Kansas Livestock Association

K-State Research and Extension

2026 Ranch Management Field Day

HP Rafter Lazy T Ranch • Hoxie

Thursday, August 27 • 3:30 p.m.

HP Rafter Lazy T Ranch

HP

Hoxie, Kansas

Sponsored by:

Farm Credit Associations of Kansas

HUVEPHARMA

HP Rafter Lazy T Ranch

Background

HP Rafter Lazy T Ranch is a combination of Keith and Shirley Popp's HP brand and their son, Trevor's, Rafter Lazy T brand. Trevor began working full-time alongside his parents following college graduation in 2011. In 2017 the family chose to join their brands to form an LLC, combining their commercial cowherds near Hoxie in Sheridan County.

The cowherd consists of primarily black cows bred to a variety of bulls, including Angus, Hereford, Balancer, Charolais and Copperhead (Red Angus x Charolais). Bulls are selected based on available genetic data, with emphasis placed on maternal numbers to produce successful female progeny. The roughly 550-head herd has been closed for more than 25 years, making reproductive and maternal traits significant to the program. Other traits important to the Popps include docility, ribeye, $B, frame score and feet.

Though the cows at HP Rafter Lazy T are commercial, records are kept on all females for reference in future herd decisions. As a result of their closed program and detailed records, the Popps have increased longevity in their herd and focus on reproductive traits to maintain calving within a specified timeframe.

First-calf heifers are artificially inseminated to Angus and Hereford bulls while cows are exposed to Balancer, Charolais or Copperhead bulls. The Popps breed heifers to calve in December, followed by the cows in January and February. Pelvic measurements are taken on all potential replacement heifers around 10 months of age. Steers and heifer calves not selected as replacements are weaned and backgrounded for 45-60 days, before being sold through Superior Livestock Auction video sales.

In addition to raising cattle, the Popps also operate a custom haying business. Beginning near the end of March in Texas, the crew works their way north over the course of the haying season, ending in northwest Kansas.

Trevor married Taylor in 2023, and now she also is invested in the success and operations of HP Rafter Lazy T Ranch.

Cattle/Beef Industry Situation and Outlook
KLA

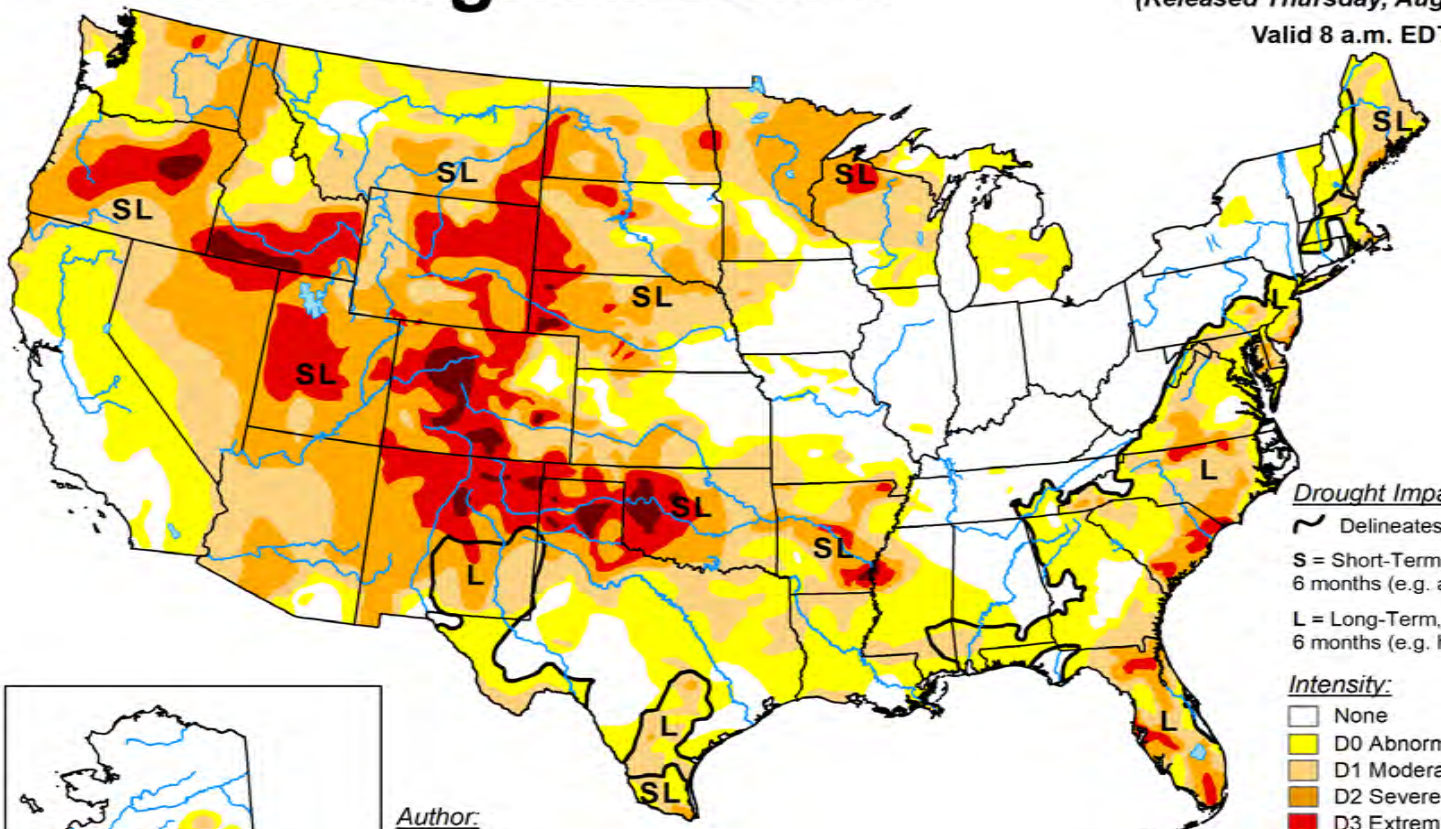
August 27, 2026

U.S. Drought Monitor

August 18, 2026

(Released Thursday, Aug. 20, 2026)

Valid 8 a.m. EDT



Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:
David Mocko
NASA/GSFC/SSAI

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

USDA NDMC NOAA NASA

droughtmonitor.unl.edu

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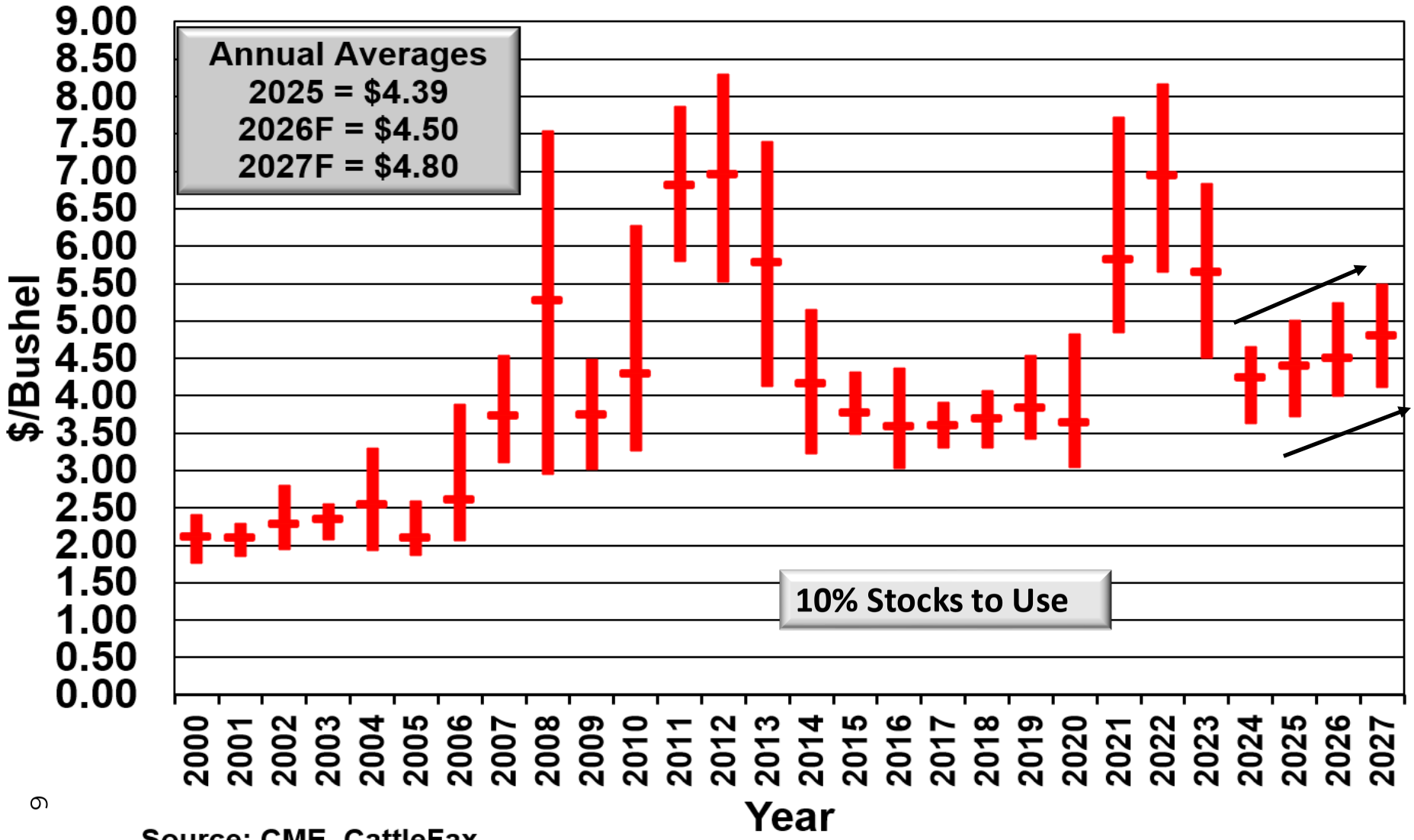
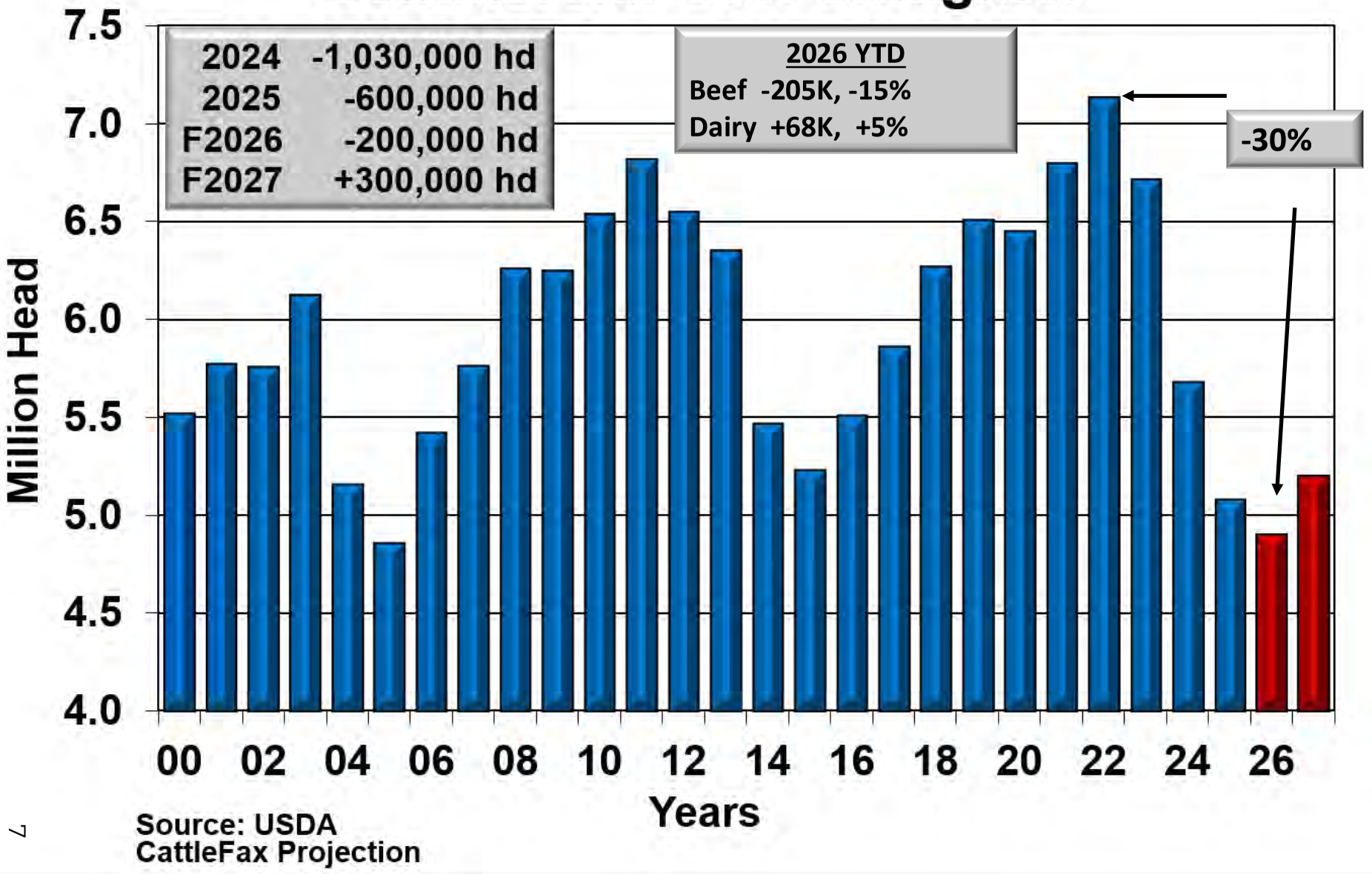
Spot Corn Futures

