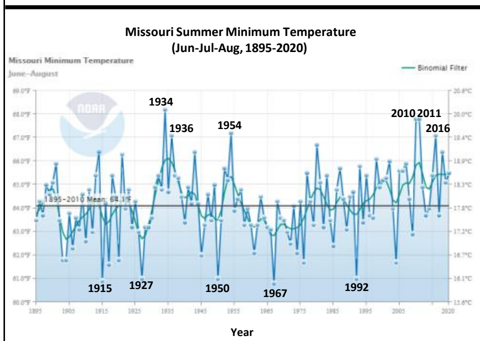
Missouri Autumn Maximum Temperature (Sep-Oct-Nov, 1895-2019)

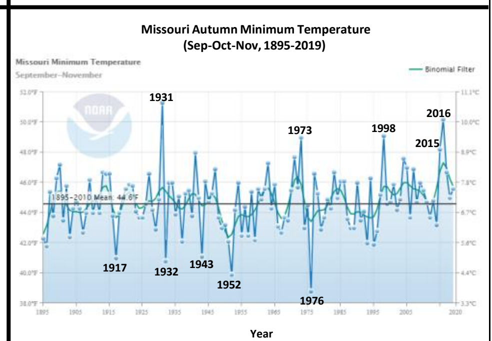
Climate At A Glance: www.ncdc.noaa.gov/cag/

Missouri minimum temperature trends have been warming in all four seasons.



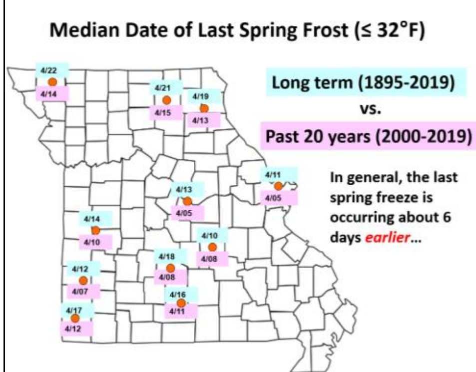




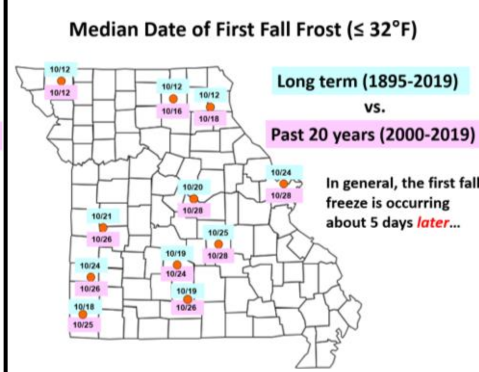


Climate At A Glance: www.ncdc.noaa.gov/cag/

What are the climatic impacts from warmer minimum temperatures?
-Longer growing season.

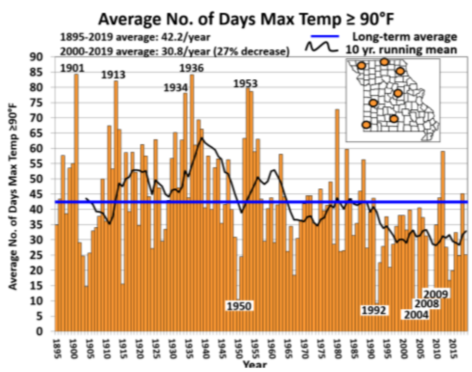


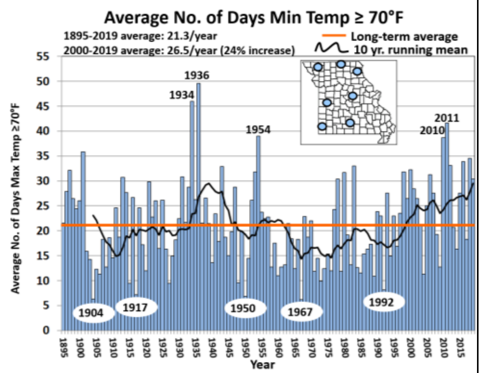
Source: NOAA/Missouri Climate Center



Source: NOAA/Missouri Climate Center

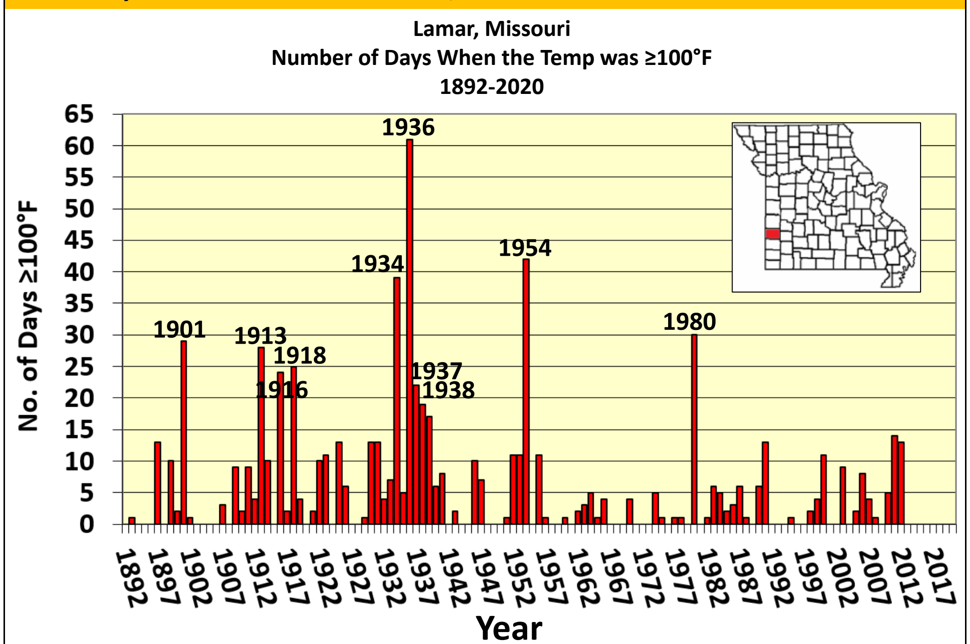
What are the climatic impacts from cooler summer maximum temperatures & warmer summer minimum temperatures?
-Fewer 90°F days, but more uncomfortable summer nights w/ minimum temps ≥70°F.

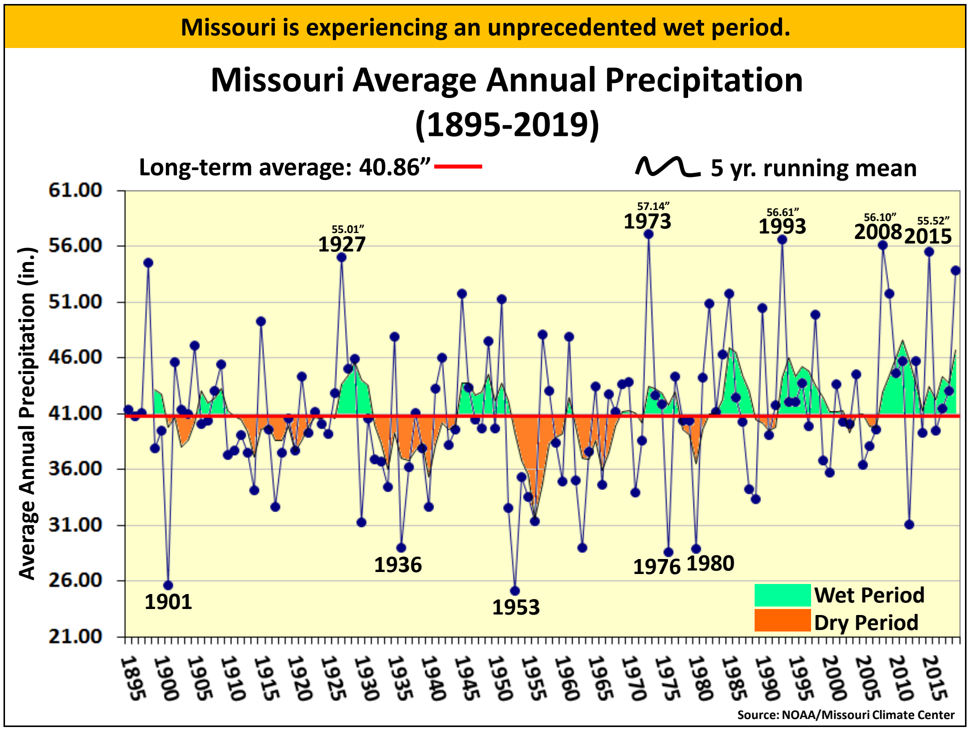


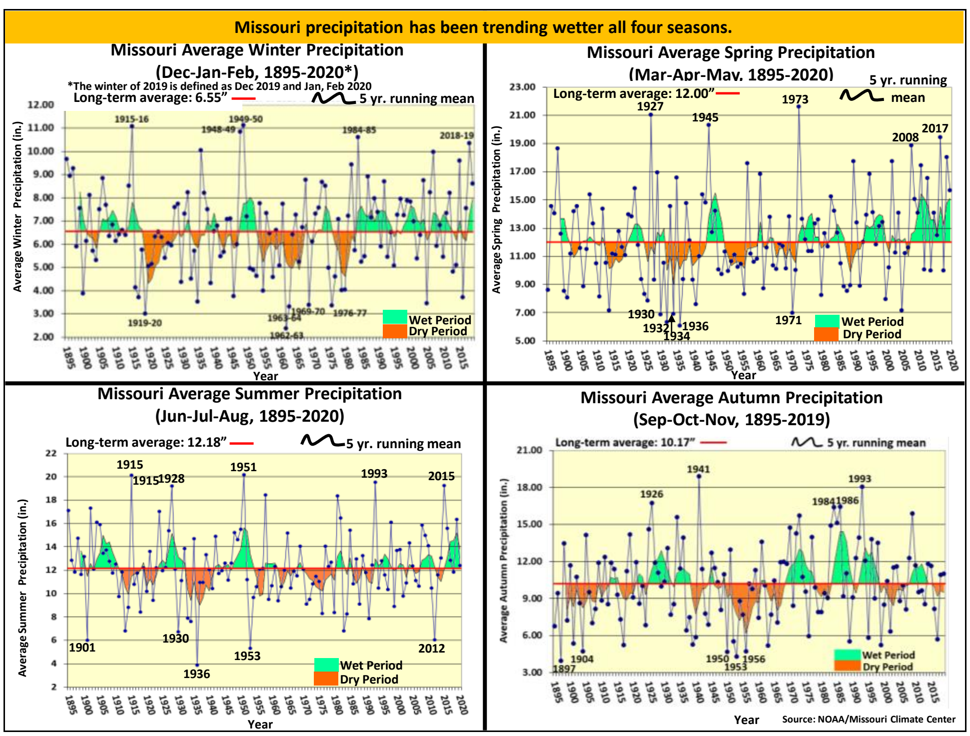


Source: NOAA/Missouri Climate Center

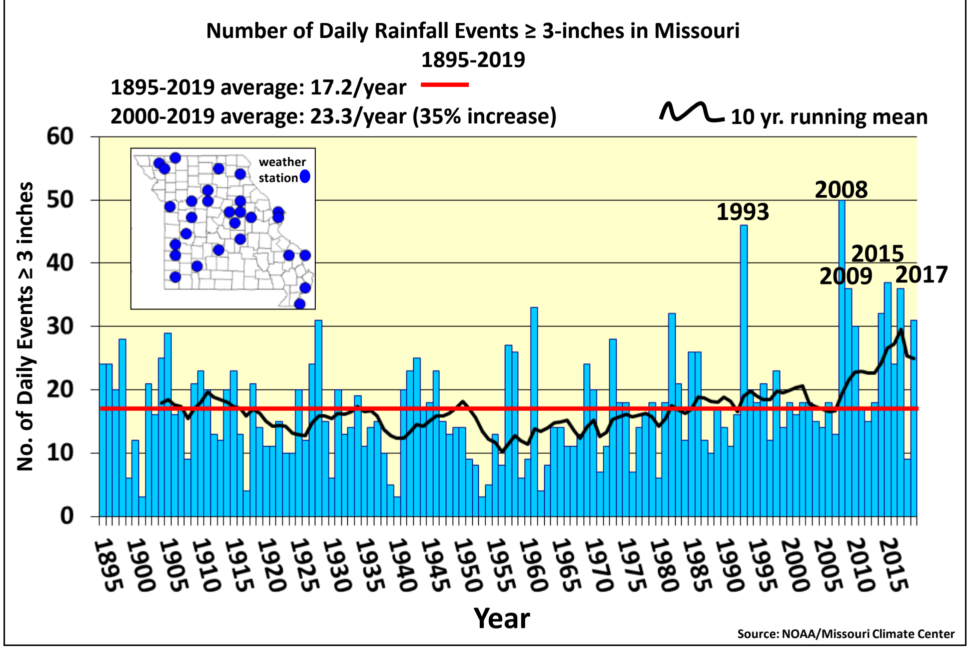
What are the climatic impacts from cooler summer maximum temperatures?
-Fewer days with extreme summer heat, but will this continue???????



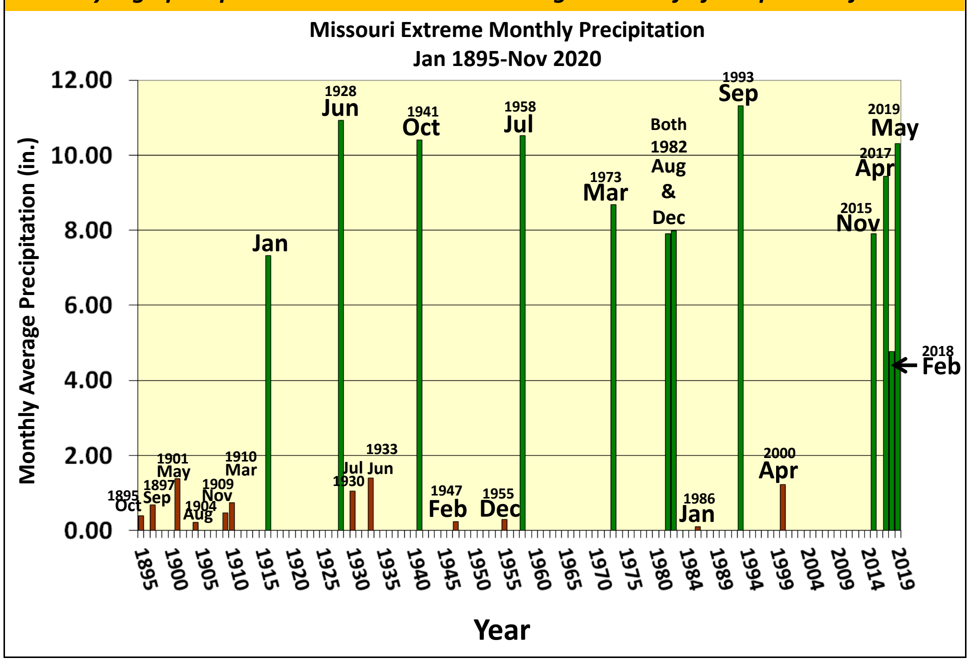

Missouri is experiencing an unprecedented wet period.
Missouri Average Annual Precipitation
(1895-2019)
Long-term average: 40.86”
5 yr. running mean
Average Annual Precipitation (in.)
55.01”
1927
57.14”
1973
56.61”
1993
56.10”
2008
55.52”
2015
1901
1936
1953
1976
1980
Wet Period
Dry Period
Source: NOAA/Missouri Climate Center


Missouri precipitation has been trending wetter all four seasons.
Missouri Average Winter Precipitation
(Dec-Jan-Feb, 1895-2020*)
*The winter of 2019 is defined as Dec 2019 and Jan, Feb 2020
Long-term average: 6.55”
5 yr. running mean
Average Winter Precipitation (in.)
Year
Missouri Average Spring Precipitation
(Mar-Apr-May, 1895-2020)
Long-term average: 12.00”
5 yr. running mean
Average Spring Precipitation (in.)
Year
Missouri Average Summer Precipitation
(Jun-Jul-Aug, 1895-2020)
Long-term average: 12.18”
5 yr. running mean
Average Summer Precipitation (in.)
Year
Missouri Average Autumn Precipitation
(Sep-Oct-Nov, 1895-2019)
Long-term average: 10.17”
5 yr. running mean
Average Autumn Precipitation (in.)
Year
Wet Period
Dry Period
Source: NOAA/Missouri Climate Center

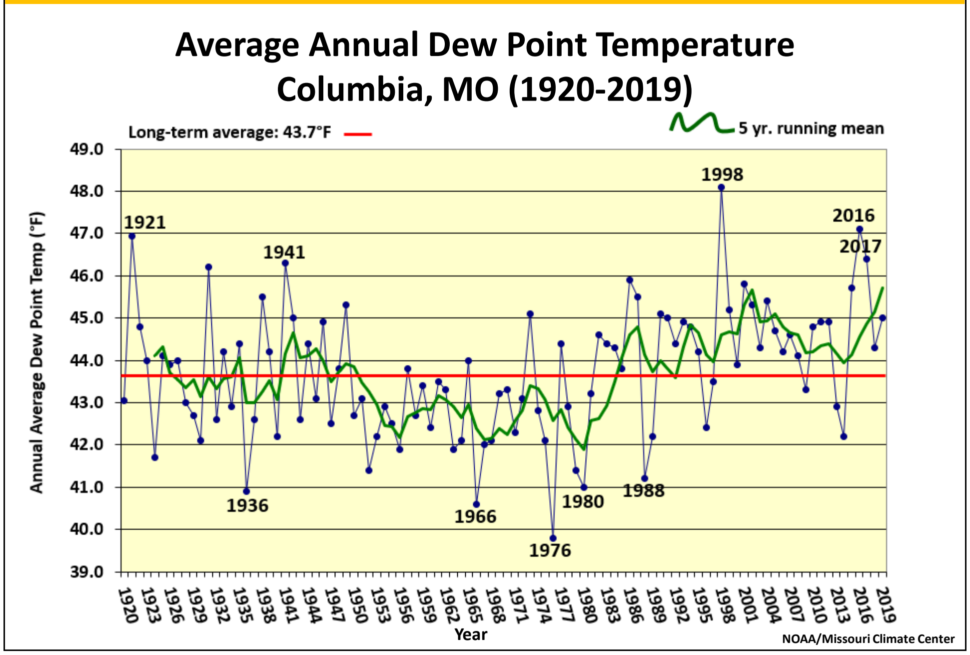
What are the climatic impacts of wetter precipitation trends?
-More extreme precipitation events, more flooding.



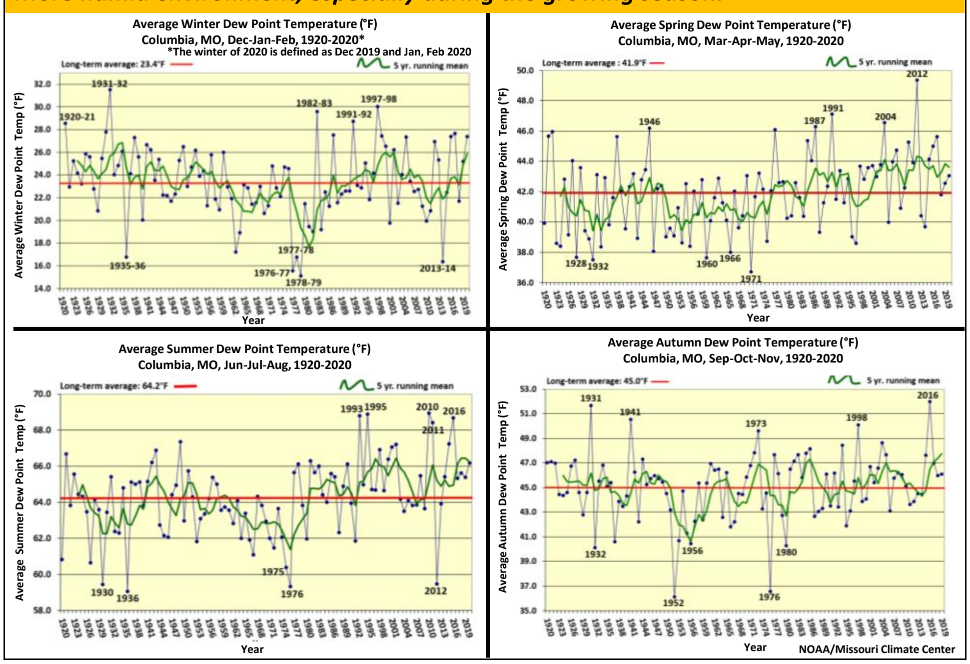
What are the climatic impacts of wetter precipitation trends? *–Breaking more monthly high precip. records than low ones during latter half of the period of record.*



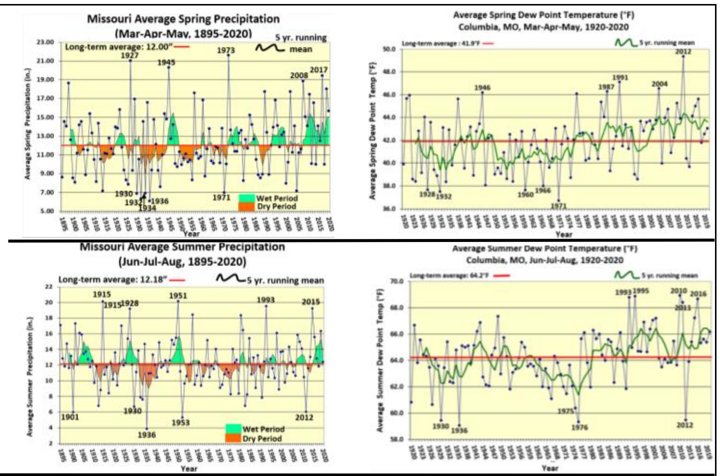
What are the climatic impacts of wetter precipitation trends?
-More humid environment.

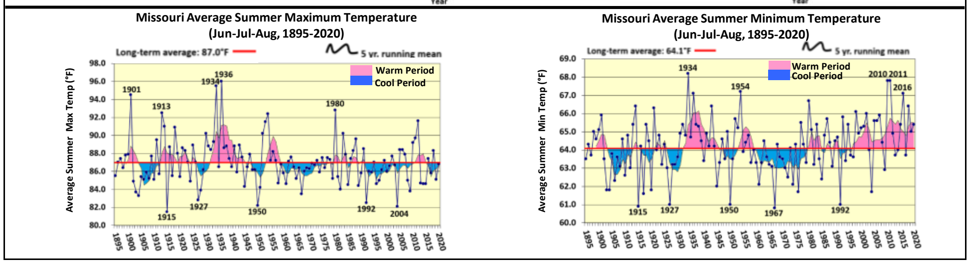


What are the climatic impacts of wetter precipitation trends? -
More humid environment, especially during the growing season.

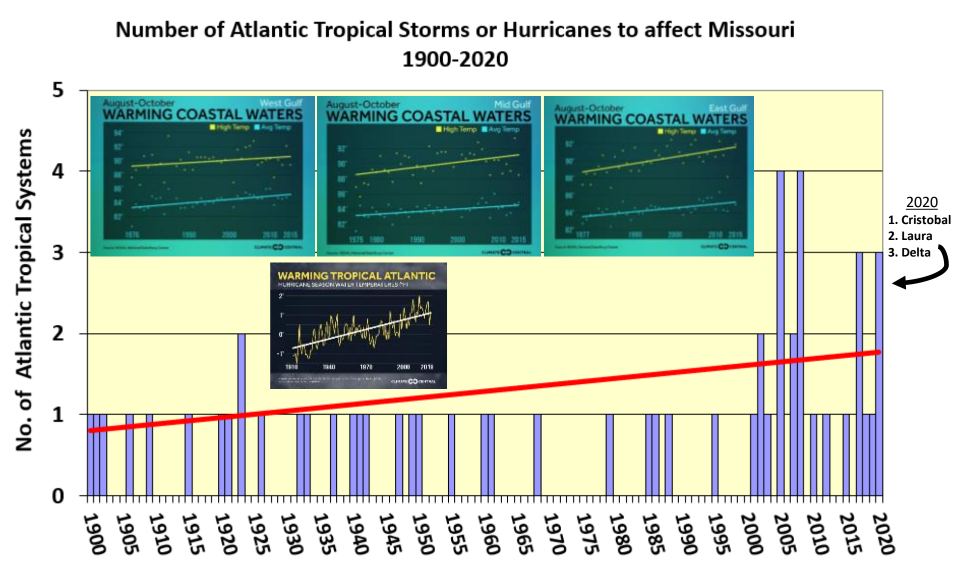


- Wetter seasons have contributed to higher dew points and available soil moisture during the growing season.
- With available soil moisture, more of the sun's energy is used in evaporating water from the soil profile and transpiring water vapor through leaf stomata, i.e. evapotranspiration.
- These efficient processes help to suppress daytime maximum temperatures and elevate nighttime minimum temperatures.





The oceans are warming, including the Tropical Atlantic and Gulf of Mexico, which increases water vapor, and enhances precipitation opportunities.



Note: These are mostly remnants of tropical storms and hurricanes when they moved into Missouri.