Annual Range of Daily Closing Prices



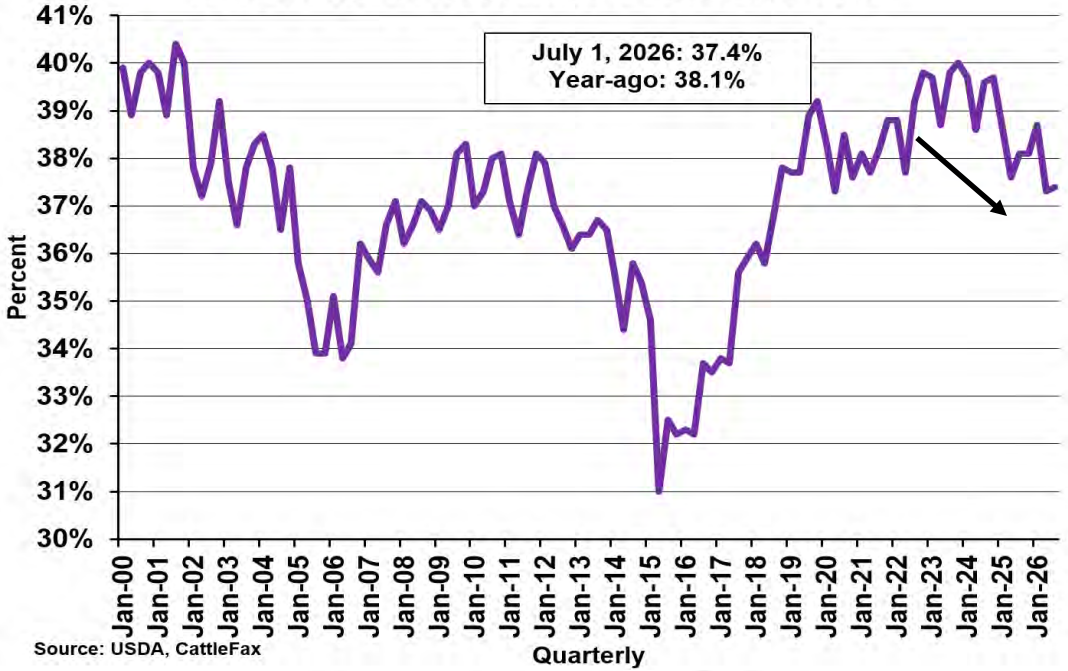
Source: CME, CattleFax

Commercial Cow Slaughter



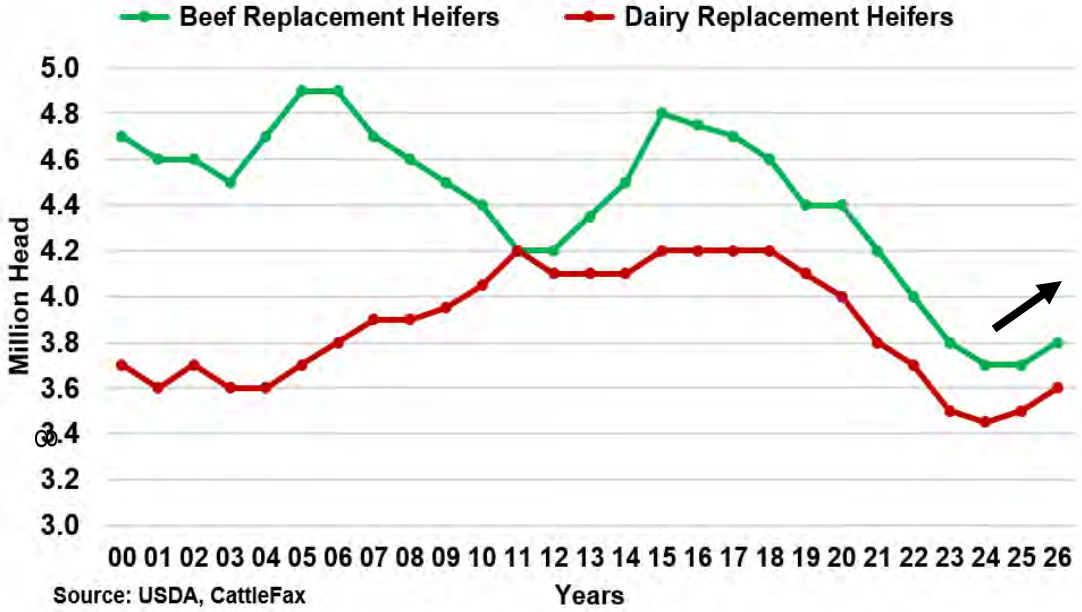
Source: USDA
CattleFax Projection

Heifers as a Percent of Cattle on Feed



Source: USDA, CattleFax

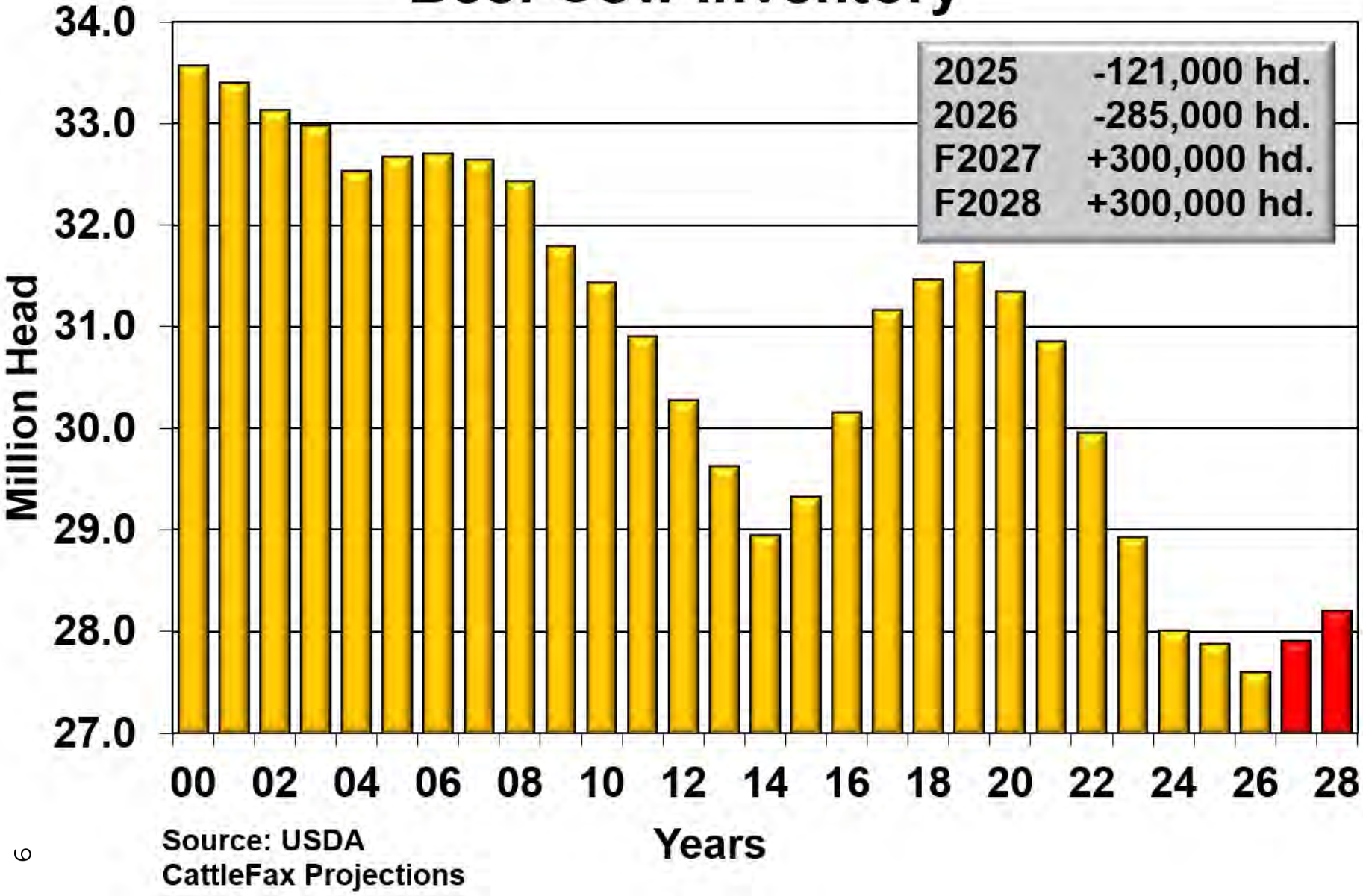
July 1 Replacement Heifers



Source: USDA, CattleFax

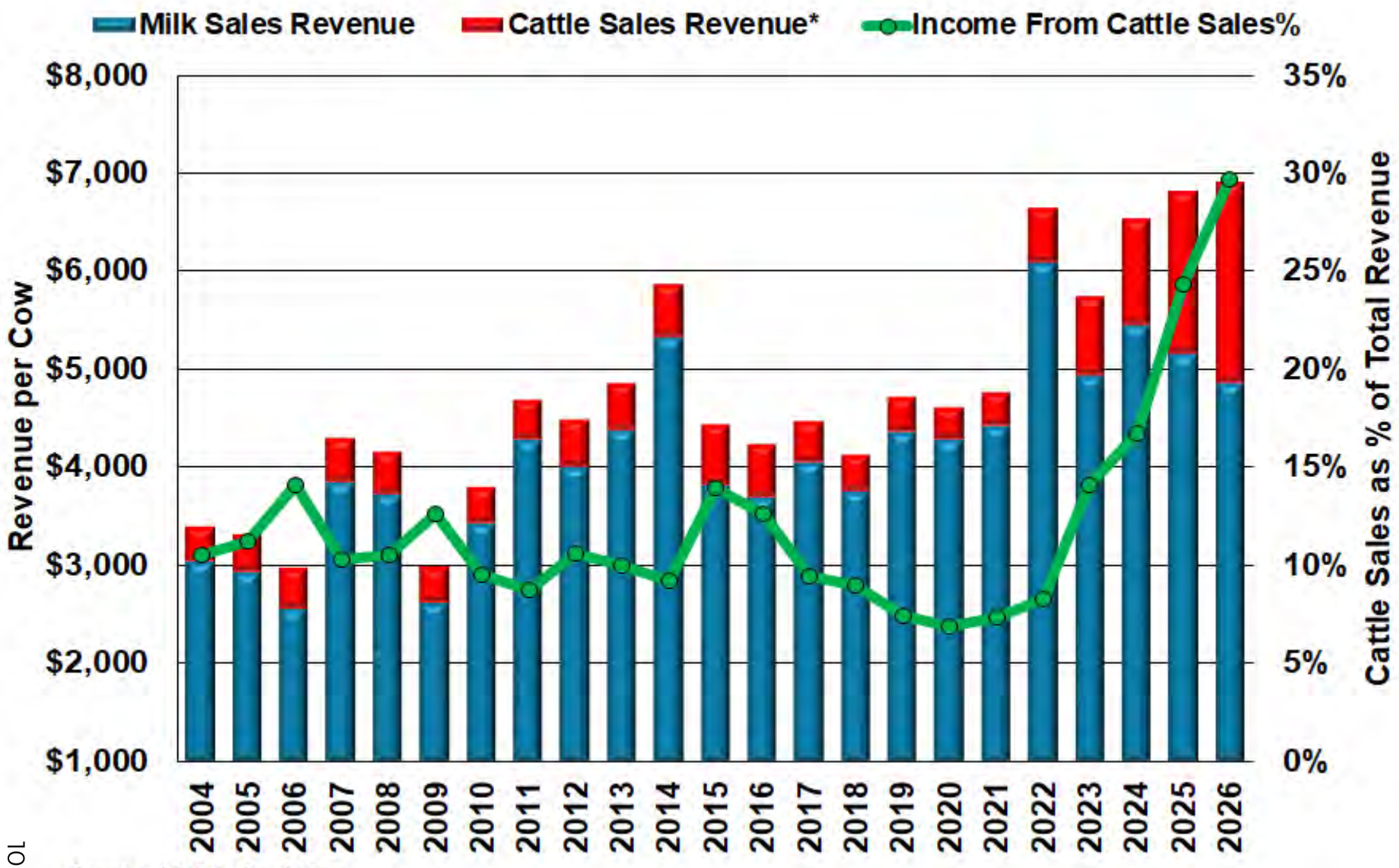
CattleFax | THE DECIDING FACTOR

Beef Cow Inventory



Source: USDA
CattleFax Projections

Estimated Annual Revenue Per Dairy Cow

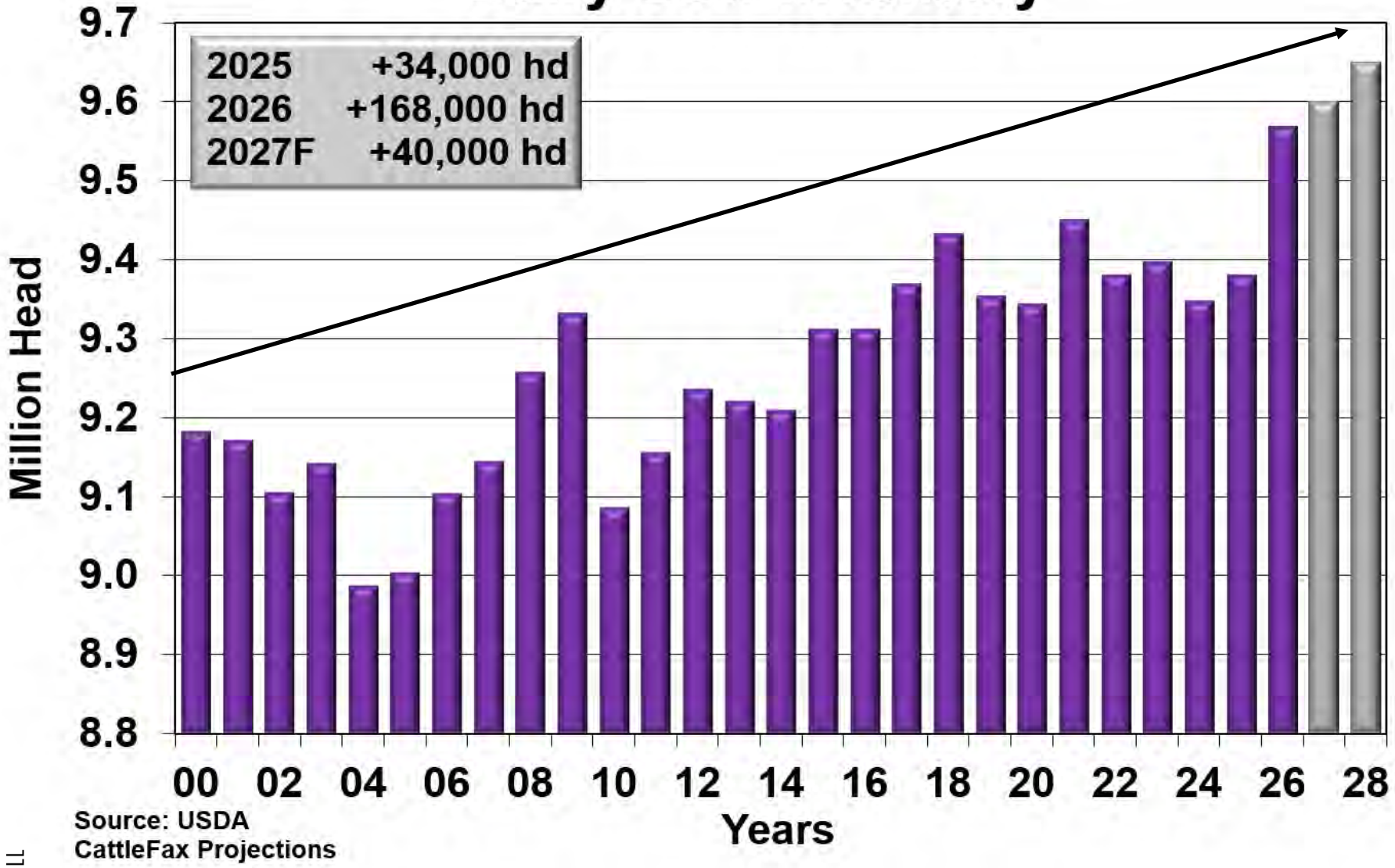


Source: USDA, CattleFax

*Estimated day-old values plus cull cow sales

CattleFax | THE DECIDING FACTOR

Dairy Cow Inventory



Source: USDA
CattleFax Projections

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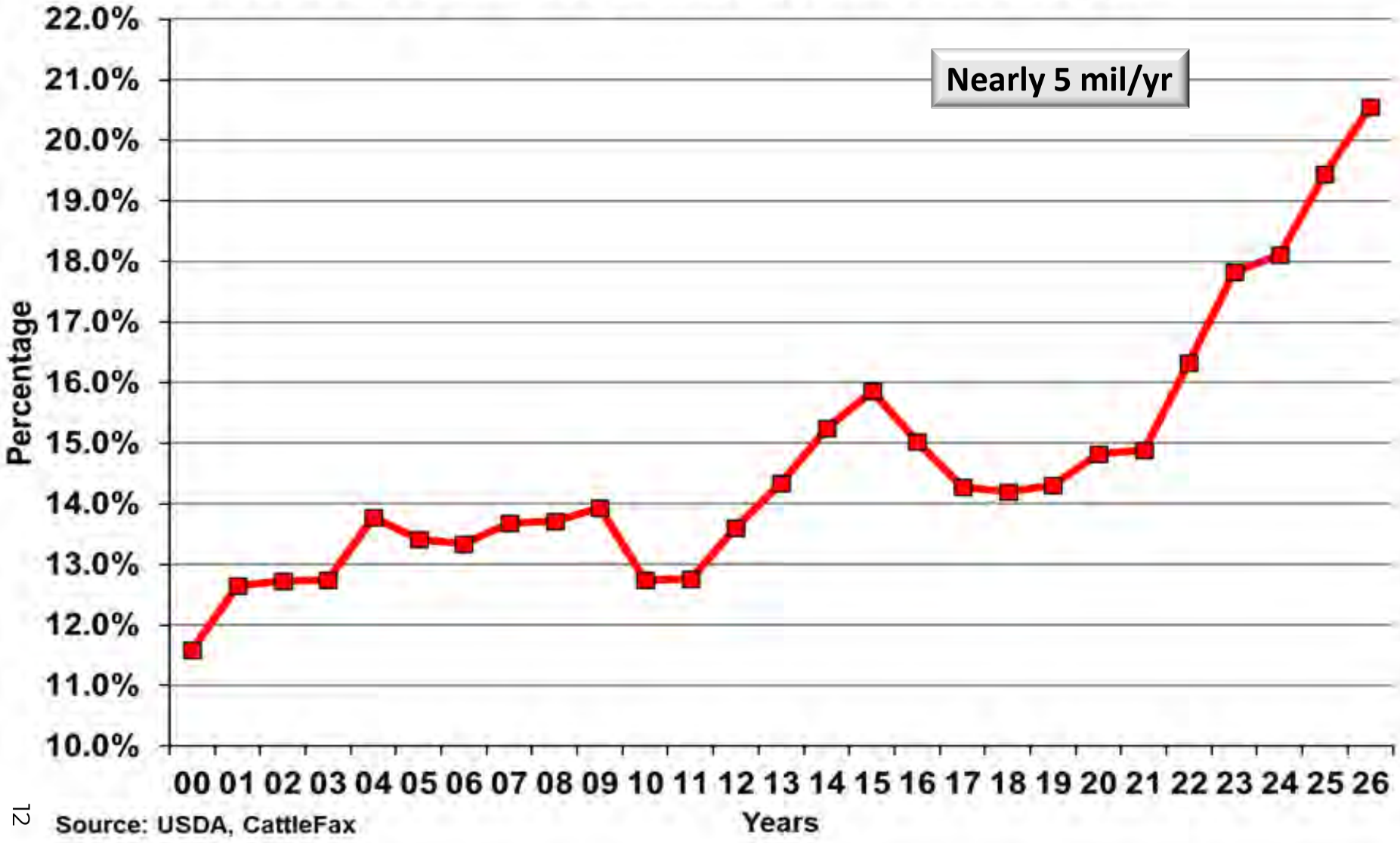
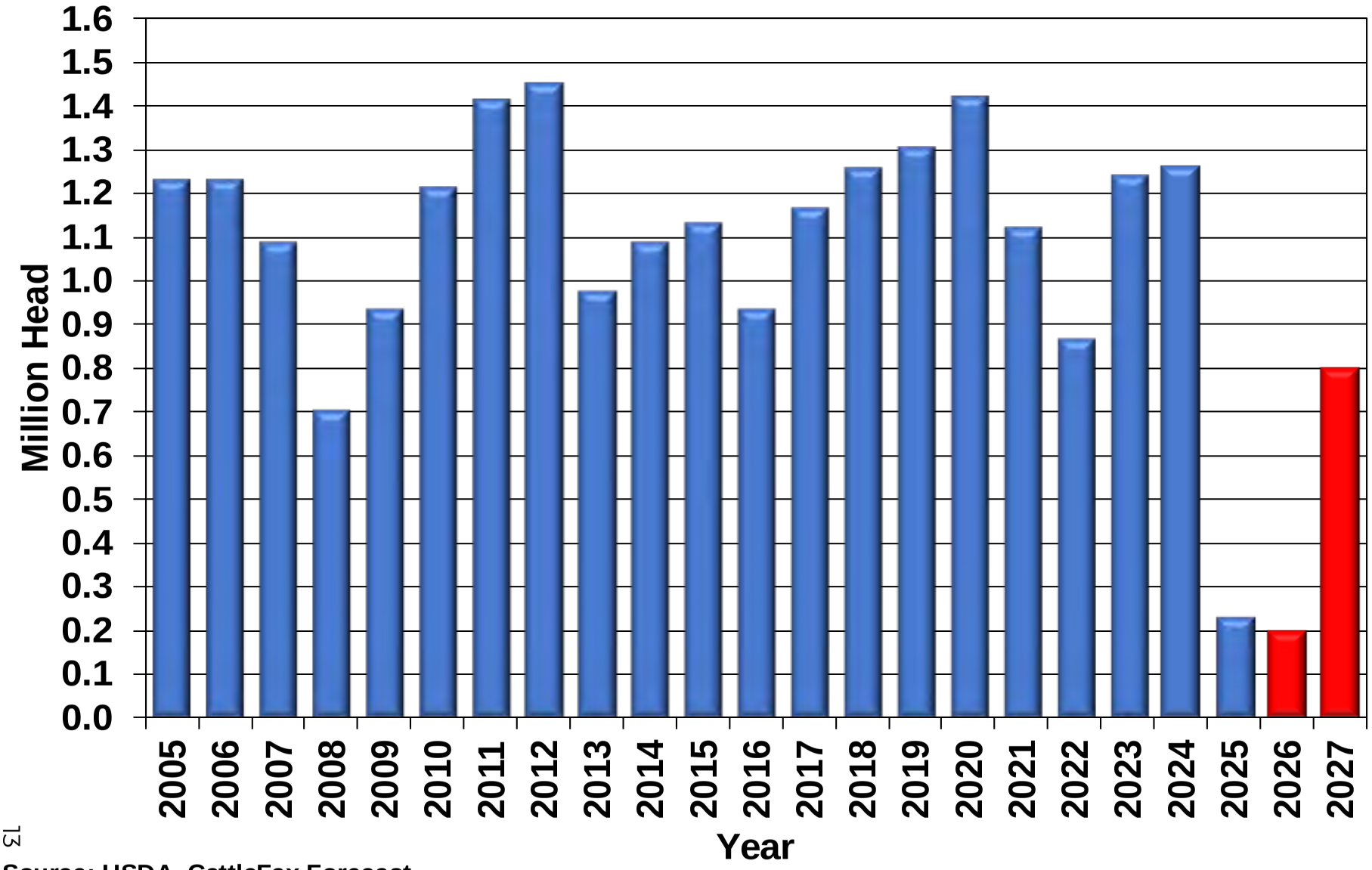
Estimated Dairy-Influenced Fed Cattle Slaughter