Changing Climate Trends in Missouri

Updated through Oct 31, 2020

•Missouri's most recent warm annual temperature trend began in the late 1990's, most notably, since 1998, where 17 out of the past 22 years (77%) have been above normal; 2012 was the warmest year on record. The majority of warming has occurred with minimum temperature.

•Seasonally, Missouri winters and springs have experienced the greatest warming trend; 22 out of the past 32 winters (69%) and 18 out of the past 23 springs (78%) have been above normal.

•The median last spring frost date in Missouri is occurring nearly a week *earlier* over the past 20 years compared to the long-term average.

•Mean temperature trend signals during the summer and autumn have been weaker than winter and spring. Missouri summers have not been exceptionally hot compared to others in the past, ie. 1901, 1934, 1936, 1954 and 1980. The biggest degree of growing season warming has been with minimum temperatures.

•The median first fall frost date in Missouri is occurring about 5 days *later* over the past 20 years compared to the long-term average.

•Dew point temperatures have trended above normal over the past few decades, especially during the growing season. Since 1981, 70% of the years have had above normal dew points for the Jun-Aug period.

Source: NOAA/Missouri Climate Center

Changing Climate Trends in Missouri

Updated through Oct 31, 2020

•Beginning in the early 1980's, and since instrumental records began in 1895, an unprecedented wet period has emerged in Missouri. Since 1981, 24 out of 39 years (62%) have had above normal precipitation.

•Over the past few decades, all 4 seasons have witnessed more above normal precipitation years in Missouri; Snowfall trends have been declining.

•Over the past few decades, Missouri has witnessed an above normal trend in heavy (≥ 1") and extreme (≥ 3") daily precipitation events compared to the long-term average.

•Recent historical trends for Missouri indicate an unprecedented multi-decadal wet period beginning in the early 1980's. Conversely, there have been multi-decadal dry periods, i.e. 1950's and 1960's.

•Extended dry and wet patterns can change abruptly and there are numerous occasions, where Missouri transitioned from one extreme to another in a short period of time.

Source: NOAA/Missouri Climate Center

Missouri 2020 Growing Season Climate Summary

Most of Missouri experienced a favorable growing season in 2020 with the exception of southwestern sections where a localized but intense drought emerged in early summer and persisted through the first half of October, creating adverse conditions and challenges for producers in the region.

The growing season started off cool with April being nearly two degrees below average. There were alternating periods of above and below average temperatures during the month but a majority of below average daily minimum temperatures combined with a much below normal cold spell from Apr 13-17 tipped the scale toward a colder than average month.

Heavier April precipitation totals were reported across southwest, south central and east central Missouri where 4-6 inches were common. Much of northern and west central Missouri received 2-4 inches. Statewide, April precipitation was near normal with an annual statewide average of 3.95 inches.

Two unusual mid-April snow events impacted northern Missouri on April 16-17. The first event impacted far northeastern sections during the morning of the 16th. Accumulations were generally 1-4 inches and occurred mostly on elevated and grassy surfaces. The next snow event occurred the following day and impacted much of northern Missouri with 3-10 inches and heaviest amounts reported on the Missouri-Iowa border.

According to the Missouri Agricultural Statistics Service, for the week ending April 26, corn planting was 25% complete, 21 percentage points behind the 5-year average. Stock water supplies were reported mostly adequate at 94% with 84% of the hay supplies and other roughages adequate and 9% surplus. The majority of pastures, 59%, were in good condition and 29% in fair condition.

Seasonably cool temperatures were the rule in Missouri during May, especially with maximum daily temperatures. The statewide average temperature was 62.0°F, or 2.3° below the long-term average. It was the coolest May since 2002. It was the coolest April-May period since 2008 and only the fifth time since 1998 with below normal temperatures for the two-month period.

Unusually cool minimum temperatures, some at or below freezing, occurred on May 9 and 11 with frost reported in many locations. Lowest temperatures at some locations during these dates were at or below 30°F. Several long-term low temperature records were broken including Columbia (36°F on May 11), Kansas City (34°F on May 9), and Vichy-Rolla (36°F on May 9).

May precipitation was variable across Missouri but averaged above normal for the state. The statewide average May total was 6.22 inches, or 1.45 above the long-term average. May precipitation varied across the Show Me State, ranging from less than 3-inches in some central and west central counties to more than a foot over portions of the Ozarks.

Slow moving upper level lows resulted in extended periods of cloudy weather during the month, especially between May 12-22. Using solar radiation records for Columbia, MO, it was the lowest solar May since 2013.

According to the Missouri Agricultural Statistics Service, as of May 31, 92% of the corn and 49% of the soybean crop had been planted; the 5-year average is 90% and 49%, respectively. The cool, cloudy weather generally benefited pastures with 64% of them reported to be in good to excellent condition.

Above average June temperatures were dominant for Missouri with a statewide average monthly temperature of 75.0°F, or 2.0 degrees above the long-term average. The above average temperatures followed the warm trend over the past several years, where only one June since 2005 has been cooler than average. It was also the first warmer than average month since March.

June precipitation was below average statewide, but highly variable across Missouri, ranging from over 9-inches in far northeastern sections to less than 0.50 inches in the far southwestern corner of the state. The statewide average rainfall total was 3.63 inches, a little more than 1-inch below the long-term average.

An unusual event impacted Missouri on Jun 8-9 when the remnants of an early season tropical storm named Cristobal spiraled northward through the center of Missouri and dropped significant rainfall, ranging from 1-4 inches. It was unusual not only for the time of year but also for the track it made from Louisiana, northward through Missouri, then north-northeastward into the upper Midwest.

Abnormally dry conditions began to emerge as June progressed and was impacting far western sections of the state, especially around the Kansas City area southward to the Arkansas border. A few counties south of St. Louis were also abnormally dry and moderate drought crept into portions of Jasper and Newton Counties, in far southwestern Missouri.

According to the Missouri Agricultural Statistics Service, for the week ending June 28, 7% of the corn was silking compared to a 5-year average of 17%. Soybean was 94% planted, compared to a 5-year average of 86%. Topsoil moisture supplies were rated 77% adequate to surplus and subsoil moisture was rated at 87% adequate to surplus. Corn was rated mostly good to excellent at 68% and soybean was reported at 63% good to excellent. Pasture conditions were mostly good to excellent at 66%. The majority of hay supplies and other roughages were adequate at 97%. Stock water supplies were reported to be in adequate (94%) or surplus (4%) condition.

Above average temperatures impacted Missouri in July a statewide average temperature of 79.1°F, or 1.5° above the long-term average. It was the second consecutive warmer than average month and fifth for the year. Daily temperatures for July were seasonably warm, but not extreme, with highest temperatures reaching the lower 90’s statewide and minimum temperatures staying in the 60’s and 70’s.

July precipitation was above average across the state with the exception of a few areas in southwestern and south central Missouri as well as a few northeastern counties bordering Iowa and the southern tip of the Bootheel. The statewide average July total was 5.84 inches, or 2.02 inches above the long-term average.

Heaviest July rainfall occurred over portions of northwestern, west central and east central Missouri where 5-8 inches were common. Driest conditions were across parts of southern Missouri. An extreme rainfall event in west central Missouri at the end of the month was reported in St. Clair County where a CoCoRaHS observer reported nearly a foot of rain in a 24-hour period.

According to the Missouri Agricultural Statistics Service report from July 26, 2020, 26% of the state reported topsoil moisture supplies in short to very short condition with 71% of the state reporting topsoil moisture in adequate condition. Statewide subsoil condition was reported 21% short to very short, and 78% adequate. Corn, soybean and pasture conditions were reported at 7%, 7%, and 14% in poor to very poor condition, respectively. The majority of corn and soybean were reported in good to excellent condition at 73% and 69%, respectively. The majority of pasture was in good to excellent condition at 53%. The majority of hay and other roughages were adequate to surplus (90%), as well as stock water supplies (92%).

Abnormally dry to moderate drought was impacting all of southwestern Missouri as well as parts of south central Missouri and the southern tip of the Missouri Bootheel, according to the U.S. Drought Monitor map released on July 30, 2020.

Seasonably cool August temperatures impacted Missouri with a statewide average temperature of 74.2°F, or 1.9° below the long-term average. Near to below normal temperatures occurred during the first three weeks of August followed by warmer conditions in the final 10-days, including a few days with high temperatures in the lower and mid-90s.

Daily summer temperatures (Jun-Jul-Aug) this year reflected the overall trend for the past few decades, with no prolonged periods of extreme high temperatures. No triple-digit heat was reported in 2020 and the statewide average summer temperature was 76.1°F, 0.5° above the long-term average. Summer weather patterns over the past several decades indicate little change in maximum temperature trends whereas minimum summer temperatures have been warming. This phenomenon is primarily due to above average summer dew point temperatures in Missouri, which act to suppress maximum air temperature and elevate minimum air temperature.

Drier than average weather impacted Missouri in August with a statewide average of 2.94 inches, 0.76 inches below the long-term average.

Typical of the summer season, August rainfall was highly variable, ranging from less than 0.25 inches to nearly 12-inches. Radar estimates indicated pockets of more than 5-inches in parts of the state and driest areas located in some far northern counties and southwestern sections. Remnants of Hurricane Laura impacted southeastern Missouri on August 28.

According to the U.S. Drought Monitor map, for the week of August 25, 2020, abnormally dry conditions to severe drought was impacting parts of Missouri. Impacts were accumulating, with crop stress, burned-up pastures and decreasing water supplies reported in parts of southwestern Missouri where dry conditions have been ongoing since early June.

According to the Missouri Agricultural Statistics Service report for the week ending August 31, 2020, 64% of the state reported topsoil moisture supplies in adequate condition with 1% surplus, whereas 31% of Missouri reported short topsoil moisture supply and 4% very short. Subsoil moisture supplies were reported 69% adequate and 0% in surplus condition compared to 29% of the state reporting subsoil moisture supplies short and 2% very short. Corn was reported 77% in good to excellent condition compared to 38% last year. Soybean was reported 75% in good to excellent condition compared to 46% last year. Pastures were rated at 55% in good to excellent condition compared to 70% last year. Hay and other roughages were 87% adequate to surplus compared to 84% last year. Stock water supplies were 91% adequate and 9% short.

Mostly pleasant late-summer, early fall-like temperatures occurred during September with a statewide average temperature of 67.1°F, or 1.2 degrees below the long-term average. Drier than average conditions prevailed during the month with an average statewide total of 3.08 inches, 0.99 inches below the long-term average. September rainfall, however, was highly variable across Missouri with highest amounts occurring over parts of west central, central, north central, northeast and far southeastern Missouri and a dry corridor extending from east central to southwestern Missouri, generally paralleling I-44. Another area of dryness was found in far northwestern Missouri.

The U.S. Drought Monitor map for September 29, 2020 showed portions of Missouri experiencing abnormally dry conditions to severe drought. Driest conditions were located in southwestern Missouri where some counties experienced dry weather for much of the summer. Agricultural and hydrological impacts in southwestern Missouri were mounting, ranging from poor crop yields, burned-up pastures, and dry springs, creeks and ponds. Some ranchers were hauling water, but the big concern was whether hay supplies would last into next spring.

According to the Missouri Agricultural Statistics Service, as of September 28, 2020, the majority of the corn crop was in good to excellent condition at 62% and 18%, respectively. Remaining corn conditions this year were 16% fair, 3% poor and 1% very poor. Corn harvest was behind schedule at 21% compared to the 5-year average of 41%. The majority of the soybean crop this year was also reported in good (61%) to excellent (20%) condition compared to 44% good and 6% excellent at the same time last year.

The majority of hay and roughages were adequate (76%) to surplus (14%) this year with 7% short and 3% very short. Stock water supplies were mostly adequate at 91%, with 8% short and 1% very short. The majority of pastures were reported in good (47%) to excellent (7%) condition while 12% were in poor or very poor condition. The majority of topsoil moisture conditions were adequate (73%) and 0% surplus while 24% were reported short and 3% very short. The majority of subsoil moisture conditions were also reported to be adequate (76%) to surplus (0%) with 21% short and 3% very short.

A couple frosty mornings occurred during the first week of October over parts of Missouri, with a few locations in northern sections and the eastern Ozarks dropping into the upper 20's and lower 30s. Overall, however, weather conditions were seasonably mild and dry during the first half of the month. A major pattern change occurred mid-month and much cooler and wetter weather dominated the rest of October. Most locations, with the exception of the Missouri Bootheel and dense urban population centers, experienced their first fall freeze by the morning of October 16, effectively bringing an end to the growing season. The statewide average October temperature was 3.5 degrees below the long-term average.

The statewide average precipitation total for October was around 3.5 inches, near the long-term average. However, precipitation was highly variable and the majority of it fell during the latter half of the month. Monthly amounts ranged from 0.50 to 1.5 inches across the northern third of the state, 1.5 to 4.5 inches over the central third, and 4.5 to 8.0 inches over the southern third of Missouri. A few southern counties reported more than 9-inches including locations in Taney, Douglas, Scott and Mississippi Counties.

Excellent harvest weather during the first couple weeks of October transitioned to limited opportunities for crop dry-down and harvest with the cool, wet conditions during the latter half of the month. Crop harvest was running slightly behind normal by the end of October. According to the Missouri Agricultural Statistics Service, for the week ending November 2, corn and soybean harvest was 80% and 60% complete, respectively; 7 percentage points behind the 5-year average for both crops. The majority of topsoil and subsoil moisture conditions were reported adequate at 69% and 68%, respectively. Hay supplies were mostly adequate (73%) to surplus (10%) with only 13% reported short to 4% very short. Stock water supplies were mostly adequate (81%).

It's important to note that wetter conditions in drought-affected southwestern Missouri mitigated water supply concerns during the last couple weeks of October but the rainfall came too late for renewed grass growth and concerns remained with availability of livestock winter feed supplies.

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Four Season Pasture Management

In most of Southern Missouri, managing forage for a cow/calf operation means managing KY31 endophyte infected fescue. KY31 fescue is not a native grass to the Ozarks - but it sure thinks it is! Since we no longer make hay, our challenge in managing forage year round is how do we graze to best utilize what grows on our place without a lot of added inputs. The cow/calf business is rarely so profitable as to allow a lot of money to be thrown at problems, so the challenge is to work with what forages the farm produces, and a lot of that forage is KY31 fescue. Our forage management plan is to breed and graze animals that fit the farms' grass and climate, and to learn to manage the grazing so the cattle are able to utilize those forages well enough to be profitable.

Since having a calf to sell every year is a cow's most important trait for profitability it's necessary for the cows to calve and breed back quickly every year on the forage we grow under our grazing management. Our yearlings are kept to utilize the spring flush of grass and take advantage of the compensatory gain available before selling them as feeder cattle to be grass finished elsewhere. The stockers need to grow well, but they are not on forage that has them growing to their maximum potential (annuals, alfalfa, etc.) but rather excess grass that varies in quality according to the year. We don't look for "holy cow" weaning and yearling weights but optimal and adequate weaning and yearling weights that can be accomplished with nothing more than good grass and good management and will vary from year to year depending on growing conditions.

Twenty years ago, when we ceased to put up hay on our farm, we saw my greatest fear and enemy rear its ugly head - seed heads - as well as out of control grass growth! We had always managed with the idea to keep the forage vegatative and seed head free for as long as possible. However, once we quit making hay on our farm and despite using practices geared to give us more mouths to graze in spring, we found we still couldn't control the excess growth. With so many more acres to graze we found ourselves grazing many paddocks the second time through in the spring that were much taller than we were accustomed to seeing. What was really odd is the train didn't come off the tracks when the cows grazed this taller forage - in fact they seemed to prefer it, and showed this preference with the contentment we often lacked when grazing shorter, tighter rotations where the cows often met me at the gate, bawling, to be moved. This observation led us to question our grazing management, and with time, to reset our idea of what pasture should look like when we turn cows in to graze.

What we found necessary was to change our "grass eye" and become used to working with a different height and growth level of grass. When one is used to turning in livestock at 6-8" tall and pulling them out at 2-3", it becomes a bit of a shock to wait until the forage is 10-20" tall to turn them in, and to move them off the grass at the height at which you are used to turning them in to graze. It's a reset, and both our eyes and our minds have difficulty with changes like this. With time, we began to see some real benefits from this "taller grazing" and now strive to be grazing grass tall and leaving plenty of grass behind. The benefits we've seen are not only to the cows, but to the grass, soil and wildlife on the farm. Benefits include:

- Moisture retention: Not only capturing and keeping more rainfall, but when it's dry, it's amazing how much the shading of the soil and retention of heavy dews by tall grass helps to keep soil moist.
- Digestion: Cows rarely have the high protein "rocket blast" type of manure we used to see in spring grazing. Cattle are content.
- Wildlife: Birdlife has increased dramatically - even on fescue based pastures, we see prairie birds like Dicksessels, Bobolinks and Meadowlarks.

- Diversity: We don't know all the variables that go into creating a diverse paddock, but do know that since we went to taller grazing, the diversity has increased.
- Longer Growing Season: The pastures seem to stay much greener going into winter and begin growing earlier in the year than they used to do. This may be because the taller grazing is beneficial to the soil life and allows it to stay active later and earlier in the year with it's protective cover.

We find a combination of leaving plenty of residual grass behind and moving cattle every day are the keys to keeping our grass growth humming. Our motto is, "it takes grass to make grass"

Season by season grazing. You will notice I use the word "strive" quite a bit in the following description of our grazing. We always start the year with the "perfect plan" - then manage the reality of a business that has a lot of variables throughout the year.

Spring:

This is the time of year that we have the least control of the forage and also the time of year that often makes the most difference in the financial results for our farm, as most of the pounds gained by stockers and the pregnancy rate of the cows is determined by how well we manage the spring flush of grass.

We strive to manage the abundant spring growth so that cows put on weight before and after calving and into the breeding season, to ensure a high breed back percentage in a short breeding season. We also want to put as much weight on stocker calves as possible, using only the spring flush of grass and grazing management, before we hit the usual flattening forage growth curve of summer.

Early spring we always hope to have the cattle grazing forage stockpiled from the year before. We also aim to set up a sequence for spring grazing with a grazing plan in the fall that allows both good fall tillering and a remaining height (6-12") that allows the grass to grow quickly in the spring. We then are grazing taller plants (8-12") as we move through the paddocks in the spring.

Our cows calve in a short window between mid-April and the end of May, and during this time we continue to move the herd daily, but at fairly low densities (20-30,000# per acre per day). This allows the cows to graze the upper part of the grasses but also leaves a fairly large amount of grass behind. Grazing in this lax manner gives the cows the very best nutrition and allows them to gain weight even after calving and going into breeding season. We are also grazing the stockers at similar densities during this period which allows them to "cream" the best. We are trying to take advantage of the high quality grass and move the cattle quickly over the whole farm before the grass goes to reproduction.

We also wonder if the increase we see in summer annual forbs and grasses, as well as orchard grass, brome and other cool season grasses, may be because they are better able to compete against the KY 31 fescue if given a chance to grow taller, rather than when we grazed much shorter and tighter. However, there are times, either by plan or error, where we will graze shorter, and we think this may help seeds of other plants, besides fescue, to germinate and compete. If planned this will be done in the early part of the grazing season before the heat and sun of summer will dry out soil without enough protective cover.

When we first started grazing the whole farm after we quit haying, and we had so much grass ahead of the cows in the spring, we found if we didn't graze all the acres at that time, the grass we missed went into reproduction and produced poorly, and was, of course, of very poor quality. So while we graze taller, we do want the first grazing of the grass in each paddock to be well before it reaches reproduction. As we transitioned to taller grazing, we saw unexpected accelerated growth and lack of seed heads in certain pastures that we couldn't explain. While reading a chapter in Jim Howell's book "For Love of Land", I came across Dr. Lewellyn Manske's 30 years of research on cool season grass growth.

Dr. Lewellyn Manske research (https://www.grassfednetwork.com/manske-july-2011/) indicated that taking 25-30% of the leaves on first grazing (after grasses reaches 3 1/2 leaf to flowering) stimulates new tillers and compensatory growth as well as suppressing seed head production and gave us some answers to what we observed in our own paddocks..

Dr. Manske calls this **"Defoliation Resistance Mechanisms"**

"The compensatory physiological processes within grass tillers are activated following partial defoliation at phenological growth stages between the three and a half new leaf stage and the flower stage

Grass plants are known to exudate sugars, amino acids, glycosides, and other compounds through the roots into the soil. Partial defoliation at vegetative growth stages causes greater quantities of grass plant exudates to be released into the narrow zone of soil surrounding living roots. I have discovered that when grass tillers were partially defoliated between the three and a half new leaf stage and the flower stage, the rhizosphere volume increases greatly."

Further, my understanding of this concept is defoliating a third or less of the plant at this stage of spring growth allows the plant to increase it's new tillers by reducing the amount of a hormone, auxin, in the lead tiller, which allows the growth hormone cytokinin to activate and stimulate new tillers and helps to delay the plant from going to reproduction. At the same time, this increases the rhizosphere activity that helps to feed and allow more growth for the new tillers.

Summer:

We turn bulls in for 42 days in July-August and expect 90-95% of the cows to breed at this time. If we were grazing strictly infected KY31 fescue and clover in July and August, those expectations would be unrealistic. Though we have selected for heat and fescue tolerant cattle for almost 25 years, we have found it takes both adapted cows and alternative grasses and forbs to help dilute the effects of fescue for this summer breeding management practice to work well. We rely a lot on diversity growing in our cool season pastures for summer grazing and we refer to our summer grazing as "grazing fescue without grazing fescue". Moving the herd daily ensures matching cows to acres so the cattle don't have to eat much fescue - instead grazing the diversity of grasses and forbs in the sward and more or less trampling the fescue. It's not hard to keep them from eating fescue as it's always on the bottom of the list of preferred eating at this time of year. We think our cattle learn to eat bitter or high tannin forbes because when the choice is midsummer toxic fescue or a weed high in tannin, they *learn* to like tannins.

The diversity of forages in our paddocks will include:

- Johnsongrass - We love it almost as much as the cows! Seems to thrive in our fescue based pastures. We have had no problems with it in the ten years since it began showing up in our paddocks.
- Red Clover
- Lespedeza

- Giant Ragweed - A native in the sunflower family and is much different than the Lanceleaf or Common ragweed. Giant Ragweed is a good forage to have in the summer.
- Bromegrass - We never overseeded or planted brome but it's showing up regularly in some of our pastures.
- Chicory - Ours is native and in some of our grazing cells it's abundant. Very palatable before flowering and can provide a lot of grazing. High in vitamins and minerals.
- Broadleaf Plantain - Native herb with very large leaves in the spring. First thing cows will graze in a new paddock. Much bigger than the Buckhorn plantain (toe stubbers).
- Matua Bromegrass - when we overseed red clover and lespedeza we often include Matua Brome. It's an extremely palatable grass, greens up early and makes lots of seed. Also helps control the flow of the smaller seeds through the broadcast seeder.

We're not sure what management practices have had the biggest effect on the diversity we often see in the summer pasture, but it seems all of them may contribute. We don't apply fertilizer, and consider our hay purchases as our added fertility program. We graze taller and think this may be allowing other grasses/forbes to compete well with KY31 - but then at times, when we go a long time on a paddock without ever taking it down shorter, we see KY31 come back to dominating the mix. The challenge for a grazier is that because we are dealing with biology and there are so many variables, it's difficult to ever be set in one's conclusions.

Native Warm Season grasses- Natives would seem to be an answer for much of our toughest management problems, those being summer and early fall. While we have about 40 acres of natives and are converting another 70 acres, it really is something we wish we had done years ago. Running high stocking rates has made it difficult to pull acres out of production for the conversions, and yet we think the long term return from native grasses would offset the short term loss of revenue from lower sales during the time of conversion. A case of short term goals overriding long term goals and vision.

Fall:

Early fall is often our toughest grazing season and we have not had great success with any of our management decisions. Often, the annual warm season grasses and forbs are finished growing and the fescue, along with its endophyte and ergovaline, is starting to come to life again and dominate the mix making it tough for the cows to find much diversity. On top of that, if it rains and the fescue and other cool season grasses become very lush, we see cows doing poorly on what looks like perfect, lucious fall grass, which may be caused by too much non-protein nitrogen.
https://forages.oregonstate.edu/regrowth/how-does-grass-regrow/management-scenarios/can-pastures-be-too-lush

Something we have recently tried is to full feed hay during the early fall season, sometimes for all of September. We hope to avoid some of the problems mentioned before - high levels of the ergovaline in the fescue and NPN. But we think most importantly, by feeding hay during this time we are allowing fall grasses to grow as much as possible for both increased forage in the late fall and winter and to ensure the grasses have a chance to tiller well heading into winter. This also allows us a better opportunity to start a fall grazing wedge that will then become the spring grazing wedge by having adequate fall regrowth. We want to have plenty of grass for spring grazing so that we are not grazing short, new growth grass, but instead grazing a mix with taller, higher quality, better balanced (protein to energy) forage with at least 6"-12" of leaves already in place.