Fed Dairy & BxD as Percent of Total Fed Slaughter



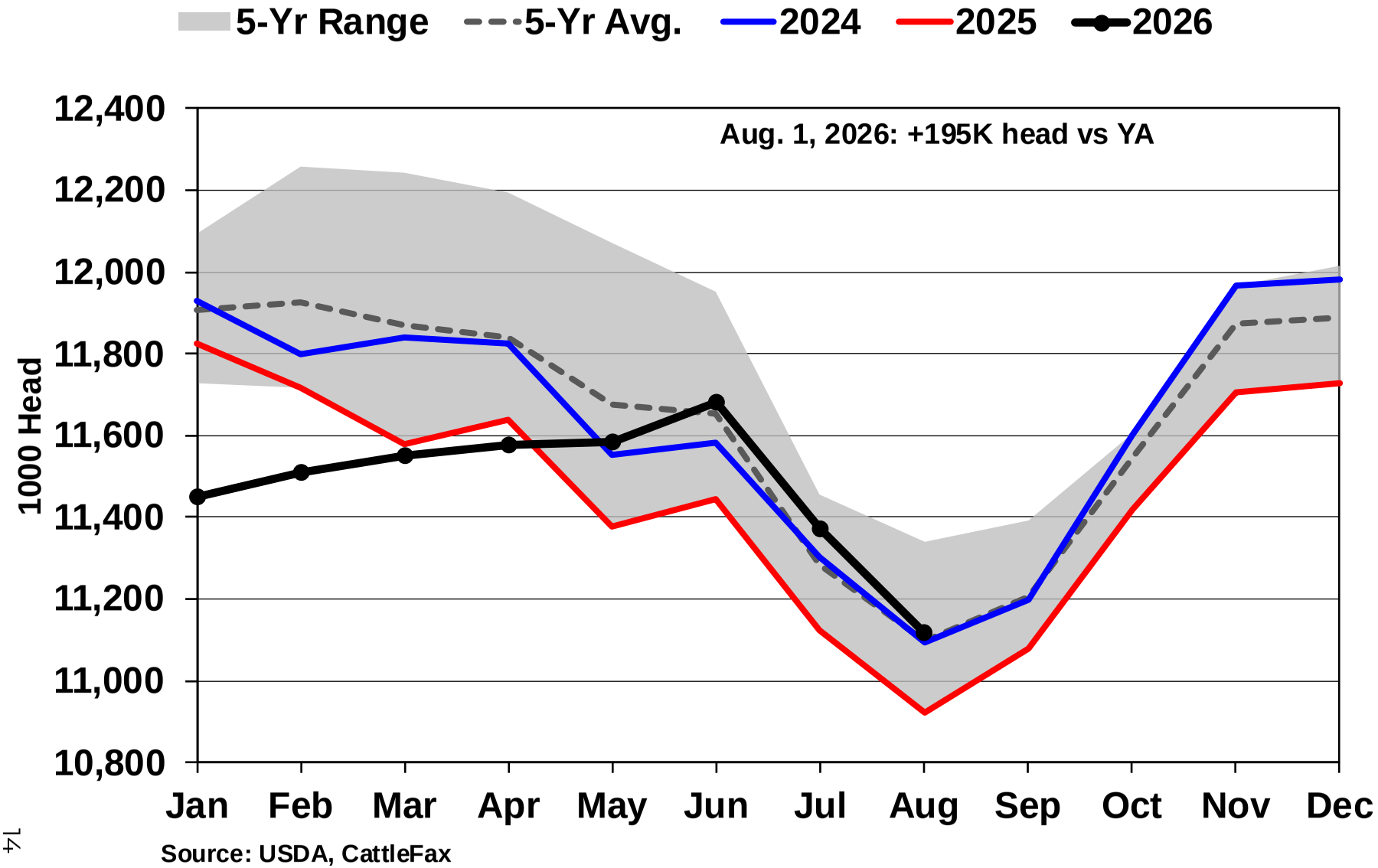
Source: USDA, CattleFax

U.S. Feeder Cattle Imports from Mexico



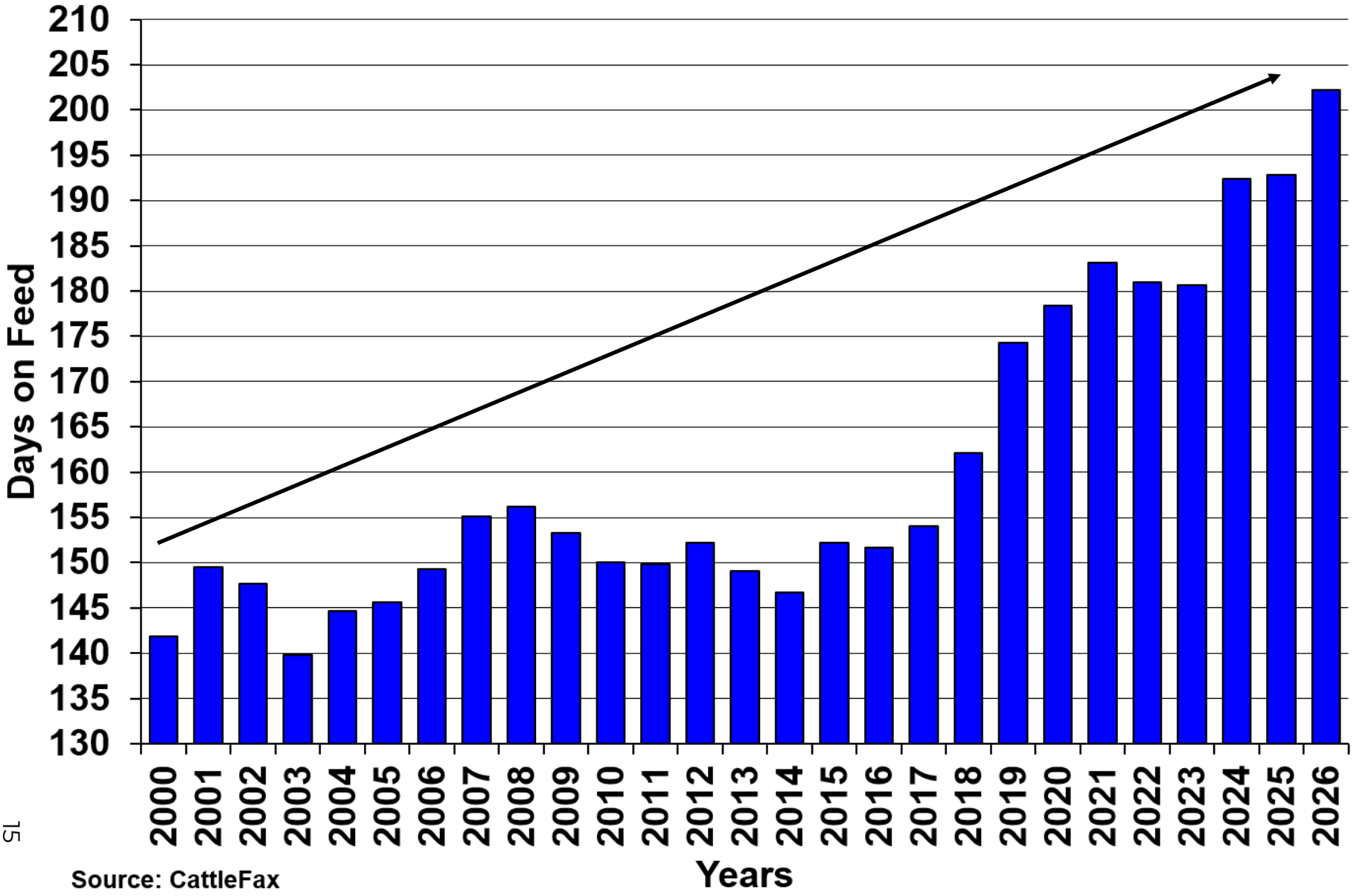
Source: USDA, CattleFax Forecast

United States Cattle on Feed



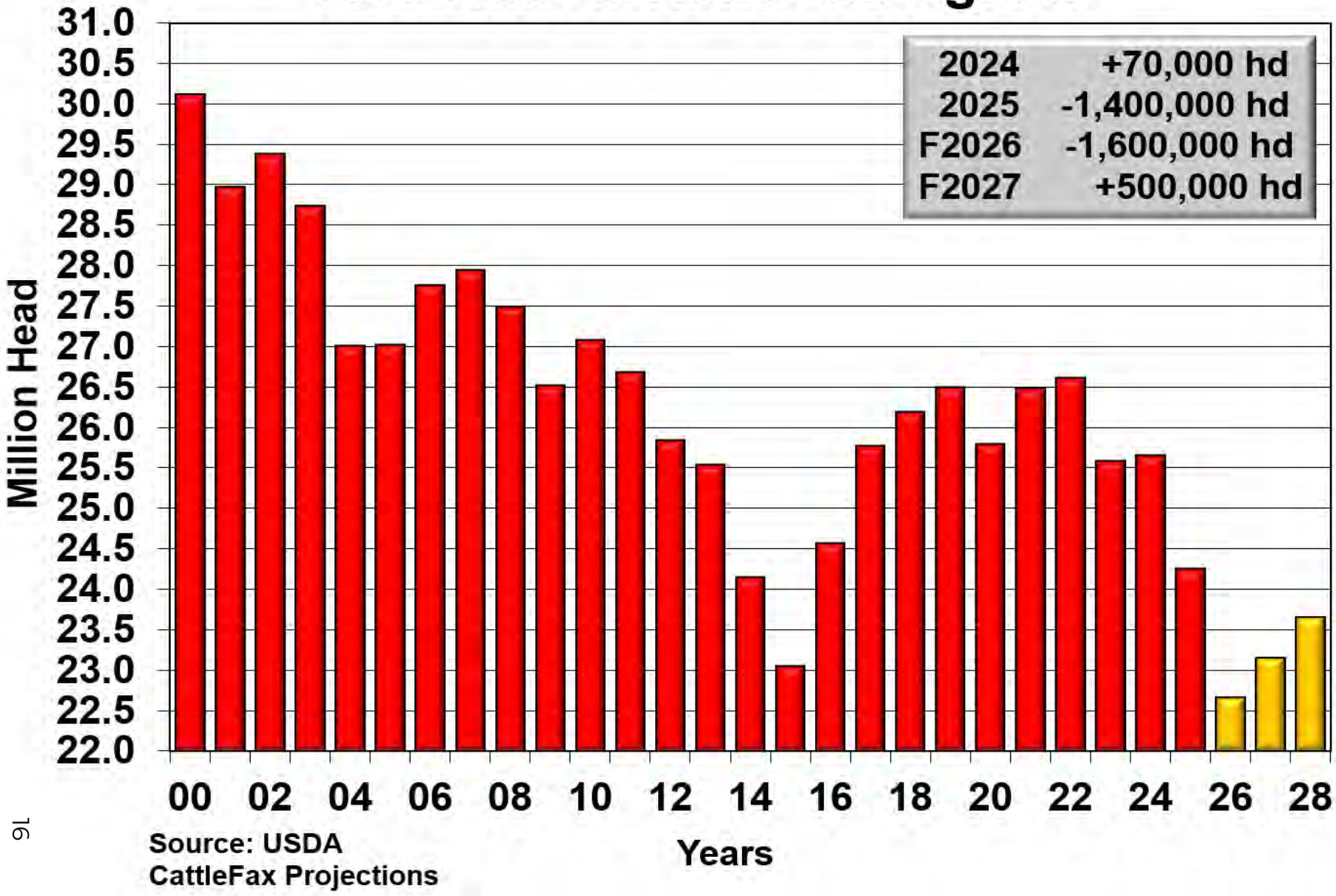
Source: USDA, CattleFax

U.S. Average Days On Feed



Source: CattleFax

U.S. Steer & Heifer Slaughter

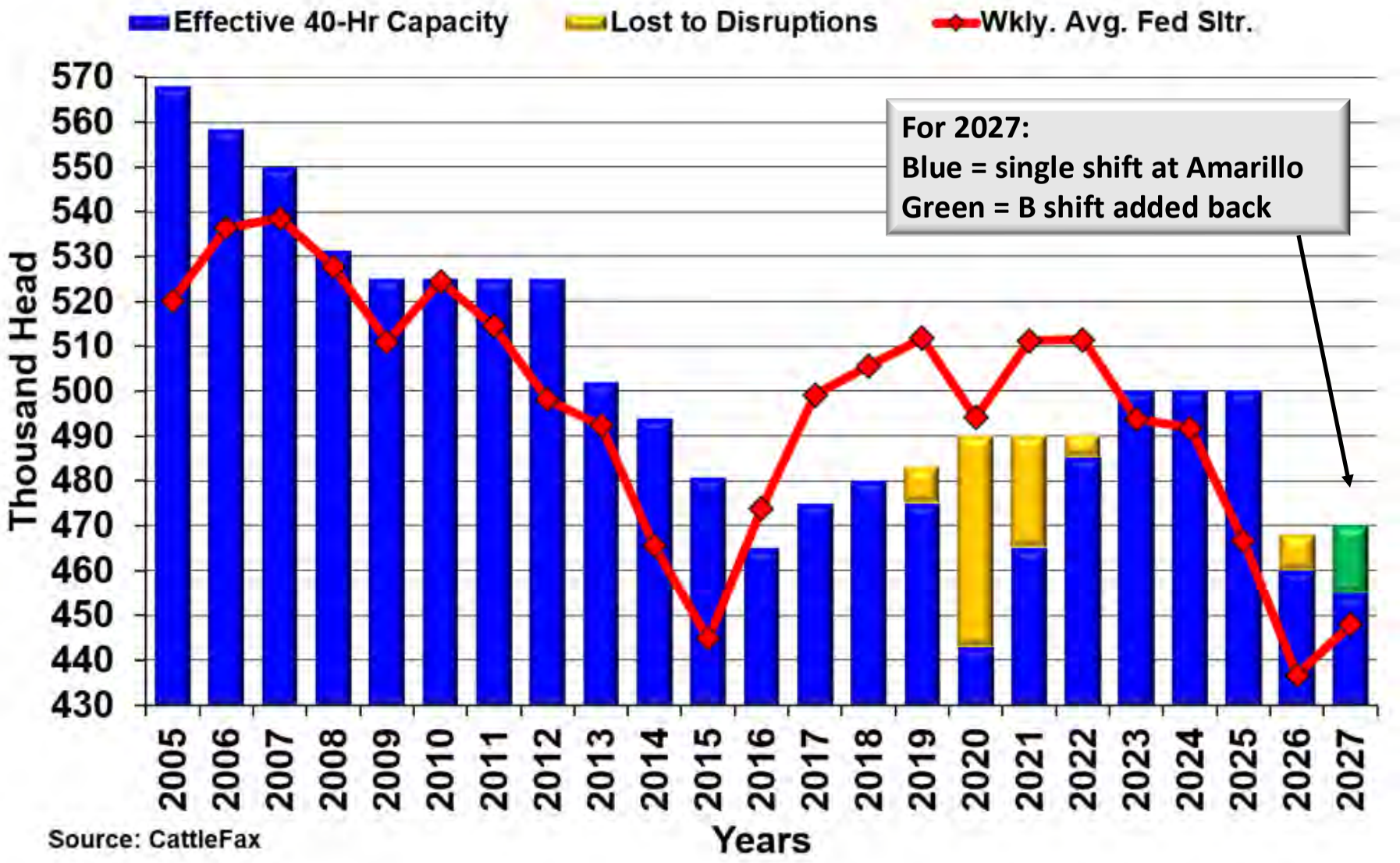


Source: USDA
CattleFax Projections

CattleFax THE DECIDING FACTOR

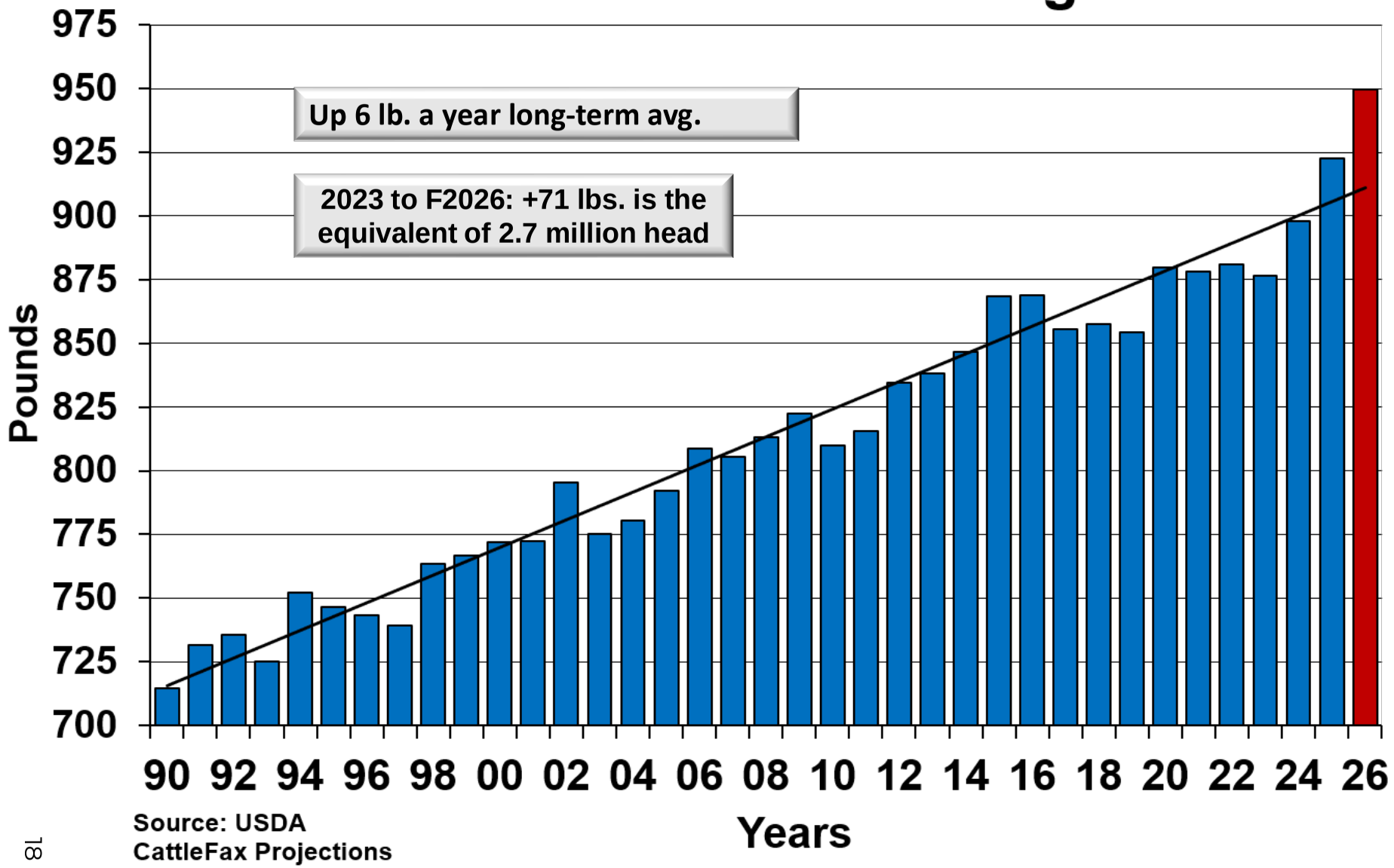
Fed Slaughter Capacity Utilization

Vs. Monday-Friday Packing Capacity



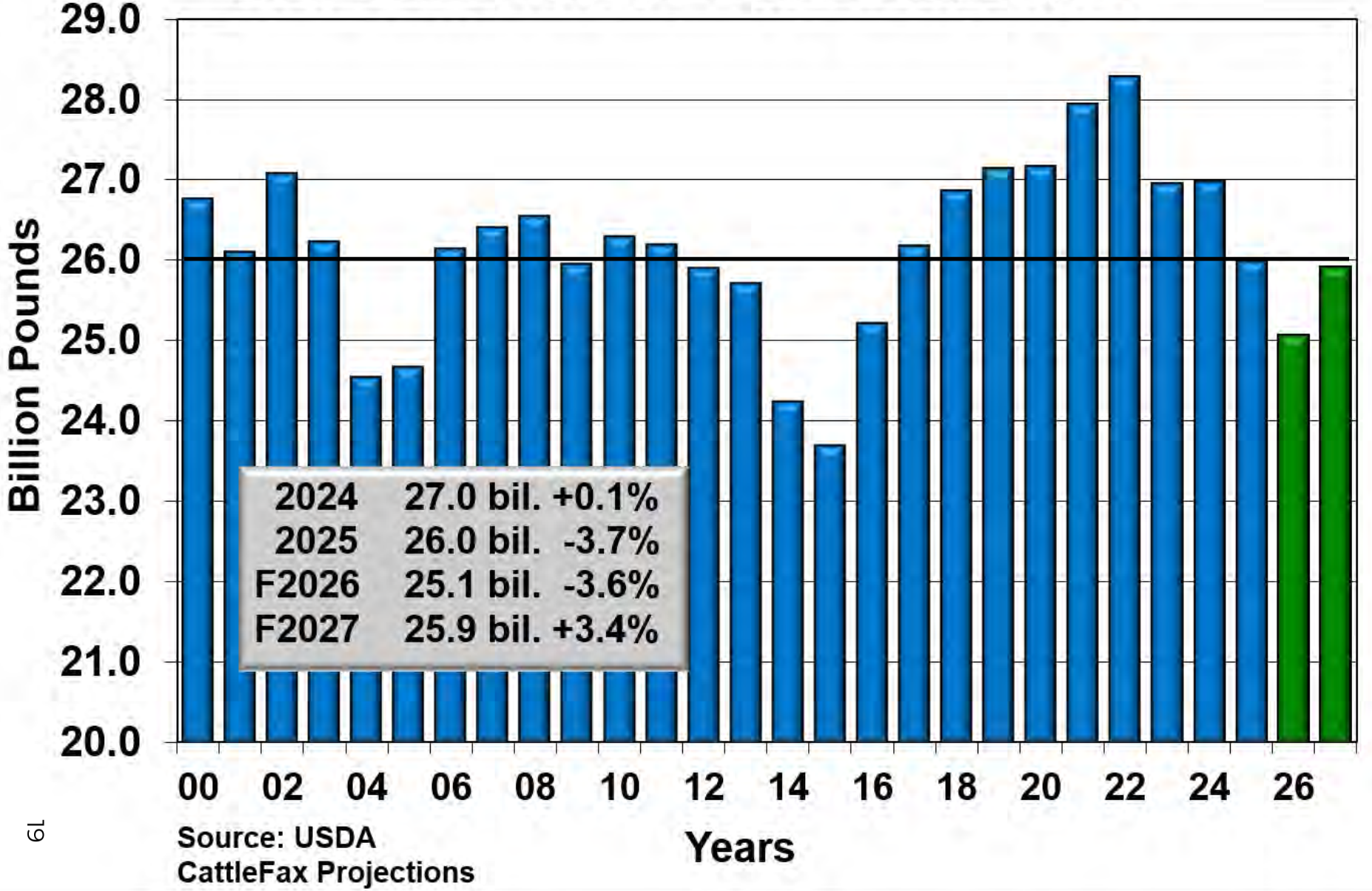
Source: CattleFax

Steer/Heifer Carcass Weights



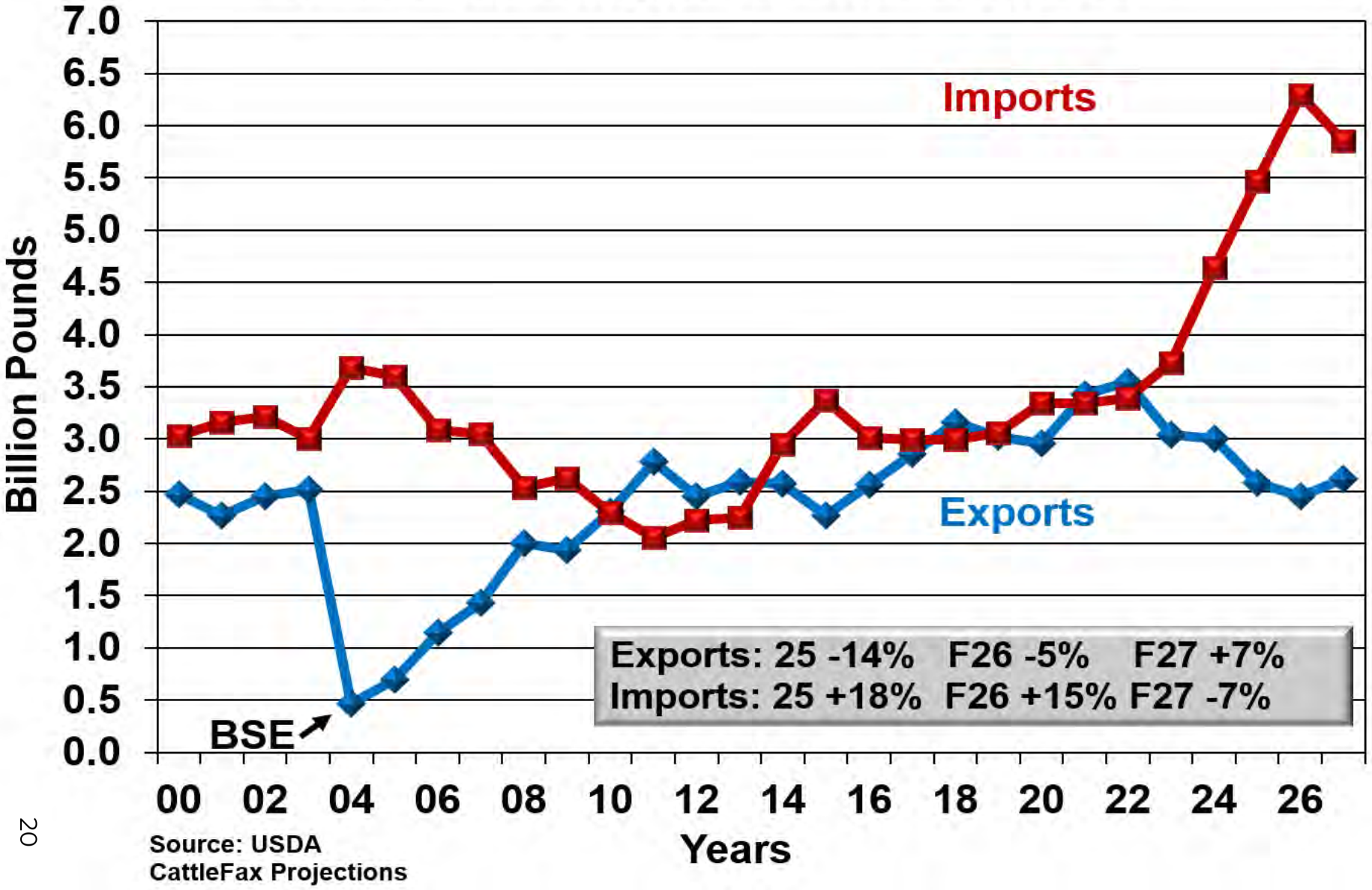
Source: USDA
CattleFax Projections