Winter:

In an ideal world, we would be grazing stockpiled fescue all winter. It's fairly easy to do in the Ozarks if you have enough stockpile and flexibility in your stocking numbers. When we leased ground, we managed at least one winter with no hay fed at all. However, we find on owned ground we often make more net income by running a higher stocking rate and buying hay for winter to offset and even out the ups and downs of a grazing year. However, purchased hay is our largest expense and one we really need to keep in balance with the higher stocking rates in order to be profitable. This expense definitely has a tipping point where, if wrong decisions are made, it can wipe out profitability.

We plan for most of the stocker cattle to be gone by August, which lowers our fall stocking rate and allows longer rotations. We drop some of the paddocks out of the rotations completely, and, as mentioned previously, have recently been feeding hay in September to allow more fall growth for stockpiling. If we have sufficient early fall rains, this works well. Come December when fall growth slows down, we calculate how much stockpile/grazing we have for winter and early spring and feed hay accordingly. We try to avoid grazing until we run out of grass. So, in December if we calculate we have 60 days of stockpile, we will feed hay in January/February, even with 60 days of stockpile left, in order to save the stockpile for February through March and early April. It seems cattle almost always do better grazing than they do eating hay, so we would prefer to feed hay early and have the cows grazing stockpile in March and April, when their nutritional needs are higher.

Our winter grazing is highly dependent on fickle fall rains and in 5 out of the last 6 years we have missed early fall rains, which has cut back our stockpiled winter feed and forced us to feed more hay than budgeted- decreasing our net income. Since this seems less like happenstance and more like a pattern, we are making some adjustments in stocking rate - lowering our cow numbers and bringing in more stockers in late winter to run with our home raised yearlings to graze through July and August before being sold. We are also thinking we may need to begin dropping paddocks out of the rotation earlier to begin stockpiling. Maybe even start stockpiling in June instead of waiting for August - which may lower the quality of the stockpile for winter grazing but our cows don't begin calving until the 2nd week of April, so their winter nutritional needs are lower. We are more interested in quantity than quality in January and February.

A new practice we have been trying for the last few years is bale grazing. Our stockpile is low this year so we will feed one half to one third of the needed DM for the cows as hay, while the rest will come from grazing the stockpile. It's an attempt to stretch out our grass and better balance either low quality hay or low quality stockpile. If the stockpile is high quality, we feed our lower quality hay and vice versa.

So in the end our goals are pretty simple - to breed animals adapted to our farm and forage, and for us to be constantly trying to learn how best to manage the grazing so the cows can utilize the forages well enough to be profitable.

You'll find more information on some of these topics at the following links.

Dr. Lewellyn Manske
https://www.ag.ndsu.edu/dickinsonrec/grazing-handbook-files/4015-part-3-web.pdf

Abe Collins - grazing taller -

https://rodaleinstitute.org/blog/grazing-taller/

Jim Howell = For Love of Land. https://www.goodreads.com/book/show/10794746-for-the-love-of-land

Non Protein Nitrogen causes problems in lush cool season grasses.
https://aces.illinois.edu/news/lush-green-grass-presents-nutritional-challenges-cattle

MIKE MEIER – YEAR-ROUND GRAZING

MONETT, MO

I am a fourth-generation dairy farmer from Monett, MO. My wife, Janan, and I originally bought into the family farm in 1980 and gained additional ownership from my brother in 1986. In 2000 we bought out my father with his retirement. The dairy operation underwent a change in 2006, switching from confinement to intensive grass-based grazing. The original plan was to liquidate the dairy while I ramped up the Rhino Liner business. Before this occurred, I attended a grazing school sponsored by NRCS and University of Missouri Extension. I was also closely watching the MU grazing dairy at the Southwest Center. Before liquidating the cows, I thought I would give management grazing a shot. In a few short months, my wife asked what happened as we were current on our feed bill. The rest is history and the farm continued toward a lower input system with the goal of maximizing pasture intake and grain feeding levels at 8-10 pounds per cow. Changes included the breeding program with the dairy operation being fully seasonal spring calving in 2008. The system has worked extremely well.

After 41 years in the dairy business I was ready to have more time for other things so I set up a five-year plan to exit the dairy business. Five years ago, we started AI breeding the dairy herd to Angus bulls and have built a beef cow herd from the resulting replacements. The plan culminated in our selling the milking herd in 2020. We are currently operating a cow/calf operation using the same grazing system previously used for the dairy. Additionally, we are developing a small herd of Wagyu cattle for a specialized market. We plan to continue on with the things we have learned about intensive grazing that have been so successful, applying them to the beef herd.

Our farm's grazing platform consists of 240 acres divided into 35 grazing cells plus an additional 7 cells on adjacent rented ground. The pastures have historically consisted of a mix of annual and perennial forage species. We have maintained 60% of the paddocks in cool season perennial grasses (ryegrass and novel endophyte fescue), and 40% in annuals. Acres devoted to annuals are double cropped utilizing a mix of wheat and barley for late fall and spring grazing, followed in the summer months with Red River Crabgrass.

The mix of forages used in our operation has proven to work very well for evening out forage availability throughout the grazing season. The first grazing of the year will come from the wheat and barley. Most years we are grazing by April 1 the perennial species of ryegrass and fescue. The small grains are utilized during early spring then perennial species are introduced into the rotation as they develop adequate dry matter cover for grazing. I should mention here that all pastures are monitored for growth and available cover through use of a plate meter or PaddockTrac with an associated grazing wedge developed with the University of Missouri Grazing Wedge tool. This technology allows us to take the guess work out of determining the order of paddock utilization. It is also useful in planning nitrogen applications and identifying paddocks to drop from the rotation for mechanical harvest. These tools allow me to measure-monitor and management and take much of the guess work out of the operation. It allows me to be proactive rather than reactive.

Cool season perennial pastures are comprised of perennial ryegrass and fescue.

Crabgrass provides the bulk of summertime grazing.

As spring progresses, perennial grasses grow more rapidly and are used more heavily. Perennial ryegrass produces more growth earlier in the season, while Tall Fescue is more productive into early summer. When the small grains mature and become less useful (sometime in May) these paddocks are drilled to Red River Crabgrass. Perennials are the main focus between sowing crabgrass and the time required for the crabgrass to grow enough cover for grazing (about June 1).

Crabgrass provides the bulk of our grazing during the months of June, July, and August. It grows rapidly and is very productive as long as we receive adequate rainfall. If soil moisture becomes an issue during summer, we have the option to irrigate our crabgrass paddocks. Our water source is the dairy lagoon. Irrigation water is applied through a K-Line irrigation system. We can store We can store enough water in the lagoon to irrigate 25 acres with up to five inches of water per year. Our irrigation capabilities prove to be very beneficial for balancing forage availability during drought prone summer months.

Crabgrass productivity begins to wane in late August so these paddocks are drilled back to wheat and barley about September 1. At this point perennials have accumulated some dry matter forage cover and are beginning to grow more rapidly as weather cools and we hopefully start receiving some fall rain. The perennials will provide the bulk of grazing during early fall. With adequate fall moisture, we will be able to accumulate some stockpile on some of these acres. By October 10, the goal is to start supplementing perennial pastures with the wheat and barley. Most years we will have adequate available forage to graze at least until early December. The overall goal is to try and balance livestock forage demand with forage growth rate. We accomplish this by using different species as described above.

The system I have described has worked very well for our dairy operation. The 2021 grazing season will be the first that we make a complete switch from milk cows to beef cows. The dairy operation was able to sustain 1 dairy cow weighing 1250 pounds per acre. This included the supplementation of 8-10 pounds of grain per cow per day throughout the growing season. We are still trying to find the sweet spot on stocking rate for the beef herd, but I think we will be somewhere between 800 to 1000 pounds per acre or 1.25 acres per cow-calf unit. I realize that this is a relatively aggressive goal. At this stocking rate we will not be able to graze as far into the winter as is the case on many farms but should be able to produce more beef per acre. I should note that while our goal is not to be a hay producer, we do monitor pasture growth and bale excess production at a stage that optimizes yield and quality. This hay will be used for winter feed and is supplemented as needed with purchased hay.

In summary, our goal is to keep the cows fed throughout the growing season, optimizing forage quality, yield, and pounds of beef per acre. We want to accomplish this by pushing for a high level of productivity while maintaining a high percentage of animal intake through grazed forage.

Matching Cow Size to Forage Resources[1]

David Lalman*, Amanda Holder†, Emma Briggs† and Mikayla Moore†

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†Graduate Research Assistant
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Introduction

Refining production efficiency and resource utilization in the beef industry is a challenge. Genetic changes that improve beef carcass yield or post-weaning performance may increase ranch income through increased weaned calf value and (or) improved post-weaning performance and carcass value. At the same time, continued selection for growth rate, carcass weight, and milk production could be leading to increased annual carrying costs in the beef cow enterprise. In most breeds, aggressive selection for growth continues and mature size continues to climb at a gradual rate. Similarly, selection for increased milk production is apparent in some breeds. These are indications that either the value of increased production is greater than potential change in input costs or the impact of increased output (growth or milk) on production cost is unknown.

Post-weaning growth, carcass weight, and carcass value has improved dramatically in the U.S. cattle industry over the past 30 years. During the same period, overall weaning rate and pounds of calf weaned per cow exposed to breeding the previous year have not improved (Lalman et al., 2016). At the same time, it is apparent that the ranch environment may limit expression of genetic potential for growth at weaning time in some regions of the country (Lalman et al, 2019). These observations indicate a need for profit-minded commercial cow/calf enterprises to a) maintain good records and evaluate their own trend over time in these key metrics, b) shift focus to controlling cow herd input costs, and (or) c) work to capture increased post-weaning value through marketing or some form of retained ownership.

Generally, commercial cow/calf enterprises manage their operations to minimize reproductive failure. An abundance of research indicates that body composition during gestation and early lactation has an impact on post-partum interval and overall pregnancy rate. Therefore, gradual increases in nutrient requirements associated with cow size, milk production, or growth rate may be offset over time by a gradual increase in input costs in an attempt to maintain body composition and therefore, overall reproductive rate. A mismatch is not easily identified. For example, ranchers cannot measure and track the trend in annual forage consumption of their beef cows. The long-held strategy of culling females that fail reproductively is probably the most practical method to improve on the match of cows to forage resources. However, consideration of future genetics (purchased through herd sires), provides the best opportunity to reduce the frequency of these failures over time.

[1]This work is supported by the Dr. Kenneth and Caroline McDonald Eng Foundation, the Oklahoma Agricultural Experiment Station and USDA National Institute of Food and Agriculture, Hatch project number 1016156

Cow Size

Consider that each 100 pounds of additional mature cow weight requires about 600 pounds of additional high-quality grass hay or moderate quality grazed forage to maintain their body weight and condition (NASEM, 2016). Consequently, feed costs, forage requirements, and ultimately ranch stocking capacity will be impacted by mature cow size. In an attempt to quantify the relationship of mature cow weight to calf weaning weight in commercial cow/calf operations, our group evaluated 3,041 records collected from 3 different operations (Bir et al., 2018). In the data set, cow weights ranged from 635 to 1,922 pounds and calf weaning weight ranged from 270 pounds to 775 pounds.

First, there was not a strong relationship between cow size and calf weaning weight (Figure 1). In other words, there was a lot of variation in weaning weight and cow size explained only a small portion of this variation. Perhaps this is a good time to point out that in almost any cow herd there will be small cows that are individually efficient (relatively high weaning weight for their mature size) and there are large cows that are individually efficient. After all, using mature size is an indirect attempt to estimate relative annual forage consumption. While there is a positive relationship between mature size and feed intake (NASEM, 2016), there will be substantial variation that is not explained by mature weight. Obviously, mature weight is a trait that is easily measured whereas mature cow forage intake is difficult and expensive to measure.

Although the relationship of cow weight to calf weaning weight was not strong, it was statistically significant and positive. It was determined that for each 100 pounds of additional cow weight, calf weaning weight increased by an average of 6.7 pounds. Arkansas data published in 2016 (Beck et al. 2016) indicated that this relationship was 19 pounds for each 100 pounds of additional cow weight and more recent data from North Dakota (Ringwall, 2017) documented a 28-pound increase in calf weaning weight. Climate and management practices likely have substantial impact on this relationship. We suspect, without solid evidence, cows in a challenging environment will wean less calf weight per added 100 pounds of cow weight, perhaps closer to 6 pounds. In less restrictive environments the relationship will likely be at the upper end or closer to 28+ pounds per 100 pounds of added cow weight. “Less restrictive” can be interpreted as higher quality, more abundant forage throughout the growing season, lower stocking rate (allowing the cattle to select a better quality diet), more harvested forage feeding, more supplementation, more winter annual grazing, less heat or cold stress, less parasite exposure and so on.