U.S. Commercial Beef Production



Source: USDA
CattleFax Projections

U.S. Beef Imports and Exports



Source: USDA
CattleFax Projections

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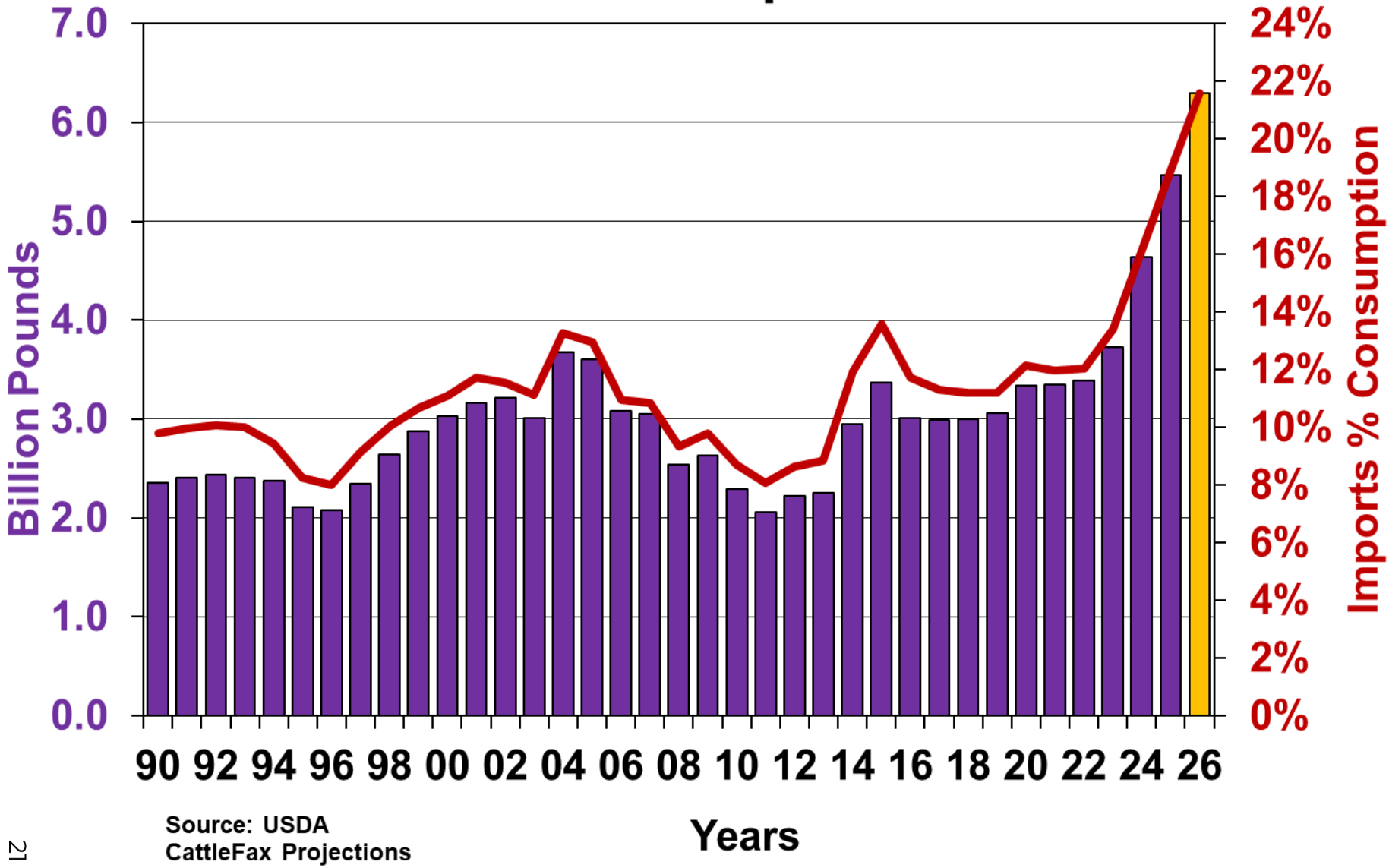
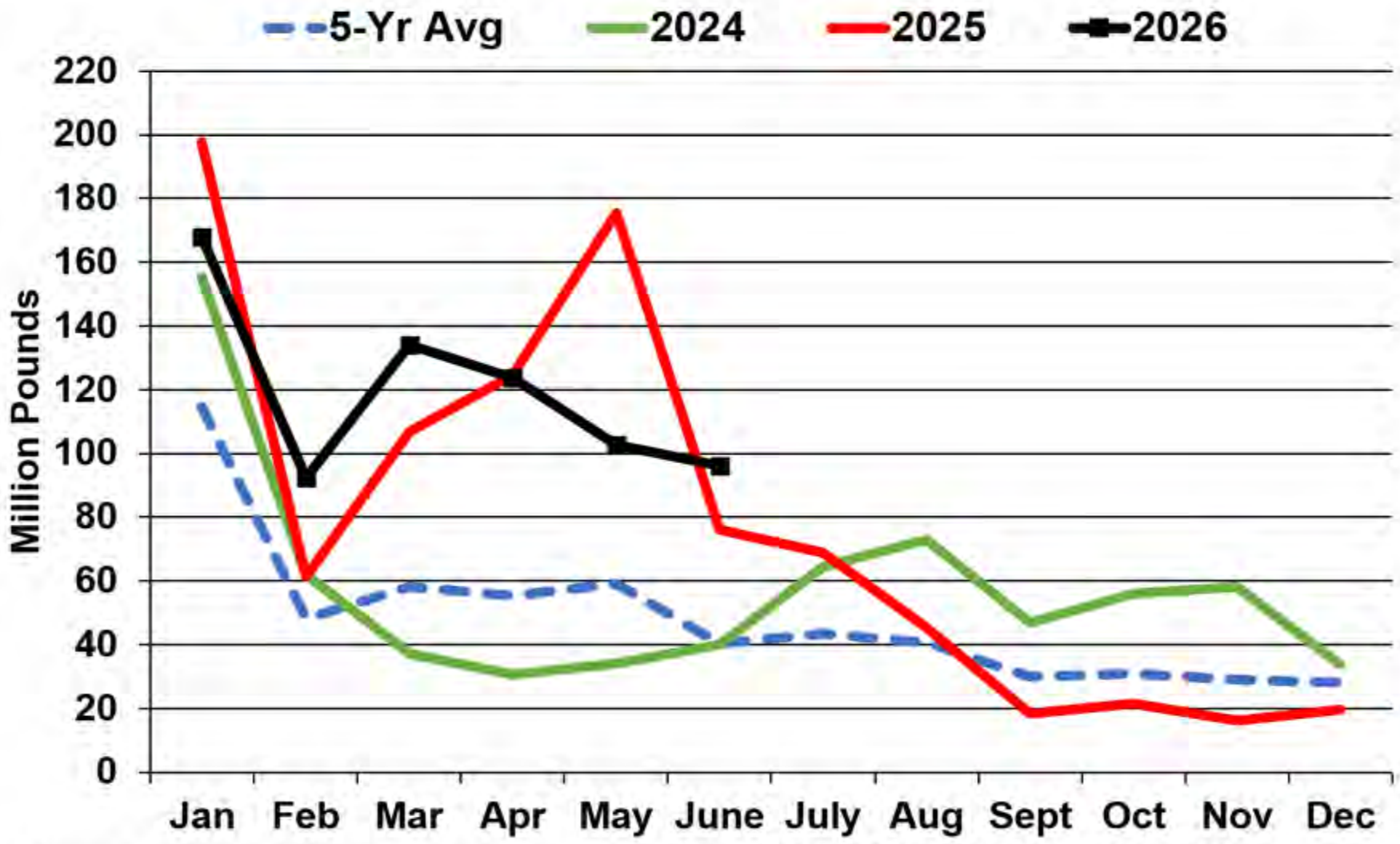
U.S. Beef Imports



Source: USDA
CattleFax Projections

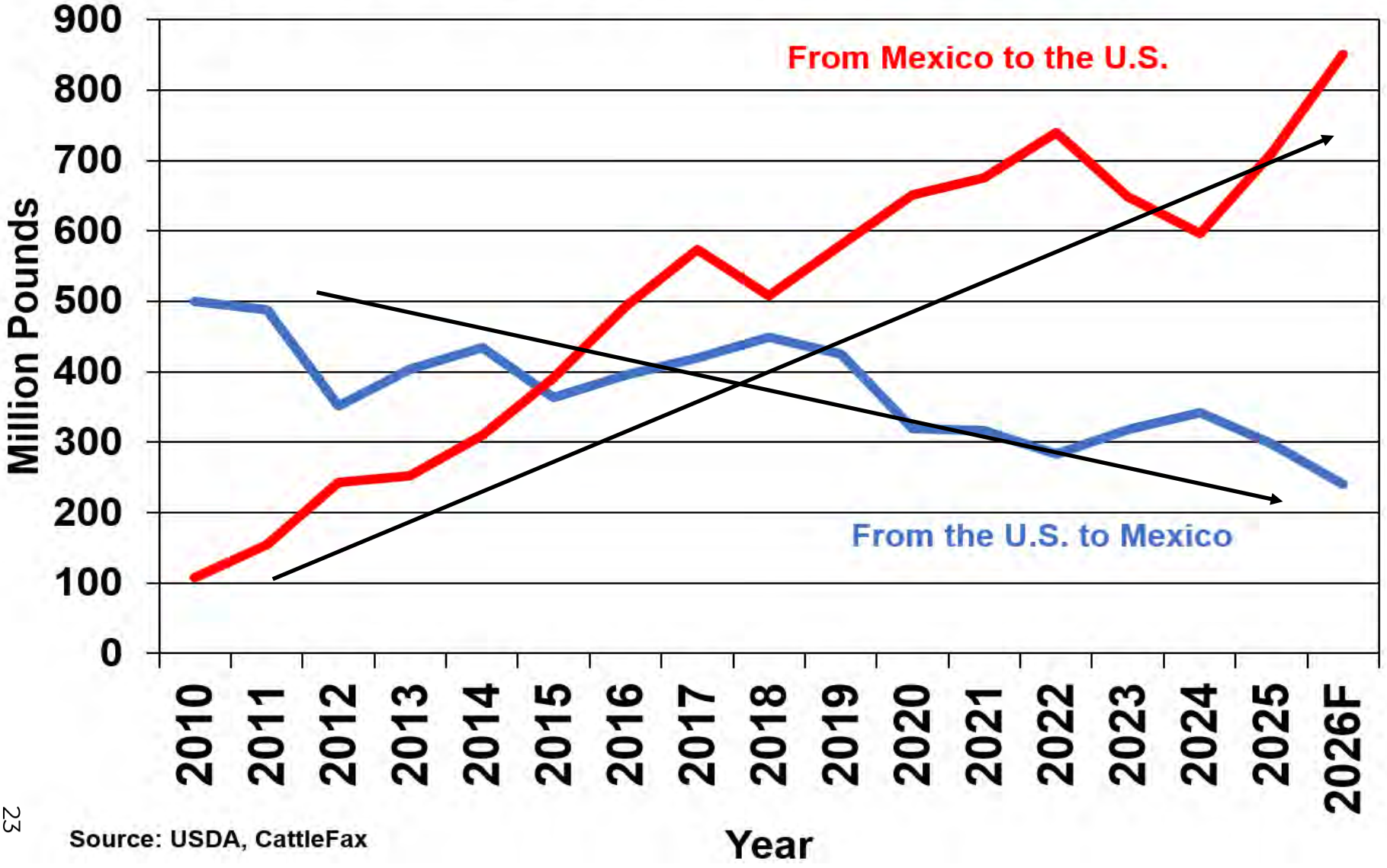
U.S. Beef Imports from Brazil



Source: USDA, CattleFax

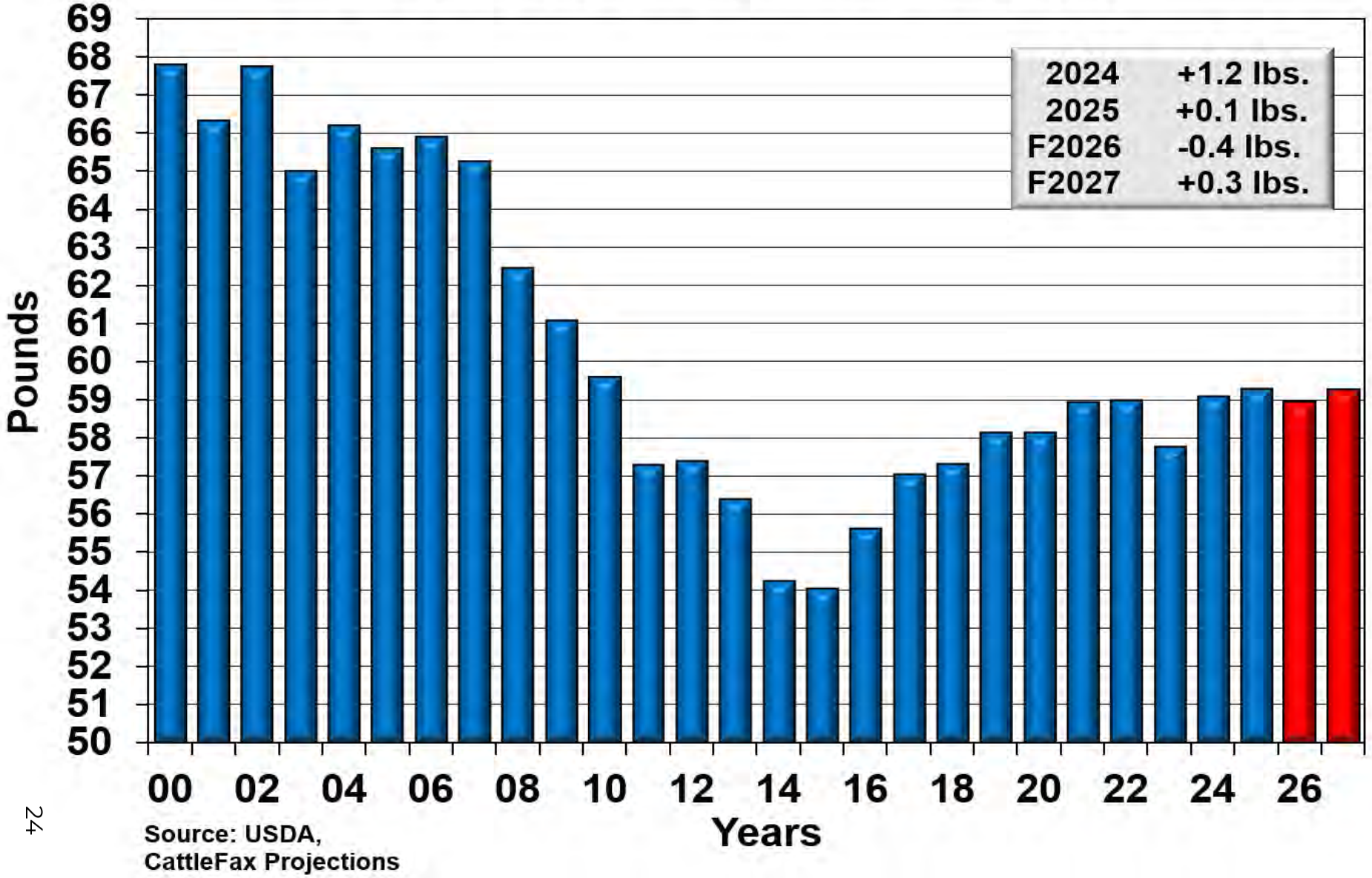
June '26: up 20.3 mil lbs. (26.7%) vs. June '25
2026 YTD: down -24.8 mil. lbs. (-3.3%) vs. 2025

U.S. Beef Trade with Mexico



Source: USDA, CattleFax

Per Capita Net Beef Consumption



Source: USDA,
CattleFax Projections

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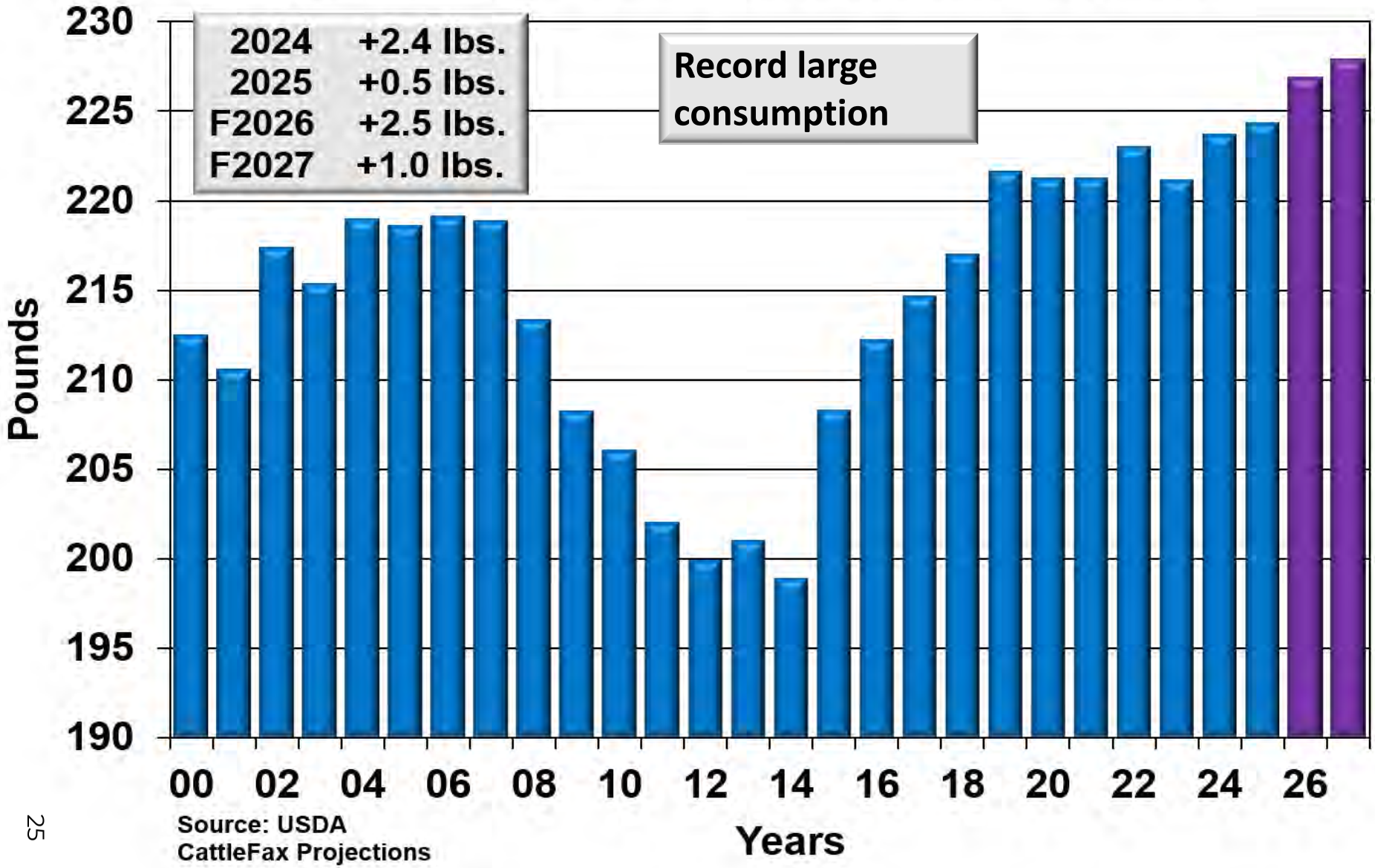
Per Capita Red Meat & Poultry Consumption