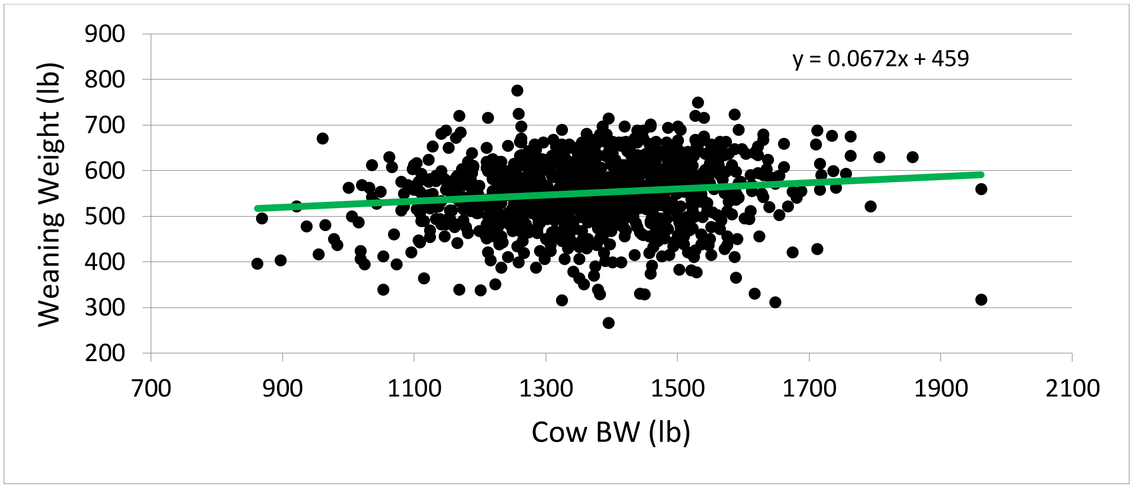

Figure 1. Relationship of mature cow weight to calf weaning weight in commercial beef cow/calf operations (Bir et al., 2018).

Based on the evidence available; it appears that each additional 100 pounds of cow weight generates about $6 to $35 of added calf income depending on the calf market. However, in a 2011 study, the addition of each 100 pounds of cow weight cost an additional $42 due to increased feed costs and grazing land required (Doye and Lalman, 2011). To take this a step farther, in several published economic evaluations of varying cow size and a given land resource, smaller and moderate cows have a financial advantage for three primary reasons: 1) higher stocking rates for smaller cows result in more pounds weaned per acre; 2) lighter calves sell for a higher price per cwt; and 3) the increased revenue from added weaning weights do not offset the higher feed costs of larger cows.

Producers are encouraged to consider evaluating this simple relationship in their own operation. A lower response to cow weight suggests that moderate cow size would be a better match for their environment and management system. Some may find a greater calf weaning weight response to cow weight. In that case, given modest grazing and feed cost, larger cows may be a better match.

Items 2 and 3 in the list above assume little to no market discount for smaller-frame calves that may have lower growth rate and likely have lighter carcass weights. Feed efficiency, carcass weight and quality grade are major drivers in post-weaning enterprise profitability. Therefore, post-weaning performance and carcass quality should not be ignored. Multi-trait selection indexes are designed to simplify these decisions. These indexes consider both the input (cost) contribution related to cow size as well as the output (income) contribution of greater genetic potential for post-weaning gain, feed efficiency and carcass weight.

Larger mature cow size generates more cull cow income, and this is considered in previously mentioned economic evaluations. One factor often overlooked when crediting larger cows with increased cull income is the original cost of the added weight. It is not free. For example, comparing 1,100-pound cows to 1,400-pound cows and a $60 per cwt cull cow price, 1,400-pound cows generate an additional $180 at culling time. However, the additional 300 pounds of growth required additional nutrients through the development stages and about 6 to 7 years of age when they finally reach their mature weight. While forage is generally the cheapest feed resource on a ranch, the conversion of forage (even high-quality forage) to cow weight gain is very poor. Consequently, the increased cull cow income will be substantially offset by the economic cost of developing or growing the added cow weight.

Milk

Milk EPDs are reflective of genetic potential for milk production and weaning weight associated with level of dam's milk and her mothering ability (Diaz et al., 1992; Marston et al., 1992; Mallinckrodt et al., 1993). However, there is a limit to the amount of milk that forage or grazing systems can support (Brown et al., 2005; Edwards et al., 2017). Therefore, it is important to consider the relative contribution of milk to calf weaning weight and the cost associated with producing the milk.

In the latest *Nutrient Requirements of Beef Cattle* publication (NASEM, 2016) the committee reviewed the literature and suggested that increased genetic capacity for milk and growth are positively related to maintenance energy requirements. Most of the work related to this issue was completed 30 to 40 years ago. With substantial changes in genetic potential for numerous traits, it seemed wise to revisit this fundamental nutritional concept. In fact, our cow/calf research group has been looking into this concept over the past few years. We have more work to do before we can say for sure, but at this time, it does not appear that this concept holds. Our preliminary data suggests that maintenance requirements for high-output cows are about the same as maintenance requirements for low-output cows.

When beef cows are fed a high-quality diet or allowed to graze high-quality forage, not all the feed energy consumed is partitioned to milk production. Some of it goes to replenish maternal tissue. In fact, anytime a lactating beef cow consumes energy beyond the amount required to maintain her body weight, part of the added energy is used to increase milk production and part of it is used to gain weight. This assumes that milk yield is not already at maximum genetic capacity when the cow is at maintenance. In one of our recent projects (Spencer et al., 2017), we have shown that the proportion of energy partitioned to maternal tissue increases with increasing feed energy intake (up to about a third of the added energy; Fig. 1). This effectively reduces the efficiency of added feed energy for added milk production.

The cow herd used in the experiment shown in Fig. 1 has a peak milk yield of about 31 pounds per day during early lactation. This project was conducted during the last 100 days of lactation when average milk yield would be declining. Even so, milk yield in these high-producing cows was highly sensitive to increased energy availability. Few ranch environments relying strictly on grazing resources would be able to sustain the highest energy level used in this experiment for more than a few weeks each year. Weight and condition loss between calving and weaning is a good indication that the animal's maintenance energy requirement and (or) genetic capacity for milk production is beyond the capability of the grazing resource. If cows gain substantial weight and body condition during lactation, then the implication is that either a) more genetic potential for milk production is justified or b) stocking rate could be increased, thereby increasing income per acre and effectively lowering the quality of forage consumed.

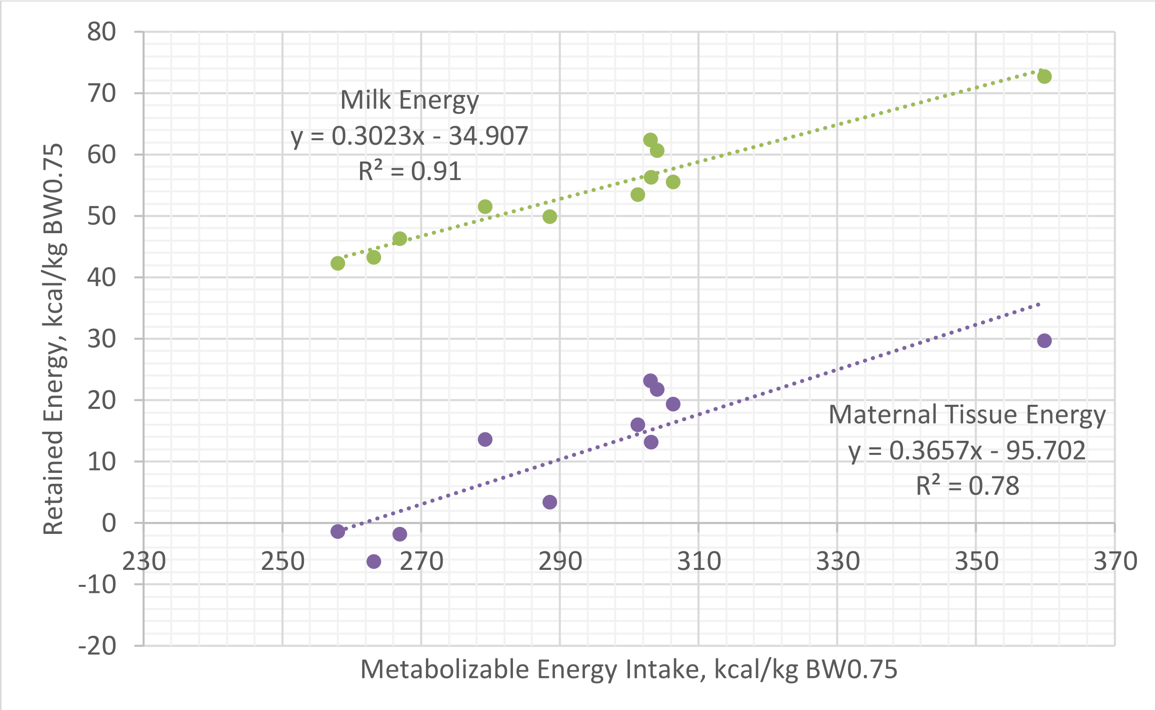

Figure 1. The relationship of metabolizable energy intake to milk energy production and maternal tissue retention in Angus cows (Spencer et al., 2017).

To calculate the profitability of added (or increased) milk production, one needs to determine the conversion of milk yield to calf weight gain. This of course is not practical in a production setting. Unfortunately, the available published literature reveals a wide range in the efficiency of milk production for increasing calf weaning weight. In ten experiments, this conversion ranges from about 12 to 71 pounds of milk for each additional pound of calf weaning weight. Increased milk consumption by the calf is associated with reduced forage consumption. Therefore, this ratio would appear to be more efficient in systems where cows have low genetic capacity for milk production because the ratio does not consider the contribution of forage grazed by the calf. Nevertheless, averaged over the 10 experiments, calf weaning weight was increased by one pound for each 42 pounds of increased milk production. In our recent experiment (Fig. 1) each additional pound of 69% TDN feed increased milk yield by one pound. Using the 42-pound study average, this suggests that about 42 pounds of a high-quality mixed diet or extremely lush, high-quality forage would be required to increase calf weaning weight by one pound. Similarly, about 52 pounds of 55% TDN grass hay would be required to increase calf weaning weight by one pound.

Remember that this calculation does not consider any potential change in cow maintenance energy requirement. More work is needed to better understand the relationships between feed inputs, milk yield, calf weaning weights and post-weaning performance in grazing systems.

What is an efficient cow anyway?

From a nutritional perspective, an efficient cow could be defined as one requiring below-average inputs (feed) while producing above average output (calf weaning weight and maternal fleshing ability). Everyone understands that cows with excessive genetic potential for milk production have a difficult time maintaining their body condition. Few cows that seem to remain perpetually thin can breed back early every year. On average, thin cows have prolonged postpartum anestrus periods, lower conception rate and overall, lower pregnancy rates. Not all thin cows give a lot of milk, but on average excessive milk yield leads to negative energy balance (weight loss). Nevertheless, we have discovered that some cows can give a lot of milk AND maintain their fleshing ability. Because of the strong link between body composition and fertility, the job description for an efficient cow should include fleshing ability.