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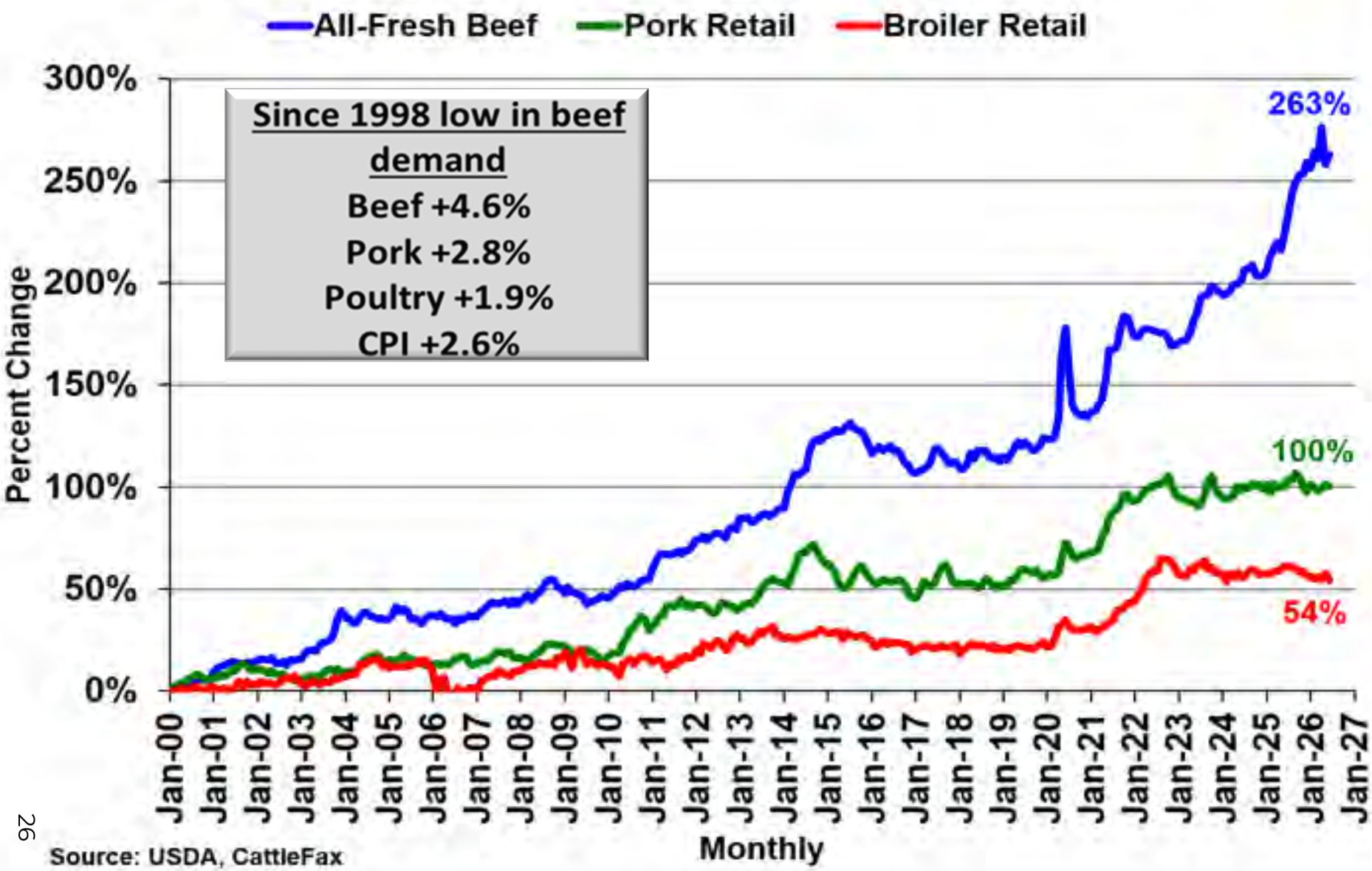
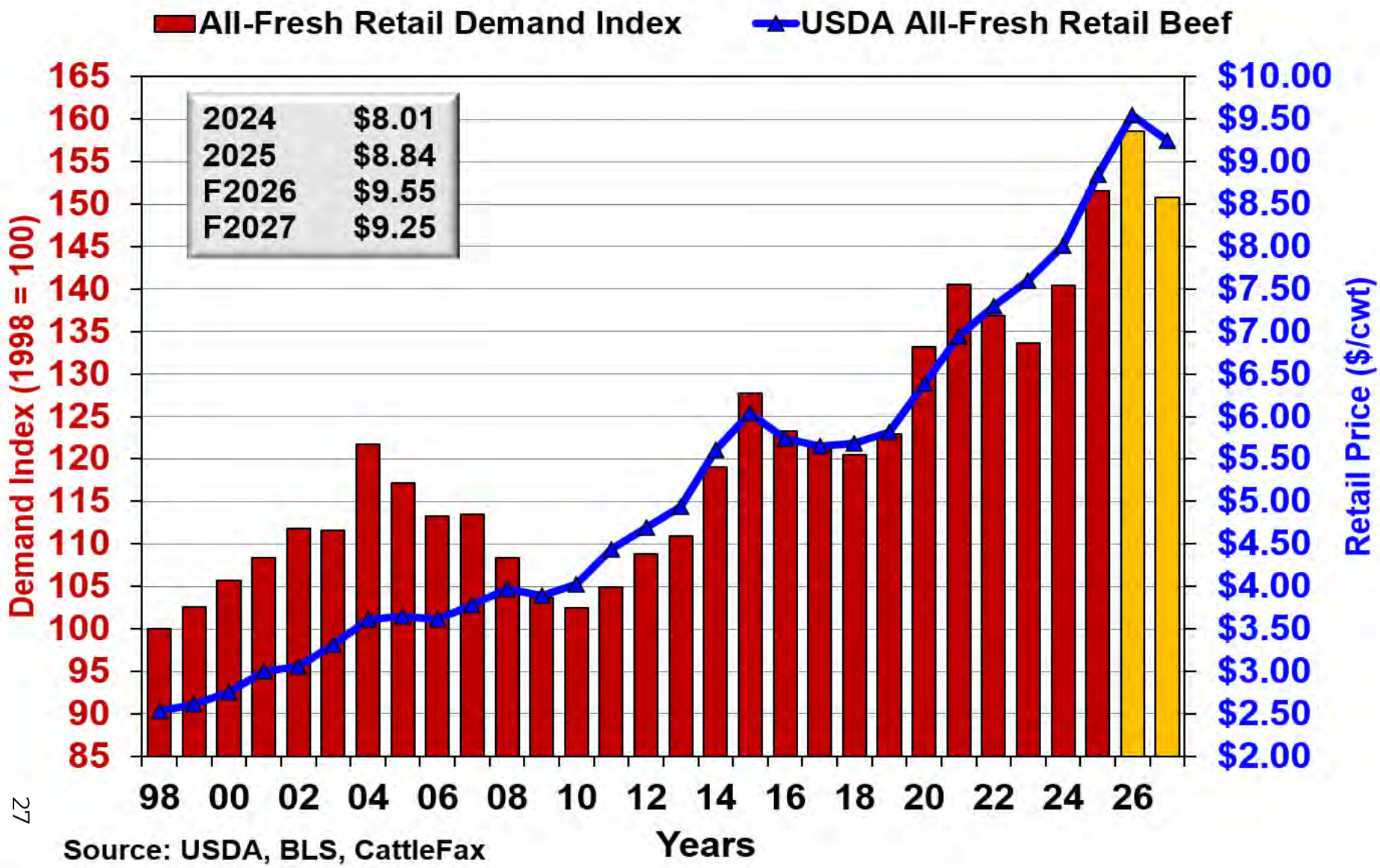
Retail Meat Price Change Since Jan-2000



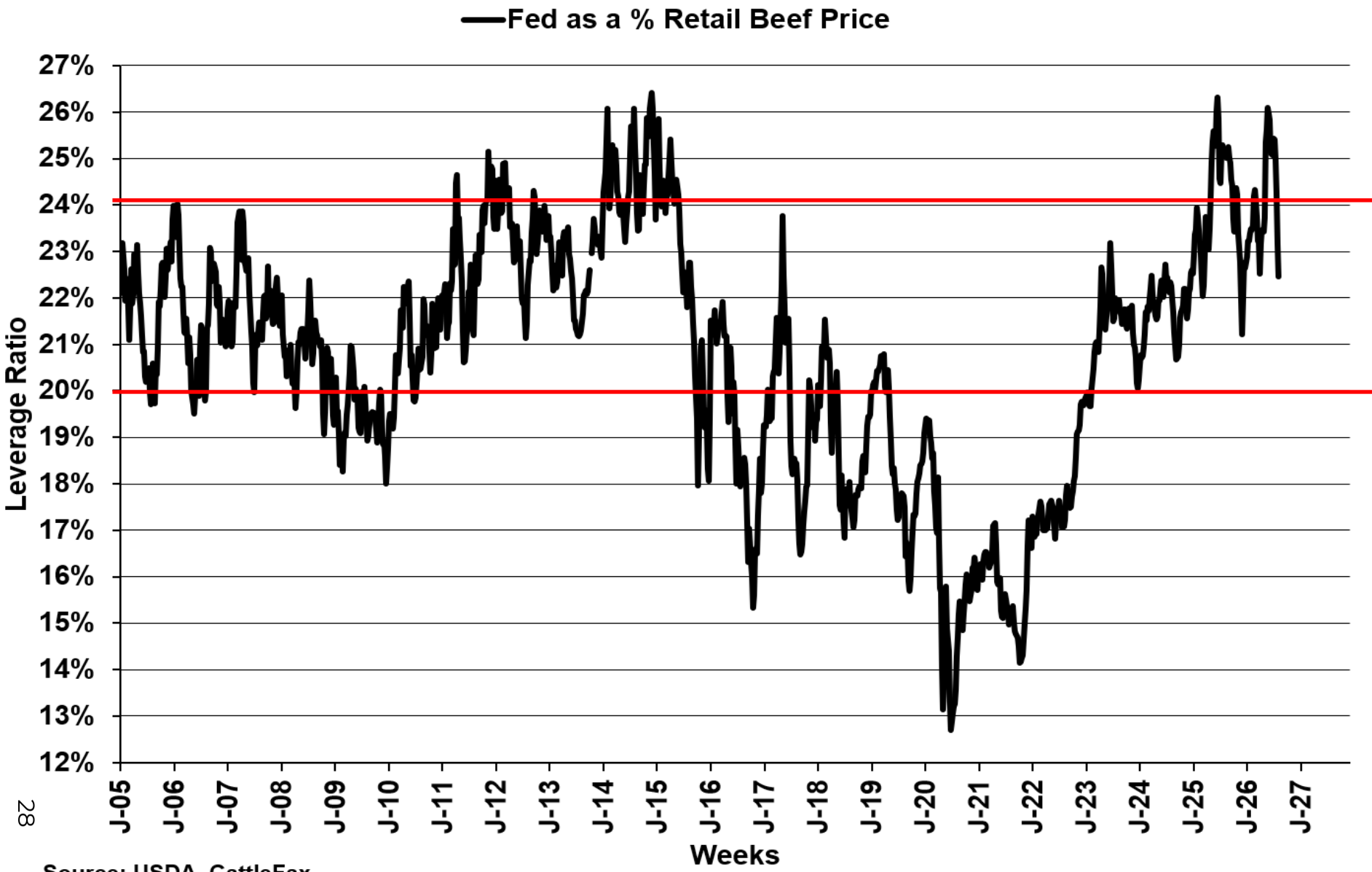
Source: USDA, CattleFax

Annual U.S. Retail Beef Demand & Price



Source: USDA, BLS, CattleFax

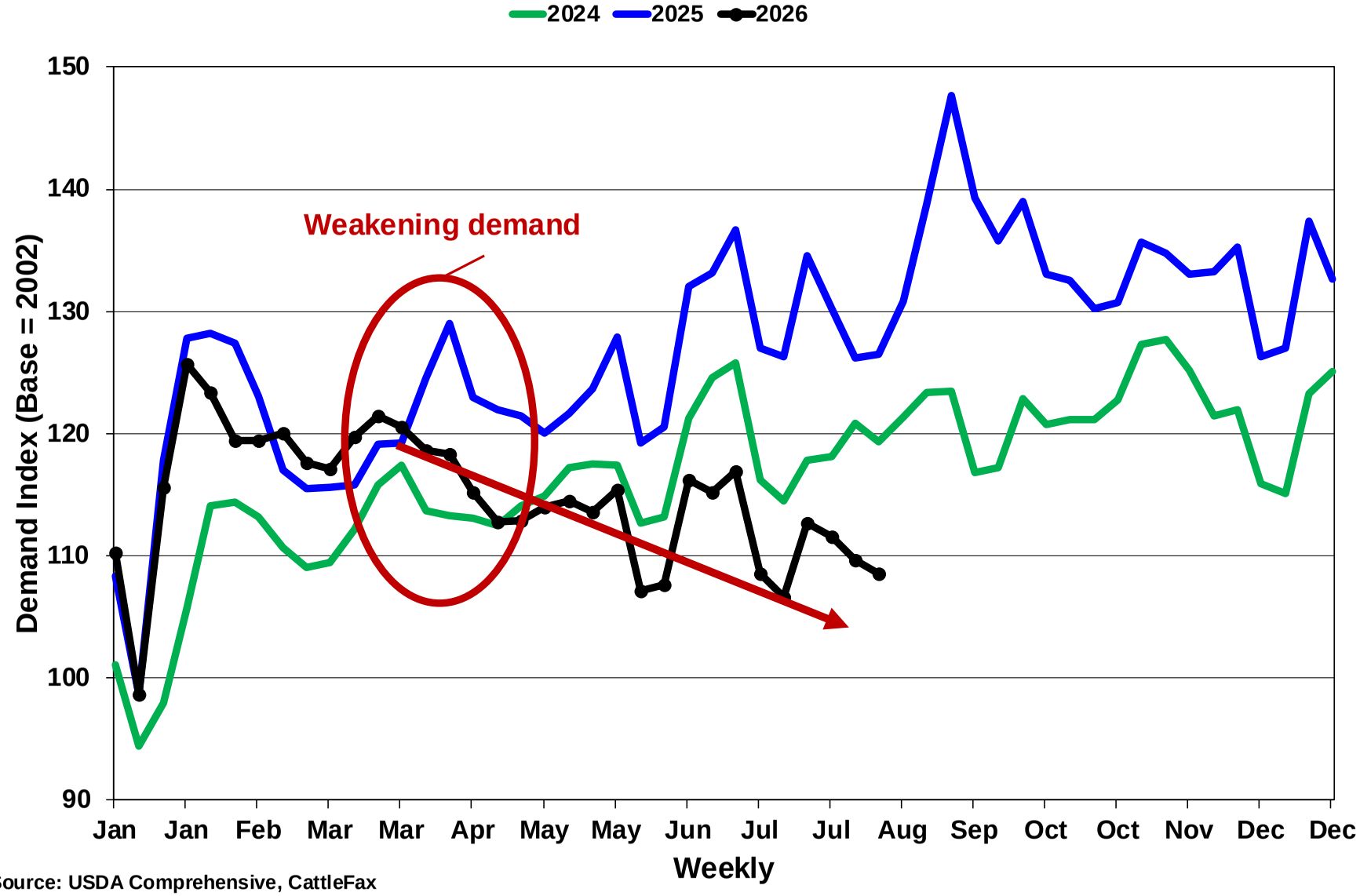
Fed as a % Retail Beef Price



Source: USDA, CattleFax

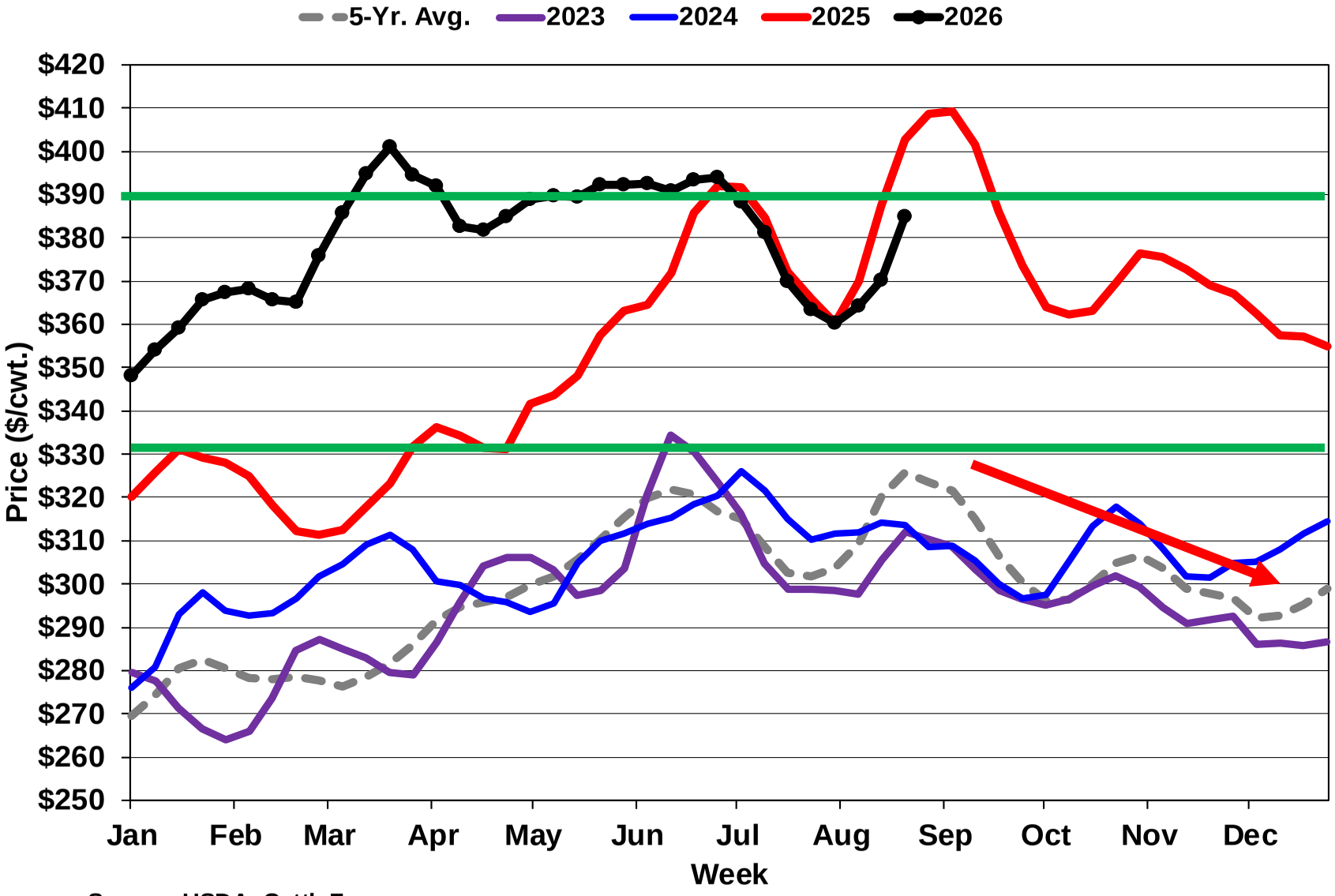
	All Fresh Retail Beef Price		
Fed %	$ 9.40	$ 9.50	$ 9.60
20.0%	$200	$202	$204
20.5%	$205	$207	$209
21.0%	$209	$212	$214
21.5%	$214	$216	$218
22.0%	$219	$221	$223
22.5%	$224	$226	$228
23.0%	$228	$231	$233
23.5%	$233	$235	$238
24.0%	$238	$240	$242
24.5%	$242	$245	$247
25.0%	$247	$250	$252
$12 Drop Credit			

Comprehensive Composite Cutout Demand



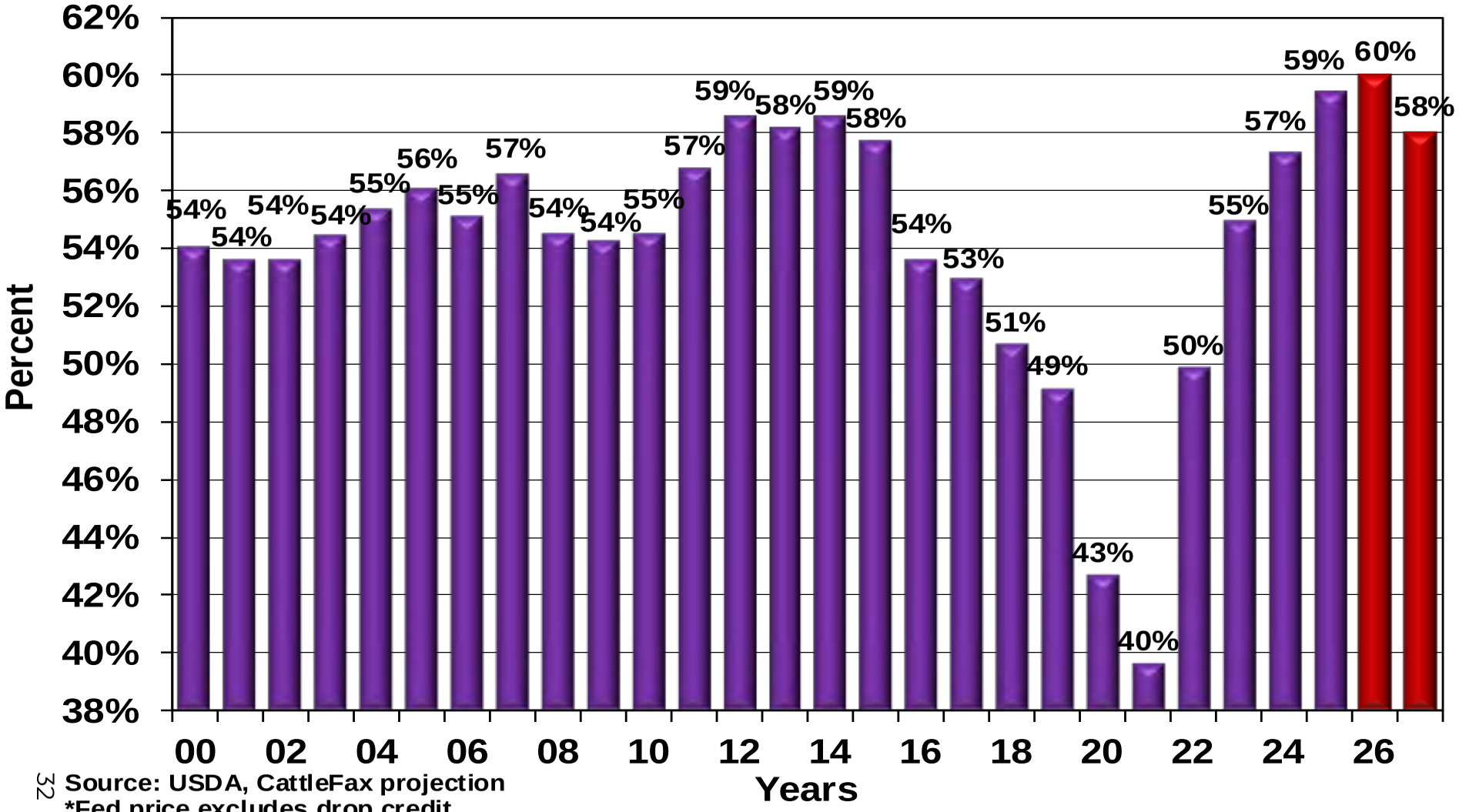
Source: USDA Comprehensive, CattleFax
Based on Real Per Capita Expenditures - 2-Wk. Avg.

USDA Spot Composite Cutout Price Seasonal



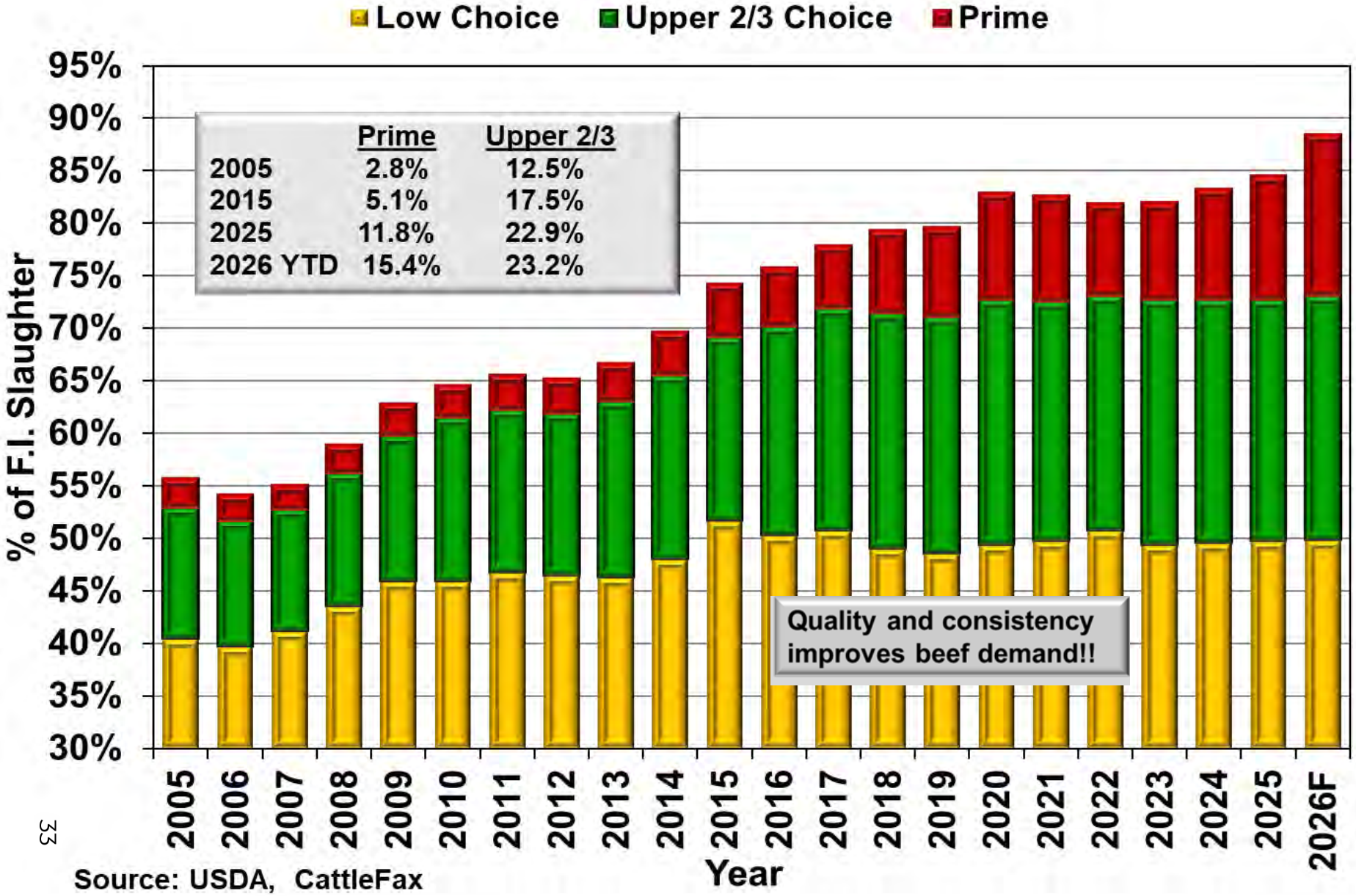
Source: USDA, CattleFax

Fed Cattle Price as a Percent of the Composite Beef Cutout Price*



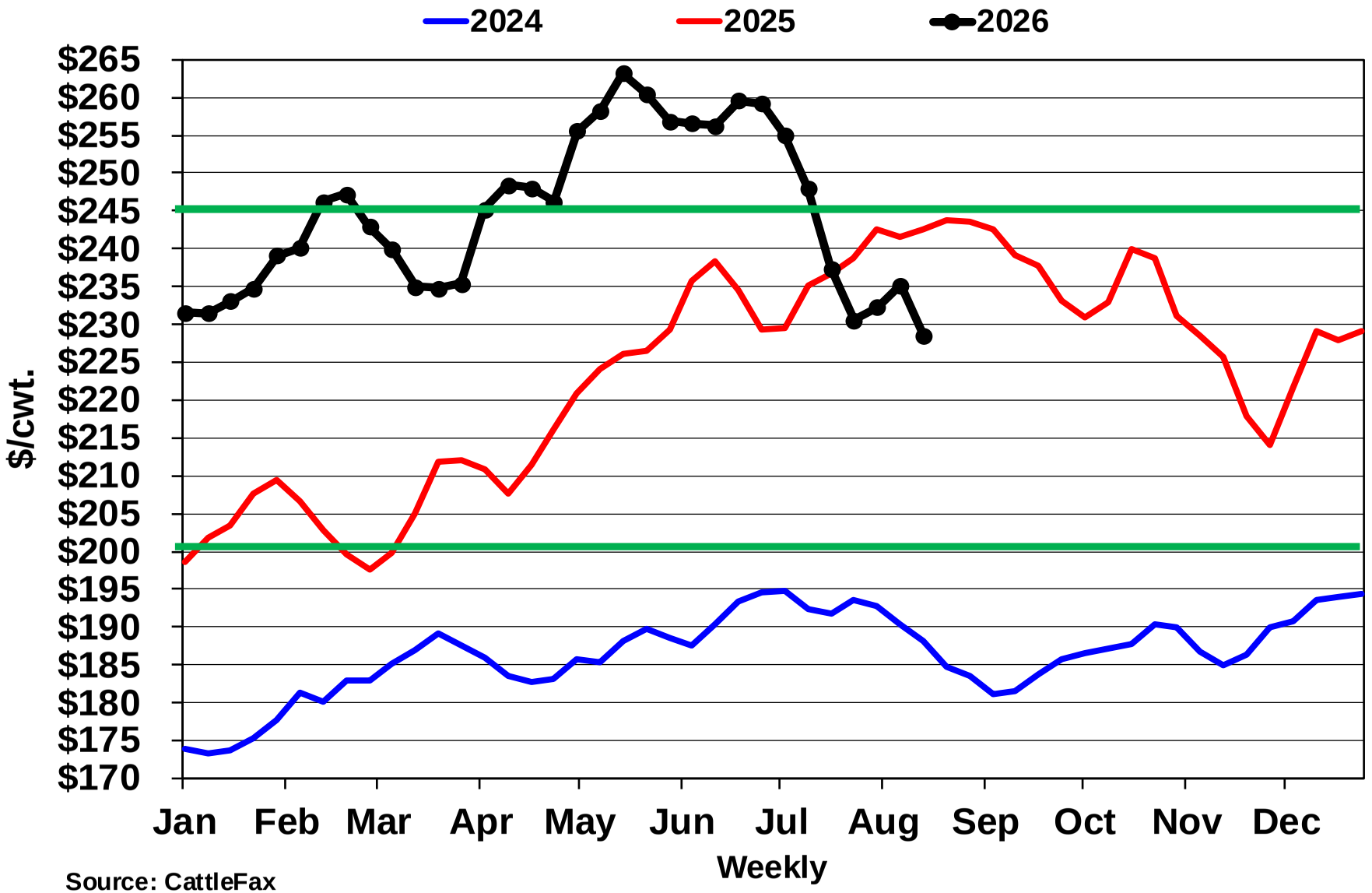
32 Source: USDA, CattleFax projection
*Fed price excludes drop credit

USDA Grading Percentages



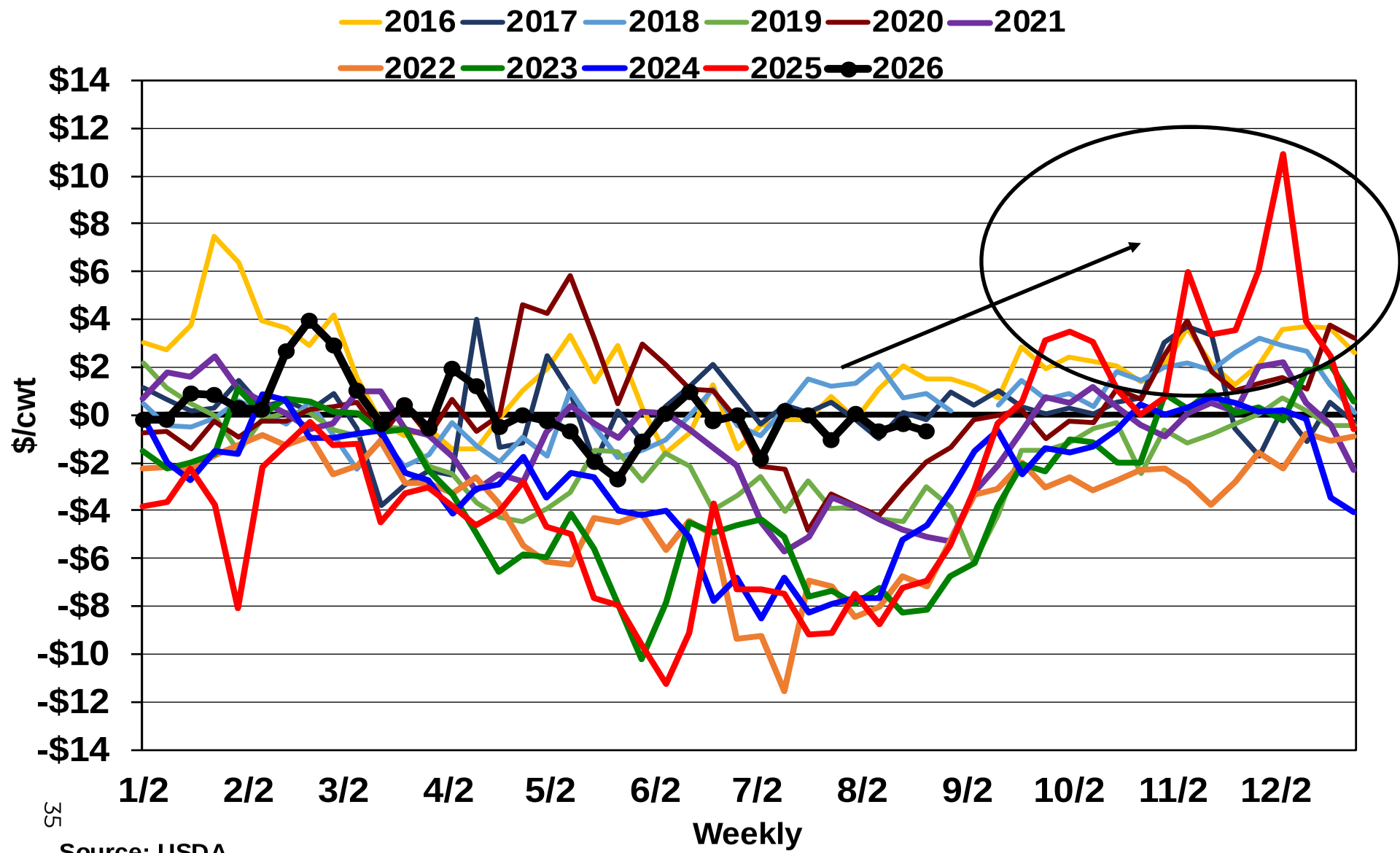
Source: USDA, CattleFax

CattleFax U.S. Fed Steer Price



Source: CattleFax

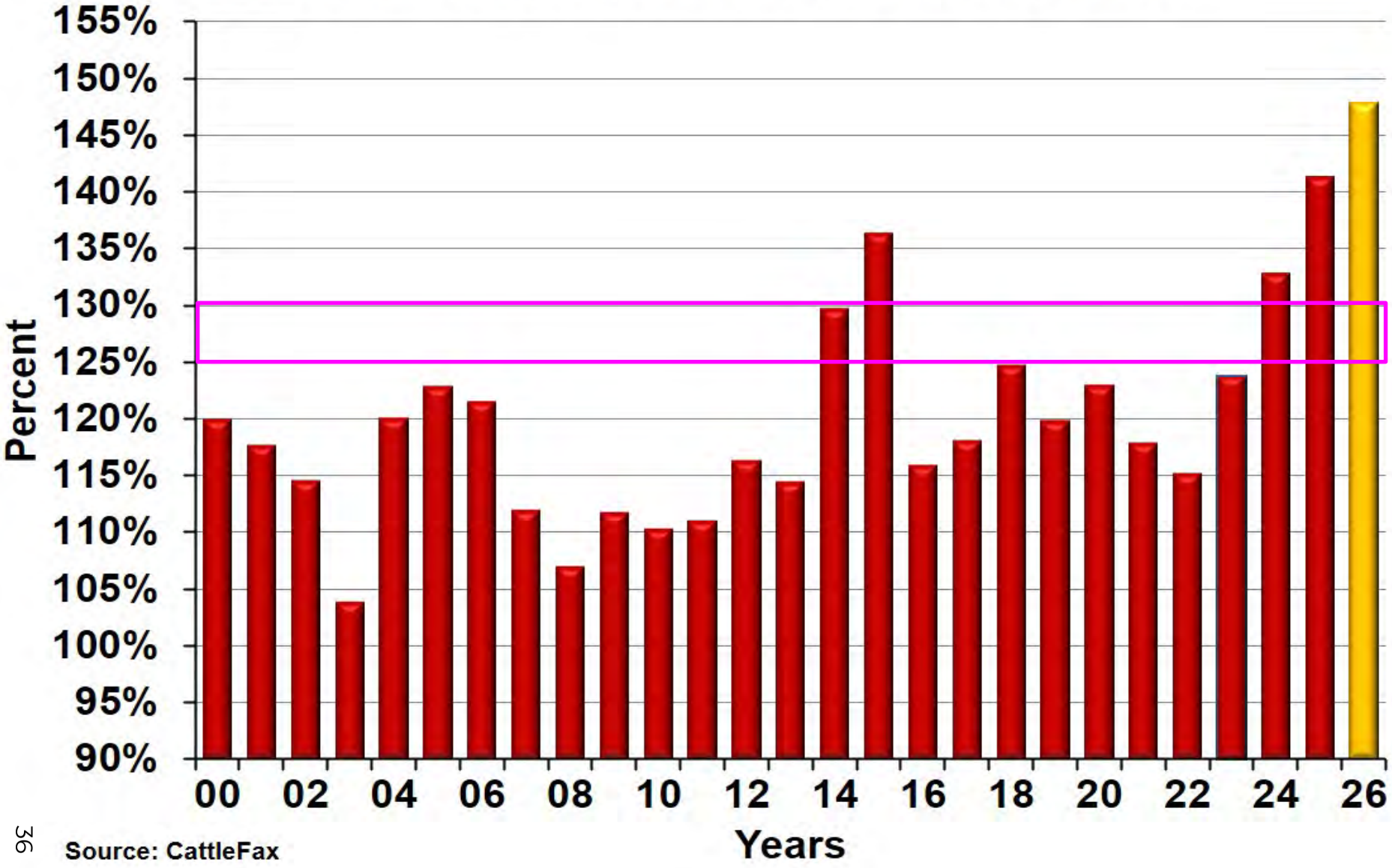
USDA Kansas - Iowa/Minnesota Fed Steer Spread