At the end of the day, it would be nice if the efficient cow could produce adequate to above average milk production…while also being superior at maintaining or even gaining body condition. Are there cows out there that can do both? Probably, but more than likely, on average, those cows would have a tremendous appetite and wind up requiring a lot of forage and possibly expensive supplemental feed. In our recent studies, we have been considering residual retained energy (RRE) as an index to rate lactating and gestating beef cows for efficiency. This index basically considers three things:

- Average daily voluntary feed intake multiplied by feed energy content = total daily feed energy intake
- Average daily weight gain or loss multiplied by energy content of each unit of weight change = energy partitioned to maternal energy gain or loss
- Average daily milk yield multiplied by milk energy content = energy partitioned to milk production

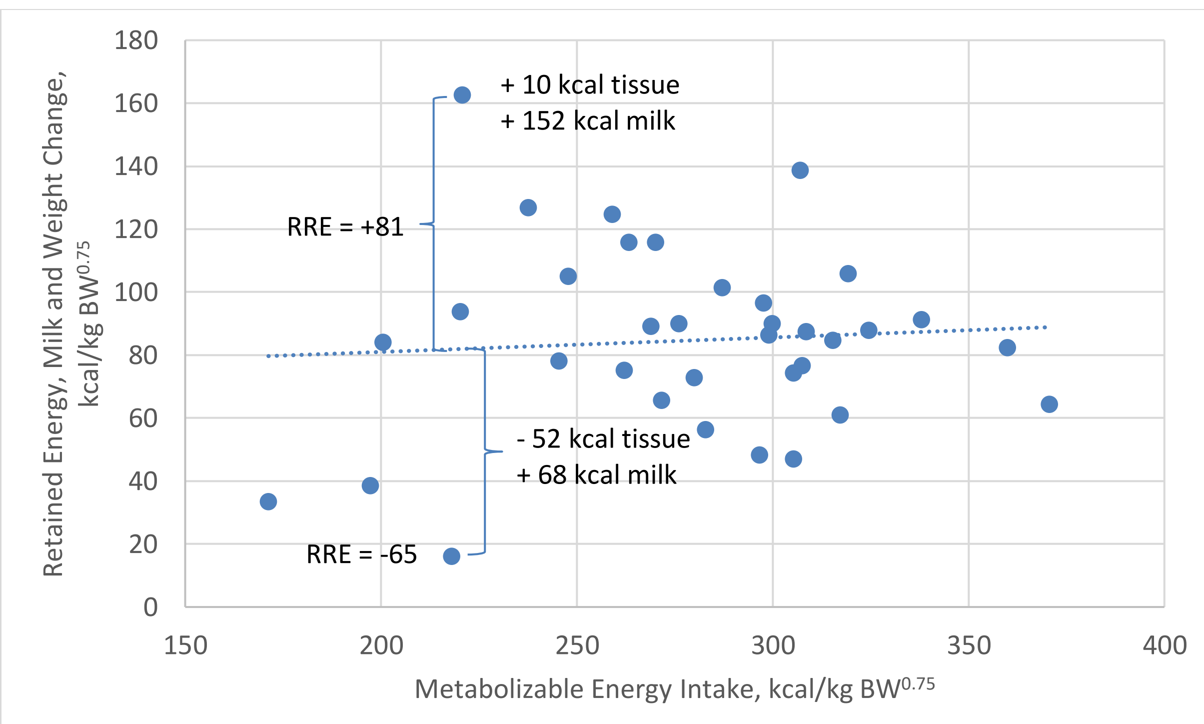

Figure 2. Example of residual retained energy in registered Angus cows.

Figure 1 provides an example from one study where all the necessary ingredients were measured; voluntary forage intake, milk yield and composition, and change in body composition/energy content. As can be seen from the graph, there is tremendous variability in efficiency of energy utilization in beef cows. The two cows highlighted consumed about the same amount of feed, although efficiency of energy utilization is dramatically different. One cow produces an enormous amount of milk energy while partitioning some energy for positive weight gain. The other cow produces substantially less milk energy and must use her own tissue energy to support the lower milk yield. Our goal is to find methods to rapidly and cost effectively identify these differences in beef cows.

Summary

Managers should consider tracking average mature cow weight at weaning, cow body condition at weaning and again around the time of calving or breeding. Recorded and monitored consistently over the years, these data can become a powerful tool. Combined with herd average trends in calf weaning weight and pregnancy rate within a restricted breeding season, these metrics are valuable in assessing the match to forage resources and the "environment" in general. A flat weaning weight trend over a long period of time, low weaning weight response to increasing cow size within a herd, cows that are consistently marginal to thin condition at weaning or breeding, requiring gradual increases in feed inputs or resulting in low pregnancy rate, are all indications that moderation in herd-level mature size and milk production should be considered. In recent years, development in mature cow weight and height EPDs represent a major advancement in managers' ability to control mature cow size through purchased herd sires. Similarly, herd sire milk EPDs can be used to control the level of milk production over time.

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Pasture Management for Small Ruminants

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Red Meat and Our Health:
Separating Scientific Fact from Politics, Emotion, and Misinformation

Dr. Peter J. Ballerstedt
Forage Ambassador

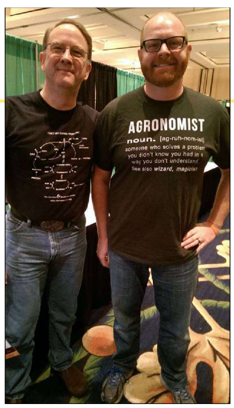
Southwest Missouri Spring Forage Conference
February 23, 2021

The opinions expressed in this presentation are based upon Dr. Ballerstedt's understanding of the relevant published scientific literature. They are not necessarily the opinions of Barenbrug Holding, Barenbrug USA or the other Barenbrug companies.

But I'm workin' on 'em!

Disclosure

- I've worked in forage agriculture
- I work for a forage seed company



Disclosure

- I'm an advocate for therapeutic carbohydrate reduction and ruminant agriculture

Outline

- Misinformation
- Emotion
- Politics
- Scientific facts
  - Evidence of harm from too little?
  - Evidence of harm from too much?

Six years ago…

Let's review…

We *don't*

- Make you fat
- Clog your arteries
- Give you diabetes
- Cause cancer
- Kill your kidneys
- Acidify your blood
- Melt your bones
- Make you morally weak
- Deprive you of food
- Drive climate change
- Destroy the planet

When each strand of the narrative is tested,

it is shown to be weak, based upon flawed beliefs.

My n=1

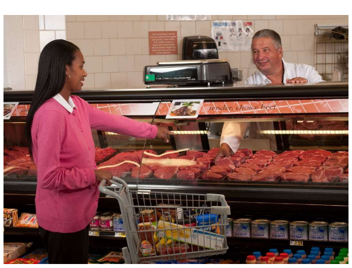
2007

2010

"What's a forage agronomist?"

"Consumers and producers alike care about animal welfare, environmental stewardship, food safety, nutrition and taste."

- Amanda Radke



Bridging the gap

True health food comes from ruminants!

Lamb (sheep)

Chevon or cabrito (goats)

Venison (deer)

Beef (cattle)

Fermented plant products

BARENBRUG

Perspective matters

“The notion that raising livestock and consuming animal-source food (milk & dairy products, meat, fish, and eggs) is fundamentally incompatible with sustainable development is flawed.”

Adesogan, A. T., et al. (2019). "Animal source foods: Sustainability problem or malnutrition and sustainability solution? Perspective matters." Global Food Security: 100325.

BARENBRUG

Dr. Ballerstedt says…

“We have no hope of feeding today’s world, let alone the world of 2050, without ruminant animal agriculture as a fundamental part of whatever agricultural systems are practiced in whatever part of the world they’re being practiced.”

BARENBRUG

Human nutrition & medicine can not obtain the answers that animal nutrition & veterinary medicine can.

BARENBRUG

Nutritional Epidemiology = Mythology

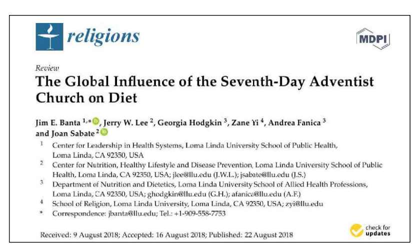
- Questionnaire-based guesses
- Nothing measured = NO REAL DATA

At least 80% fail in clinical trials

Young, S. S. and A. Karr (2011). "Deming, data and observational studies." Significance 8(3): 116-120.

BARENBRUG

Conflict of interest



religions

MDPI

Review

The Global Influence of the Seventh-Day Adventist Church on Diet

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Received: 9 August 2018; Accepted: 16 August 2018; Published: 22 August 2018

check for updates

Banta, J. E., et al. (2018). "The global influence of the Seventh-day Adventist Church on diet." Religions 9(9): 251.

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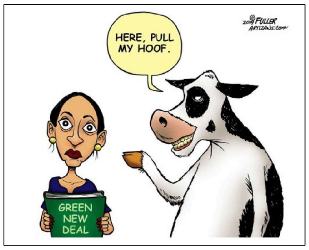
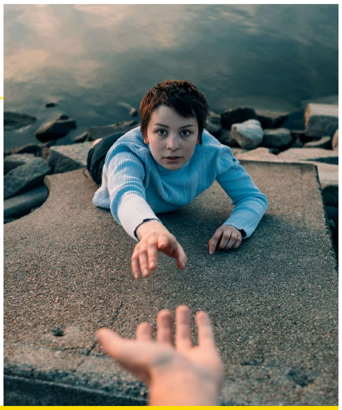
Politics



Fulfilling *our* needs

"One of your primary needs is to go out in love to others. The only way to be loved is to be loving."

- John Powell



Are you part of the 12 or the 88… ?

- Prevalence of metabolic health in American adults is alarmingly low, even in normal weight individuals.
- Less than 88% are metabolically healthy.

METABOLIC SYNDROME AND RELATED DISORDERS
Volume 17, Number 1, 2019
© Mary Ann Liebert, Inc.
Pp. 46–52
DOI: 10.1089/met.2018.0105

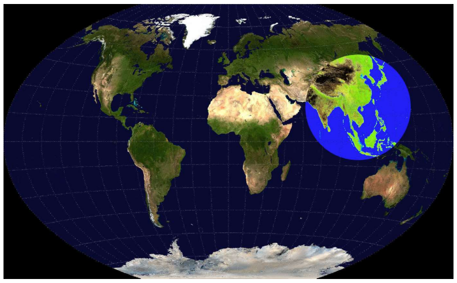
Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination Survey 2009–2016

Joana Araújo, PhD,[1] Jianwen Cai, PhD,[2] and June Stevens, PhD[1,3]

Araújo, J., et al. (2019). "Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination Survey 2009–2016." Metabolic Syndrome and Related Disorders 17(1): 46-52.

Dr. Ballerstedt says…

More people live inside the circle than outside



Malnutrition in 2021

- 11% of the world's population are undernourished – this means they have a caloric intake below minimum energy requirements.
- 820 million people globally are undernourished.
- 22% of children younger than five are 'stunted' – they are significantly shorter than the average for their age, as a consequence of poor nutrition or repeated infection.

https://ourworldindata.org/hunger-and-undernourishment

Malnutrition in 2021

- 9% of the world population – around 697 million people – are severely food insecure.
- One-in-four people globally – 1.9 billion – are moderately or severely food insecure.

https://ourworldindata.org/hunger-and-undernourishment

Malnutrition in 2021

- Worldwide obesity has nearly tripled since 1975.
- In 2016, more than 1.9 billion adults, 18 years and older, were overweight (39%). Of these over 650 million were obese (13%).

https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Malnutrition in 2021

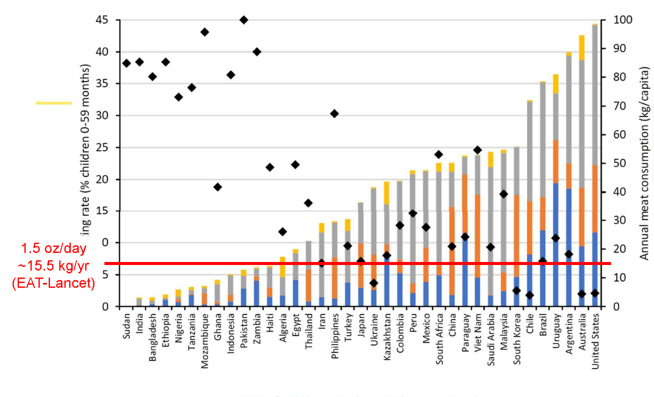
- Most of the world's population live in countries where overweight and obesity kills more people than underweight.
- 38 million children under the age of 5 were overweight or obese in 2019
- Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016.

https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

When it comes to the consumption of animal source foods:

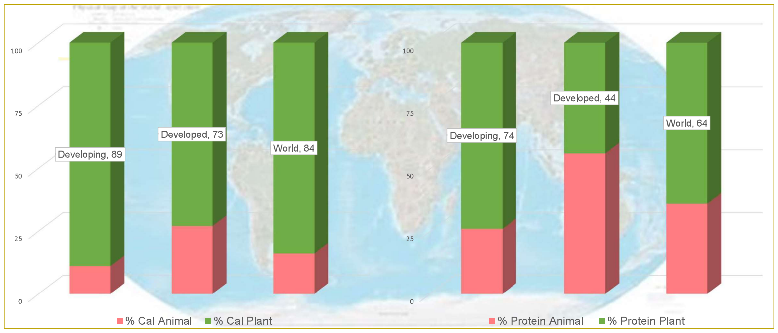
- Is there such a thing as too *little*?

From https://livestocklab.ifas.ufl.edu/media/livestocklabifasufledu/pdf-/Infographic-Nurturing-Development-with-Animal-Source-Foods_Final.pdf



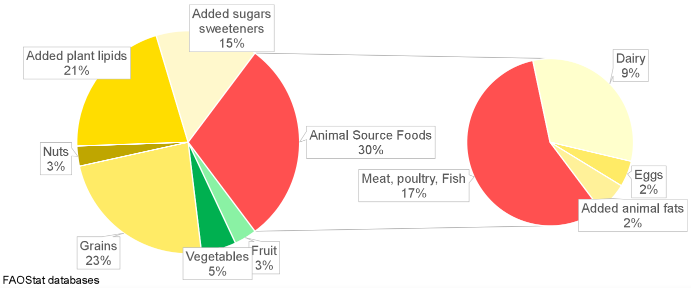
Adesogan, A. T., et al. (2019). "Animal source foods: Sustainability problem or malnutrition and sustainability solution? Perspective matters." Global Food Security: 100325

Percent of food calories & protein from plant products



FAOSTAT (Food and Agriculture Organization of the United Nations, FAOSTAT database). 1997. https://goo.gl/mkjnwQ
Cited In: Delgado, C. L., C. C. B. Courbois, and M. L. Rosegrant. 1998. Global food demand and the contribution of livestock as we enter the new millennium.
https://goo.gl/CbjDKQ

Where OUR calories come from



FAOStat databases

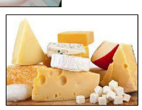
Animal- vs plant-source foods

Energy – Isocaloric quantities are NOT isometabolic

Protein & minerals – Isometric quantities are NOT isometabolic.