Source: USDA

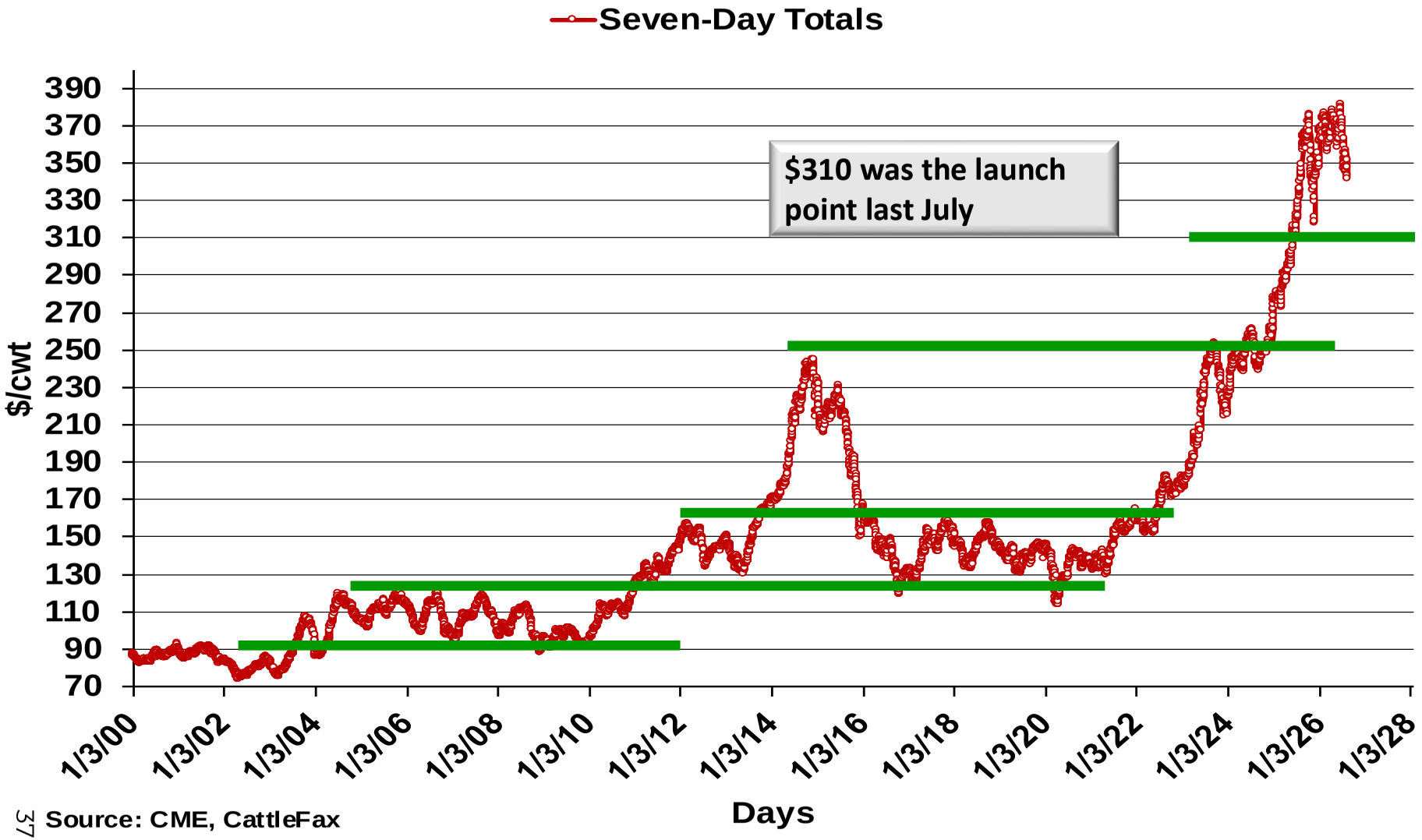
CattleFax | THE DECIDING FACTOR

800-lb. Feeder Steer % of Fed Steer Price



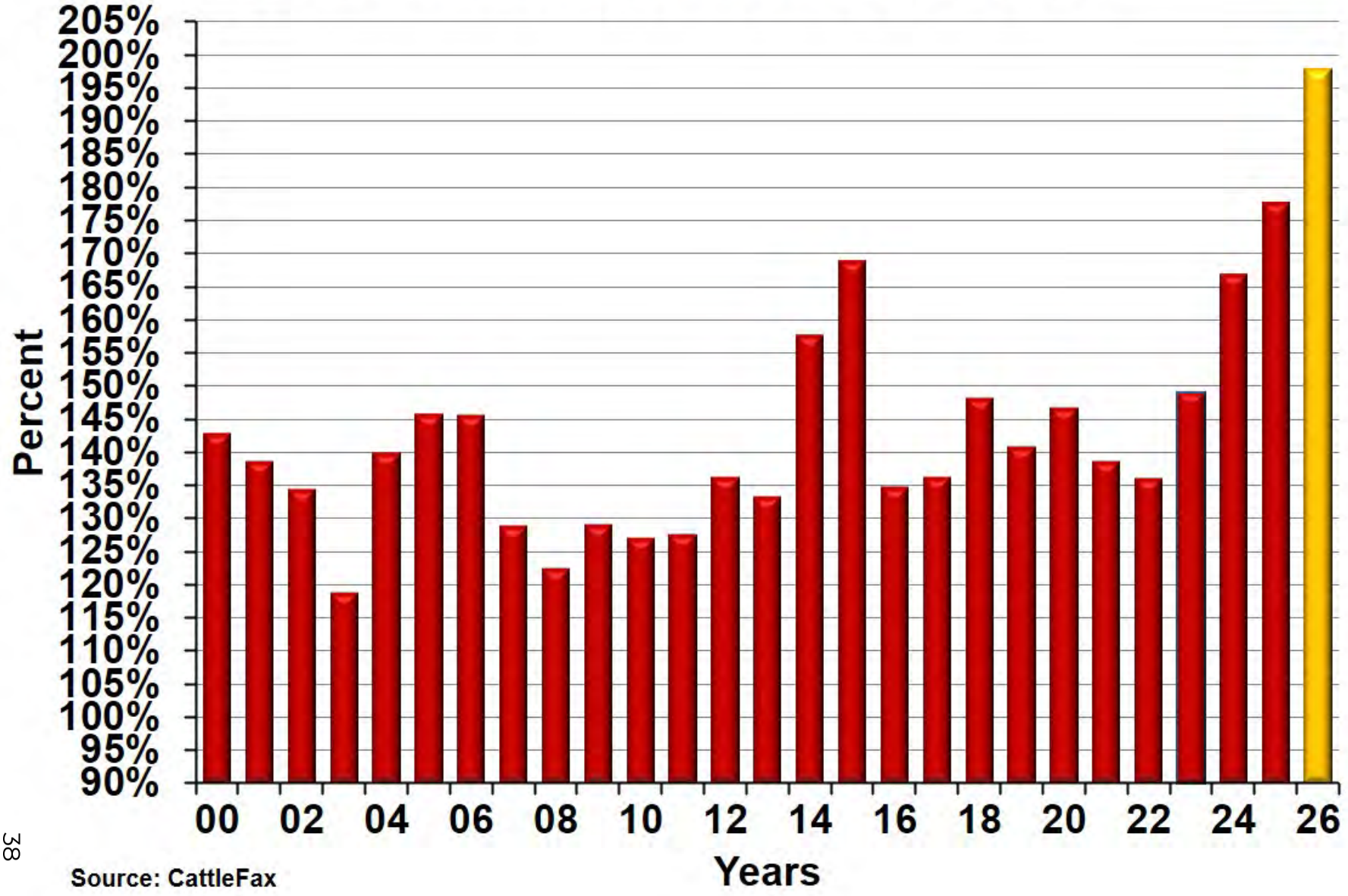
Source: CattleFax

CME Feeder Cattle Index Price



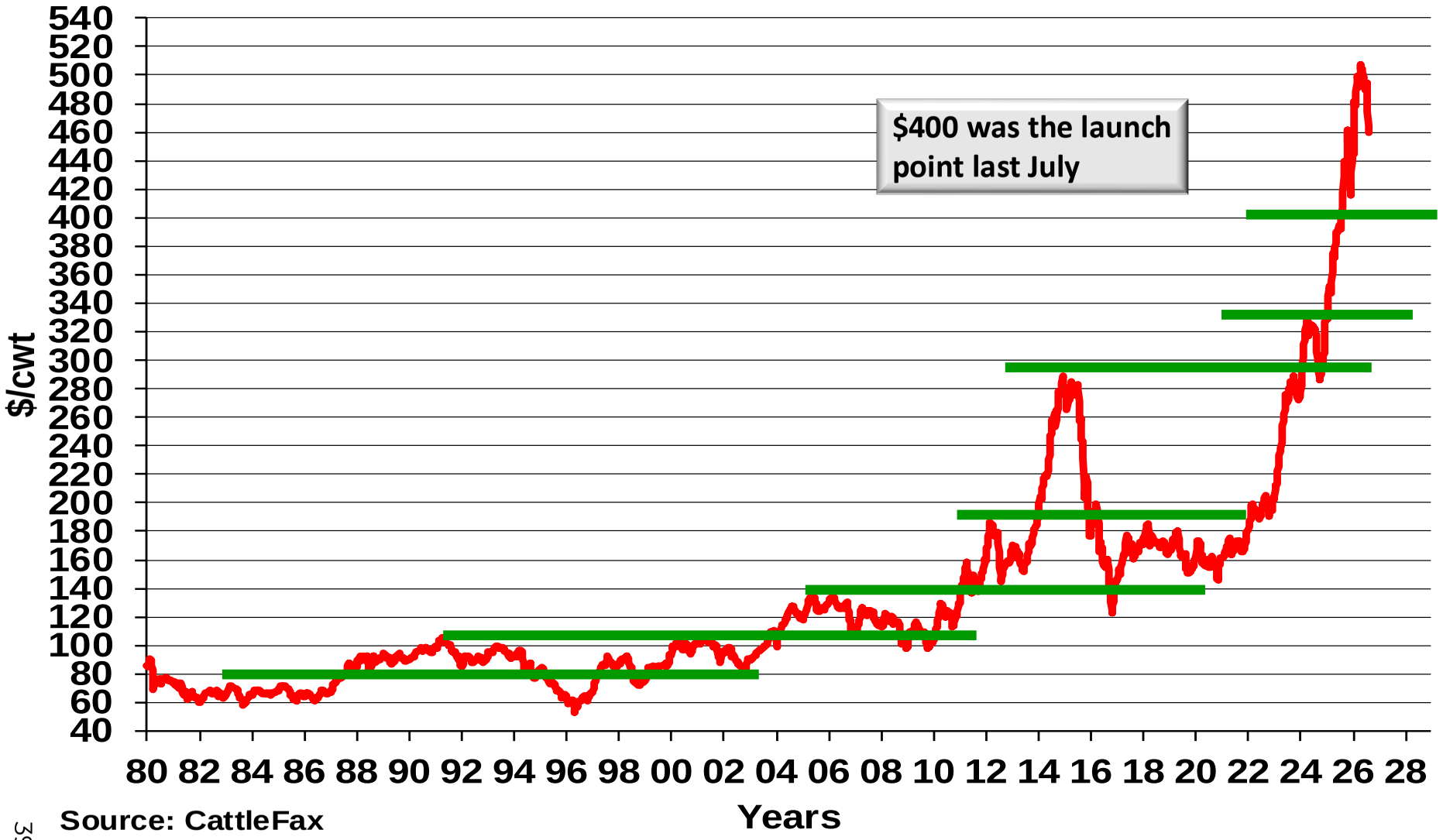
Source: CME, CattleFax

550-lb. Calf Steer % of Fed Steer Price



Source: CattleFax

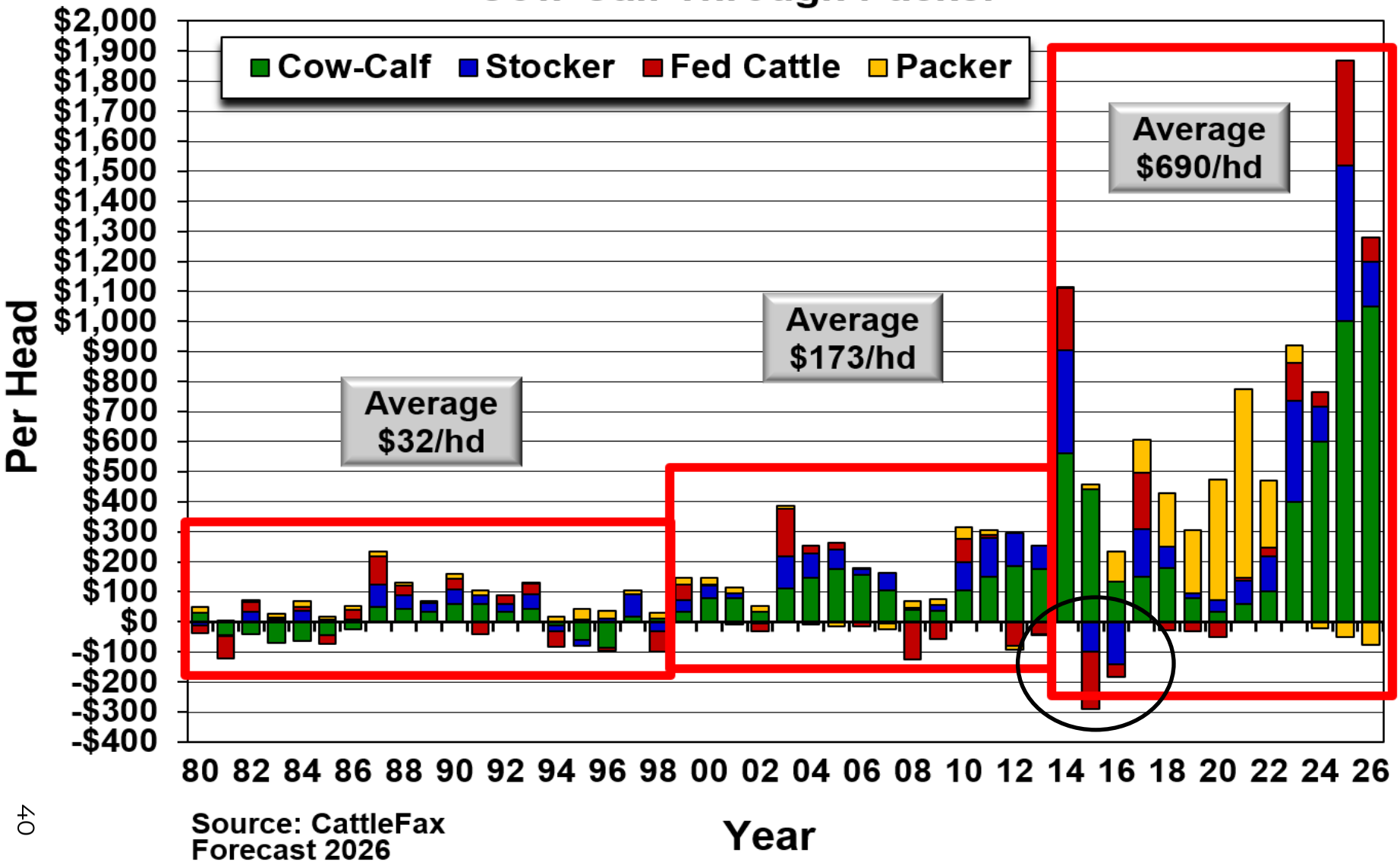
CattleFax U.S. 550-lb. Steer Price



Source: CattleFax

Industry Profitability

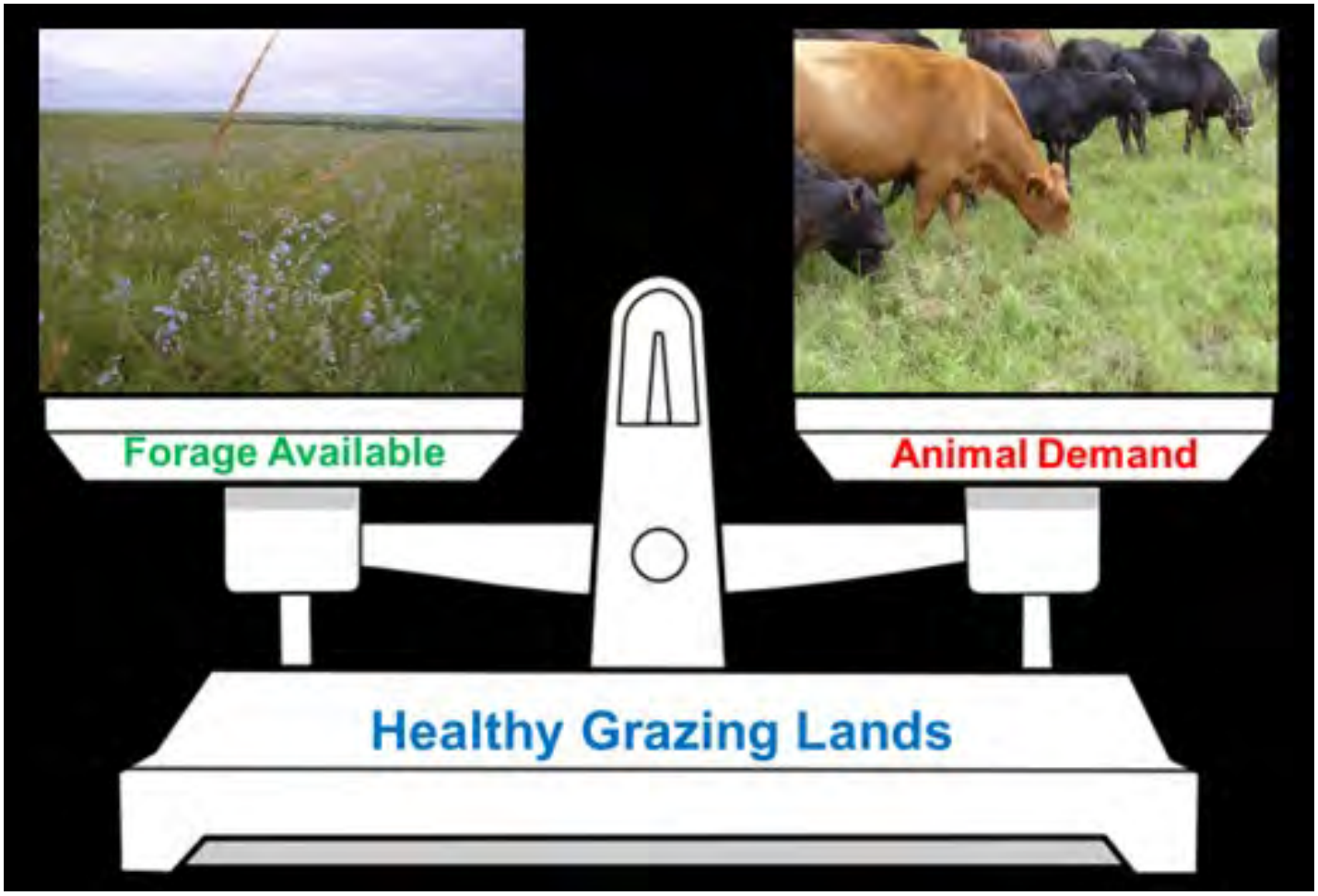
Cow-Calf Through Packer



Source: CattleFax
Forecast 2026

CattleFax | THE DECIDING FACTOR

Questions?

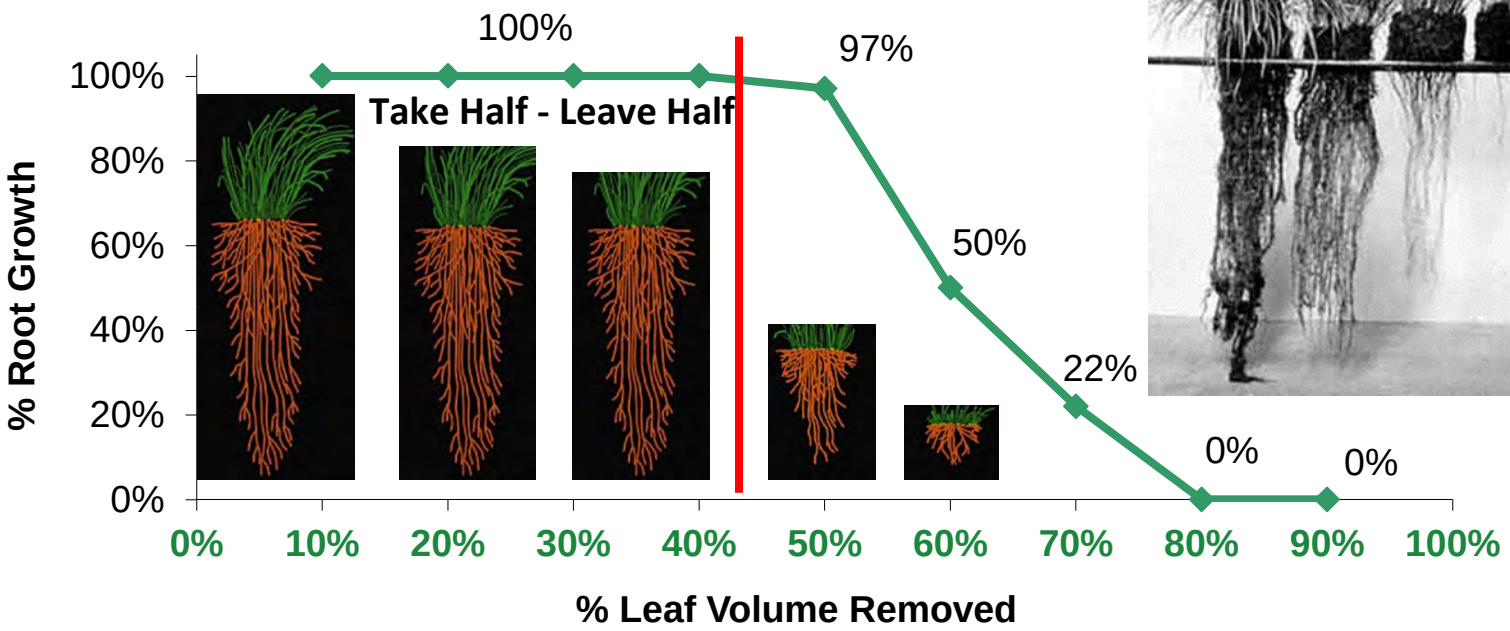


Forage / Animal Balance

- Stocking rate: The number of animals or animal live-weight assigned to a grazing unit on a seasonal basis
- Carrying capacity: The stocking rate that provides a target level of performance while maintaining the integrity of the resource base
  - Stocking rate has impact on intake and availability

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Grazing Affects on Grass Root Growth



Half or more foliage removal of cool and warm-season grass species during the growing season caused root growth to stop for a time.

80% leaf removal = complete stoppage of root growth for 12 days.

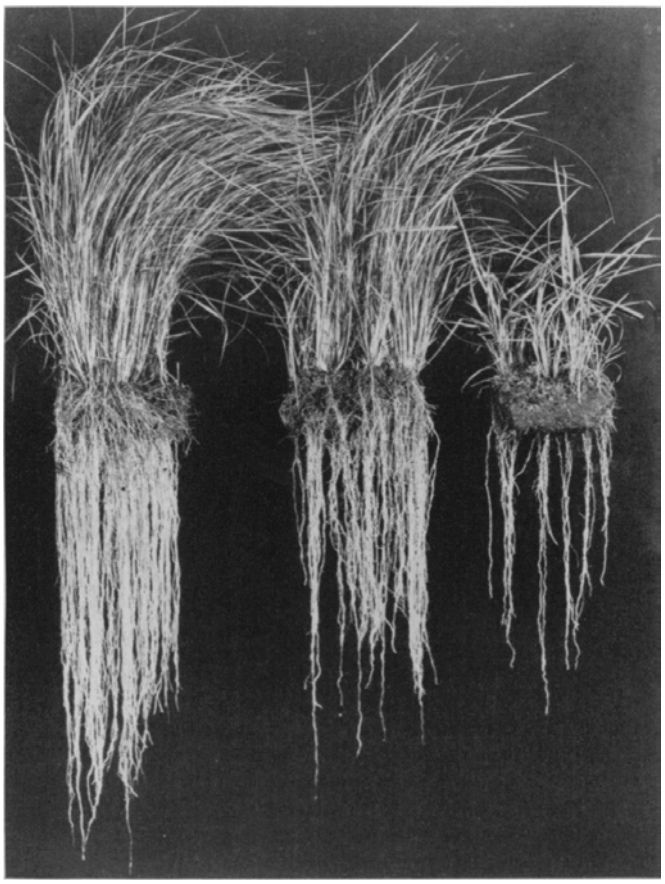
90% leaf removal = complete stoppage of root growth for 17 days.

Source: Crider, F. J., 1955.

Grass Vigor?

Little Bluestem	Left	Middle	Right
Initial Height	6”	2.5”	0.5 - 1.5”
New Leaf Growth (grams)	30.22	12.89	1.87
New Root Growth (grams)	4.7	1.72	.33
% Leaf Growth	100%	42.7%	6.2%
% Root Growth	100%	36.6%	7.0%

Transplanted into fertilized, well-watered soil on May 17th and grown for 6 weeks.



New growth of roots and tops of little bluestem six weeks after transplanting the sods on May 17. The sods were 6 inches long, 4 inches wide, and 3 inches deep but taken from a high-grade, mid-grade, and low-grade pasture, respectively.

Source: Weaver, J. E., 1950.

Total Annual Forage Production

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

For initial planning purposes an average forage production is figured based on annual precipitation, ecological site, soil types, topography, etc.