Vitamins – “Requirement” is dependent upon source.






Properly valuing protein

“…the “environmental footprint” associated to the production of animal vs. vegetal protein-containing food products, needs to be re-evaluated on the basis of the content of essential amino acids in foods.”

Tessari, P., et al. (2016). "Essential amino acids: master regulators of nutrition and environmental footprint?" Scientific reports 6: 26074.

Properly valuing protein

“The production of protein-containing animal foods would retain a (much) lower environmental impact than that previously estimated, approximately lying within the range of that of most foods of vegetal origin, because of the higher quality of animal proteins.”

Tessari, P., et al. (2016). "Essential amino acids: master regulators of nutrition and environmental footprint?" Scientific reports 6: 26074.

Properly valuing protein

“These considerations might be useful in the political planning of the food production system, aiming at providing sufficient food for humans in the near future.”

Tessari, P., et al. (2016). "Essential amino acids: master regulators of nutrition and environmental footprint?" Scientific reports 6: 26074.

Malnutrition in 2021

Deficiency	Prevalence	Consequences
Multiple micronutrient deficiencies	"Common in several parts of the world"	A deficiency in one micronutrient can impair the utilization of another.

"In particular, a diet that is low in animal source foods typically results in low intakes of bioavailable iron and zinc, calcium retinol (pre-formed vitamin A), vitamin B2 (riboflavin), vitamin B6 and vitamin B12."

Guidelines on food fortification with micronutrients (WHO and FAO)

When it comes to the consumption of animal source foods:

- There *is* such a thing as too little.
- Is there *really* such a thing as too *much*?

Improbable and unsupported

"…claims about the health dangers of red meat are not only improbable in the light of our evolutionary history, they are far from being supported by robust scientific evidence."

Leroy, F. and N. Cofnas (2019). "Should dietary guidelines recommend low red meat intake?" Critical Reviews in Food Science and Nutrition: 1-10.

Claims that red meat causes disease

The "evidence" is:

- Weak

Annals of Internal Medicine®

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Clinical Guidelines | 19 November 2019

Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the Nutritional Recommendations (NutriRECS) Consortium FREE

Bradley C. Johnston, PhD, Dena Zeraatkar, MSc, Mi Ah Han, PhD, Robin W.M. Vernooij, PhD, ... View all authors +

Author, Article and Disclosure Information

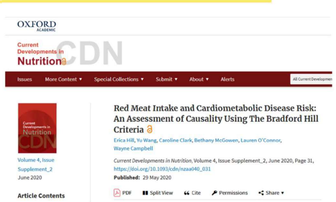
https://doi.org/10.7326/M19-1621 Eligible for CME Point-of-Care CME/MOC

Johnston, B. C., et al. (2019). "Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the Nutritional Recommendations (NutriRECS) Consortium." Annals of internal medicine. https://acpjournals.org/doi/10.7326/M19-1621

Claims that red meat causes disease

The "evidence" is:

- Weak
- Not meeting causality criteria



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Red Meat Intake and Cardiometabolic Disease Risk: An Assessment of Causality Using The Bradford Hill Criteria

Erica Hill, Yu Wang, Caroline Clark, Bethany McGowen, Lauren O'Connor, Wayne Campbell

Current Developments in Nutrition, Volume 4, Issue Supplement_2, June 2020, Page 31, https://doi.org/10.1093/cdn/nzaa040_031

Published: 29 May 2020

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Volume 4, Issue Supplement_2 June 2020

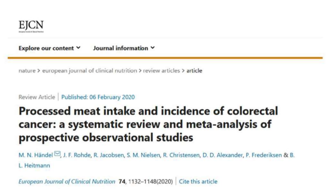
Article Contents

Hill, E., et al. (2020). "Red Meat Intake and Cardiometabolic Disease Risk: An Assessment of Causality Using The Bradford Hill Criteria." Current Developments in Nutrition 4(Supplement_2): 31-31. https://academic.oup.com/cdn/article/4/Supplement_2/31/5844440

Claims that red meat causes disease

Claims that red meat causes disease are:

- Weak
- Not meeting causality criteria
- At risk of bias



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nature > european journal of clinical nutrition > review articles > article

Review Article | Published: 06 February 2020

Processed meat intake and incidence of colorectal cancer: a systematic review and meta-analysis of prospective observational studies

M. N. Händel, J. F. Rohde, R. Jacobsen, S. M. Nielsen, R. Christensen, D. D. Alexander, P. Frederiksen & B. L. Heitmann

European Journal of Clinical Nutrition **74**, 1132–1148(2020) | Cite this article

747 Accesses | **189** Altmetric | Metrics

Händel, M., et al. (2020). "Processed meat intake and incidence of colorectal cancer: a systematic review and meta-analysis of prospective observational studies." European journal of clinical nutrition: 1-17. https://nature.com/articles/s41430-020-0576-9

Claims that red meat causes disease

Claims that red meat causes disease are:

- Weak
- Not meeting causality criteria
- At risk of bias
- Contrary to common sense

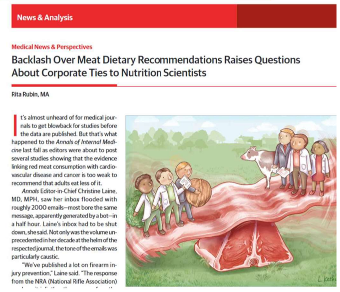

Listen
Reviews
Should dietary guidelines recommend low red meat intake?
Frédéric Leroy & Nathan Cofnas
Pages 2763-2772 | Published online: 05 Sep 2019
Download citation https://doi.org/10.1080/10408398.2019.1657063
Full Article | Figures & data | References | Citations | Metrics | Licensing | Reprints & Permissions
Abstract

Leroy, F. and N. Cofnas (2019). "Should dietary guidelines recommend low red meat intake?" Critical Reviews in Food Science and Nutrition: 1-10. https://tandfonline.com/doi/full/10.1080/10408398.2019.1657063

Claims that red meat causes disease

Claims that red meat causes disease are:

- Weak
- Not meeting causality criteria
- At risk of bias
- Contrary to common sense
- Often dishonest


News & Analysis
Medical News & Perspectives
Backlash Over Meat Dietary Recommendations Raises Questions About Corporate Ties to Nutrition Scientists
Rita Rubin, MA

It's almost unheard of for medical journals to get blowback for studies before the data are published. But that's what happened to the *Annals of Internal Medicine* last fall as editors were about to post several studies showing that the evidence linking red meat consumption with cardiovascular disease and cancer is too weak to recommend that adults eat less of it.

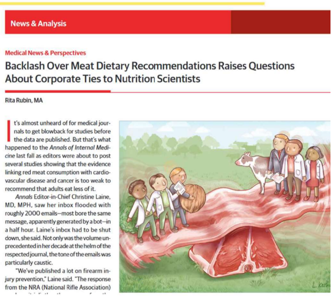
Annals Editor-in-Chief Christine Laine, MD, MPH, saw her inbox flooded with roughly 2000 emails—most bore the same message, apparently generated by a bot—in a half hour. Laine's inbox had to be shut down, she said. Not only was the volume unprecedented in her decade at the helm of the respected journal, the tone of the emails was particularly caustic.

"We've published a lot on firearm injury prevention," Laine said. "The response from the NRA (National Rifle Association)

Rubin, R. (2020). "Backlash over meat dietary recommendations raises questions about corporate ties to nutrition scientists." JAMA 323(5): 401-404. https://tamus.edu/wp-content/uploads/2020/01/JAMA-Article-1.15.20.pdf

Claims that red meat causes disease

Vegan activist Dr David Katz MD "compared the articles, which he called 'a great debacle of public health' to 'information terrorism' that 'can blow to smithereens…the life's work of innumerable careful scientists'"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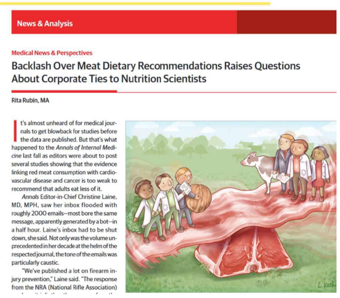
Claims that red meat causes disease

"Some of the researchers have built their careers on nutritional epidemiology. I can understand it's upsetting when the limitations of your work are uncovered and discussed in the open"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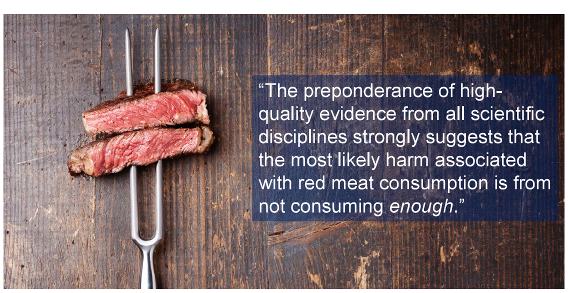
Rita Rubin, MA

Rubin, R. (2020). "Backlash over meat dietary recommendations raises questions about corporate ties to nutrition scientists." JAMA 323(5): 401-404. https://tamus.edu/wp-content/uploads/2020/01/JAMA-Article-1.15.20.pdf

Dr. Ballerstedt says…



"My doctor says I should eat less (or no) red meat…"

Has your physician told you…

- You need to lose some weight?
- You've got diabetes? (prediabetes, metabolic syndrome)
- Your cholesterol's too high?
- Your blood pressure's too high?
- You've had cancer?

Araújo, J., et al. (2019). "Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination Survey 2009–2016." Metabolic Syndrome and Related Disorders 17(1): 46-52.

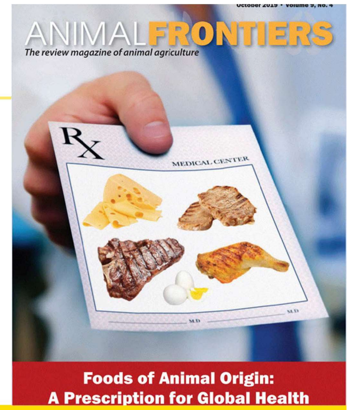
You do NOT have optimal metabolic health if ONE of the following is true for you:

- Abdominal obesity: a waist circumference >40 inches in men, >35 inches in women.
- Serum triglycerides ≥150 mg/dL.
- HDL cholesterol <40mg/dL in men, <50mg/dL in women.
- Blood pressure of 130/85 or more.
- Fasting blood glucose >100 mg/dL (HbA1c >5.7).
- Taking medications for these conditions.

Araújo, J., et al. (2019). "Prevalence of Optimal Metabolic Health in American Adults: National Health and Nutrition Examination Survey 2009–2016." Metabolic Syndrome and Related Disorders 17(1): 46-52.

Resources (free!)

- Animal Frontiers, Oct 2019. Vol 9, No. 4
- DietDoctor.com
- ALEPH 2020 https://aleph-2020.blogspot.com/
- Society of Metabolic Health Practitioners https://www.metabolicpractitioners.org/



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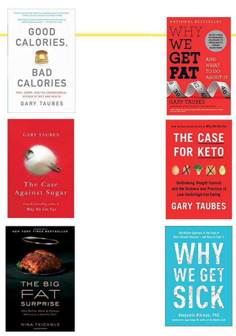
Resources

- Gary Taubes
  - Good Calories, Bad Calories
  - Why We Get Fat
  - The Case Against Sugar
  - The Case for Keto
- Nina Teicholz
  - The Big Fat Surprise
- Benjamin Bikman, PhD
  - Why We Get Sick



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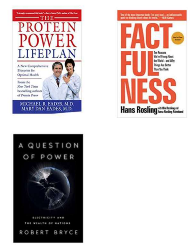
Resources

- Drs Michael & Mary Dan Eades
  - Protein Power Lifeplan
- Hans Rosling
  - Factfulness
- Robert Bryce
  - A Question of Power
  - Juice



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Dr. Ballerstedt says…

Be sure to take your daily

M E D S

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Dr. Ballerstedt says…

“A steak a day
keeps the doctor away!”

Thank you!