Considerations:

- Quantities and Vigor of Plants (desirable/undesirable species)
- Site Forage Potential (soil type, acres of each type, etc)
- Non-useable or Reduced Forage Acres
  - Trees, feeding areas, ponds, ranch roads, etc.
- Size of Pasture (acres)
- Effective Precipitation
- Tools:
  - Web Soil Survey (WSS)
  - Ecological Site Descriptions (ESD's)
  - Rangeland Analysis Platform (RAP)
  - Precipitation Records

1. Determine the Forage Available (lbs of Air-Dry Forage):

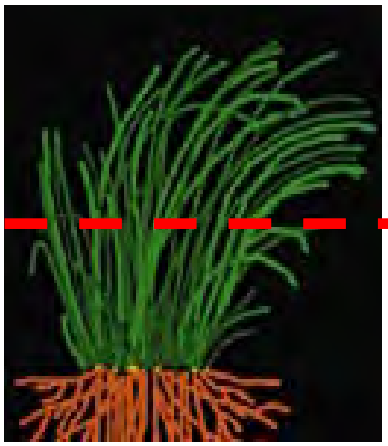
From a forage summary analysis. (weighted average of site productions)

Acres in Field		Forage Dry Matter Production (Lbs per Acre)		Total Lbs of Forage Dry Matter in Field		Harvest Efficiency [1] (%)		Available Lbs of Forage Dry Matter in Field
370	x	2780	=	1028600	x	25%	=	257150

Harvest Efficiency

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Total Forage Production

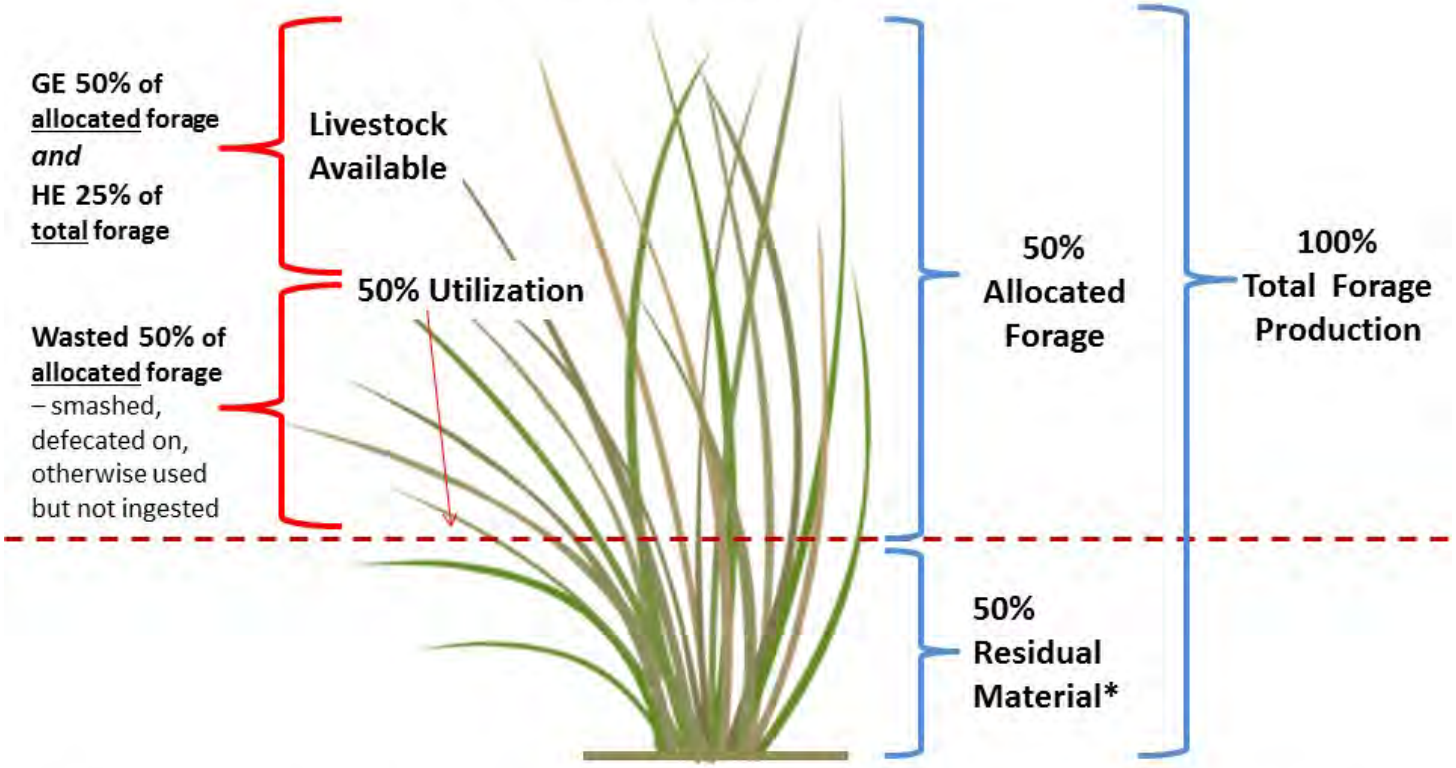


25% "Available for Grazing Animal"
- Available Forage Production

25% Environmental Loss
- Trampling, Grazing Selection, Manure/Urine Spots, Insects, etc.

50% Remains For Grass Plant Health/Vigor

Comparison of Utilization, Harvest Efficiency (HE), and Grazing Efficiency (GE)
Take Half, Leave Half Example



*Residual material for perennials is the minimum amount needed for plants to remain vigorous (typically 50%). Residual material for annuals is the minimum amount needed to meet resource objectives (typically portrayed as lbs per acre).

Average Daily Intake –3% of bodyweight

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Larger animals need more feed and thus have a higher forage demand.

- It is important to know an accurate average live weight of your livestock.

Calving and weaning dates affect forage demand of the cow/calf pair.

- Calf intake needs included in forage demand at ~6 months of age.
  - Example: A 1200 lb cow with March calf will have a 1350 to 1400 lb comparable forage demand if calf stays into October.

2. Determine the Individual Animal's Forage Demand (Animal Intake x Length of Grazing Event):

Animal Type	Average Live Weight of each Grazing Animal (lbs)		Forage Intake Rate (% of body weight per day)		Forage Dry Matter Demand per Head per Day (lbs)		Number of Grazing Days		Forage Dry Matter Demand per Head per Grazing Event (lbs)
Dry Cow	1150	x	3.0%	=	34.5	x	180	=	6210

Length of Grazing Season

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Ultimately, the decision is YOURS… but if you plan for 150 days and stay for 180 days, the forage resource will be impacted.

- Full Season – 150 or 180 day
- Double Stock – 90 day
- ¾ Season – 110 to 120 day

Stocking Rate Research

Stocking Rate Determination on Native Rangeland: Bidwell et al., March 2017

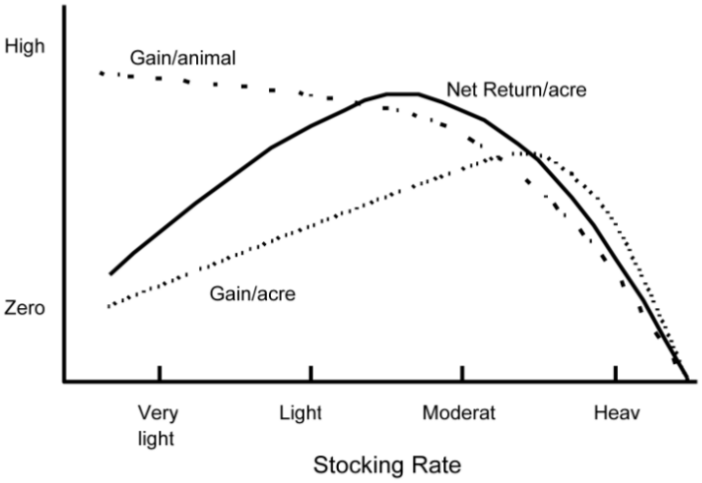


Fig. 1 Effects of stocking rate on livestock performance and profitability

As stocking rate is increased beyond moderate levels (optimum), animal performance is reduced because of increased competition among livestock. The opportunity for diet selection afforded by low to moderate stocking rates ensures that individual animal performance is maximized. Figure 1 also indicates that as stocking rate increases, the amount of weight gain produced per acre is increased up to the optimum threshold and then declines sharply. Ranchers who continually use heavy stocking rates in an attempt to improve net profitability should realize that they have already passed the point at which maximum net return will be realized because of increased costs (such as herbicide, protein supplements, and hay) that are not offset by production increases.

An additional problem with long-term overstocking of native forages is the overuse of palatable species that results in an increase of less palatable or unpalatable plants and a reduction of fine fuel, which will eliminate the ability to use prescribed fire. Without fire, woody plants will increase rapidly. As the incidence of these undesirable plants increases at the expense of the more desirable forage species, animal performance will decline and the number of cattle that the ranch will support will decline.

KSU Beef Tips: Evaluating Rules of Thumb for Grazing Management: Johnson & Harmoney, 2020

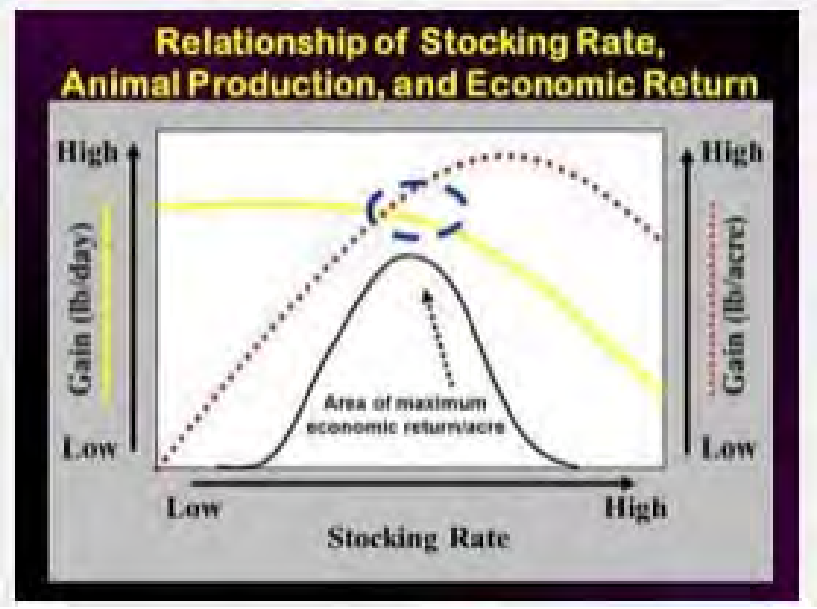


Figure 2: Relationship of stocking rate, animal production and economic return.

You Can't overgraze and make money. Pastures that are overgrazed produce lower net returns than pastures that are stocked at a moderate rate using the take half and leave half concept. Greatest net returns per acre will be experienced when collectively the greatest number of animals achieve their most efficient individual gain (Fig. 2). This is also the stocking rate where total pasture gain on a per acre basis is usually at its greatest point of efficiency. As stocking rate increases further, additional animals cause enough competition for high quality forage, or competition for enough quantity of forage, that individual performance is reduced. This results in production per acre increasing because more animals are on pasture, but production per acre increases at a decreasing rate because each individual animal will gain fewer total pounds. Increasing stocking rate further and removing more vegetation results in even more competition and lower individual animal gain, and animal gain per acre will eventually even start to decline. Grazing animals at high stocking rates don't achieve enough gain to cover their own costs of production, so net returns plummet. Returns per acre and per animal are at their greatest level when total gain is most efficient to cover the costs of production. Grazing studies have shown that the greatest returns per acre are usually achieved at a moderate stocking rate that takes half and leaves half, and are least with heavy stocking when more than half of the standing forage is annually removed.

Forage – Animal Balance

$$\text{Carrying Capacity} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

3. Determine the Suggested Number of Head:

Available Lbs of Forage Dry Matter in Field		Forage Dry Matter Demand per Head per Grazing Event (lbs)		Suggested Number of Head		Suggested Acres per Head [2]
257150	÷	6210	=	**41**	or	**9**

Stocking Rate Goal:

Maintain **forage – animal balance** within your system/land unit through time.

Total Annual Forage Production:

- Clip forage biomass samples to determine available forage
- Remove ungrazable acres from planned land unit
- Adjust production based on soil types

Harvest Efficiency:

- Maintain a healthy and vigorous root system. Do not remove more than 50% of current year's growth
    - It takes grass, to grow grass – A healthy plant leaf (solar panel) is the means of plant survival through time.

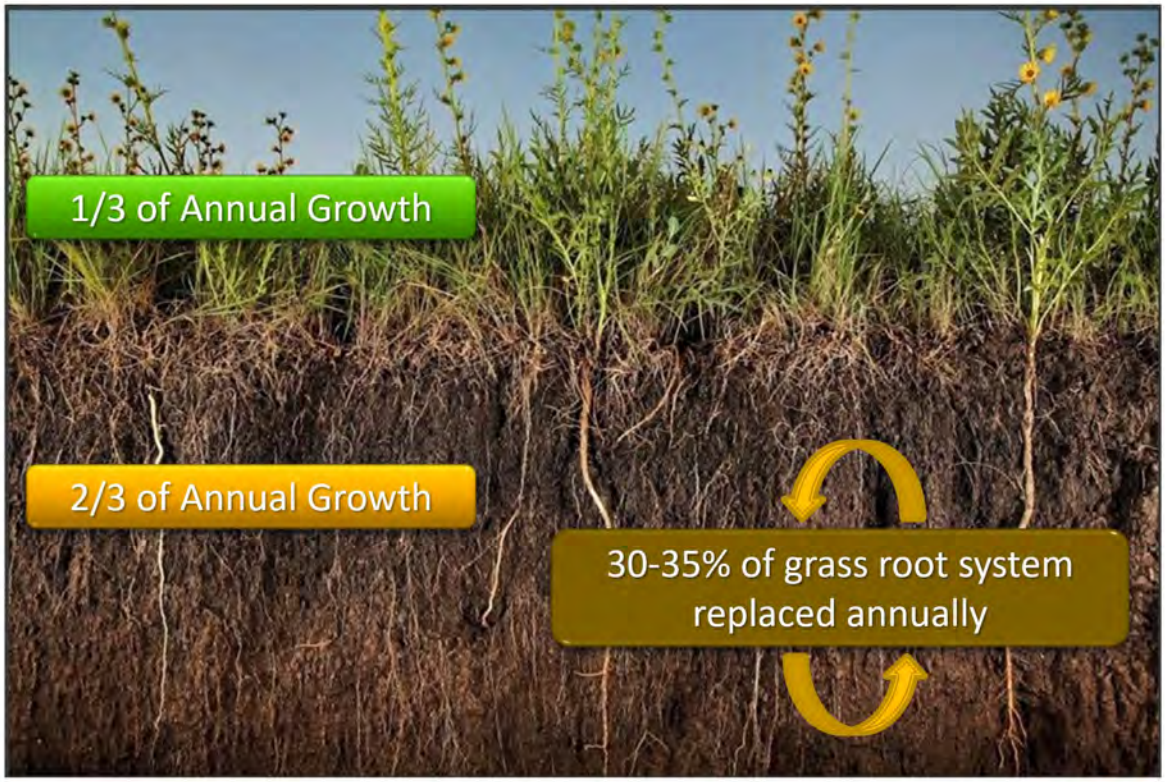
Average Daily Intake:

- Do not underestimate average weight of livestock, must know/use actual live weight in calculations.
- Include calf forage consumption starting at 6 months old.

Length of Grazing Season

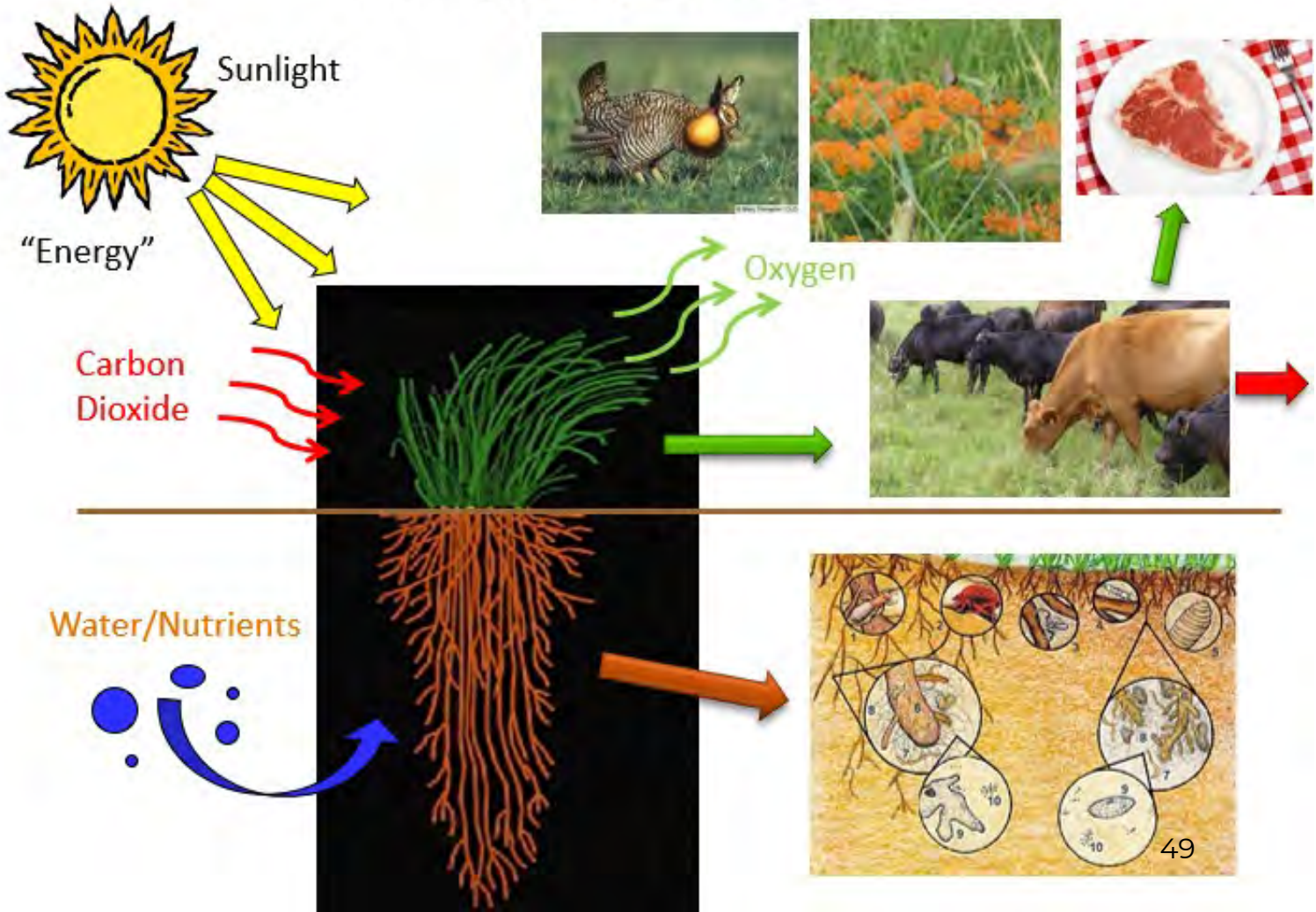
- Consider all outcomes, monitor change, and be adaptable
- Have contingency plans - i.e. drought

Maintaining the Prairie



Kansas Prairie Soil Profile
©National Geographic Society

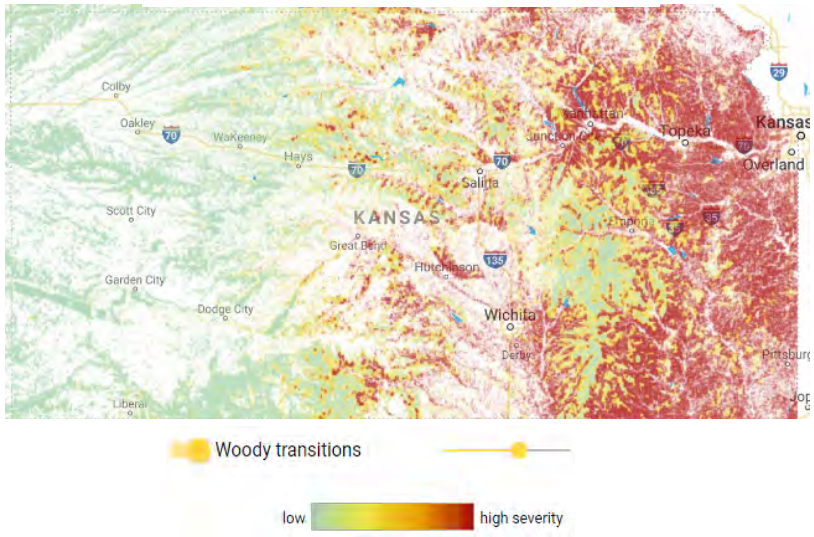
Energy Capture & Flow



Grassland Vulnerability – Woody Encroachment

Early warnings - 1990

Early warnings - 2020



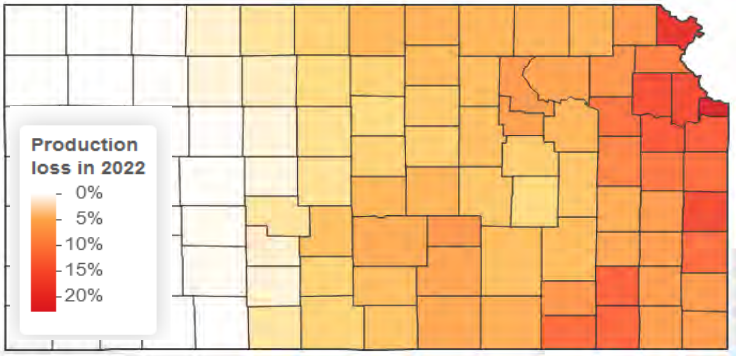
Source: https://rangelands.app/

Home – Kansas

Rangeland Production Lost to Tree Encroachment

Report updated November 10, 2023. See the changelog for details.

Production lost to tree encroachment in 2022	Cumulative production lost to tree encroachment (1990-2022)
968,908 tons	20,997,982 tons



Source: https://www.wlfw.org/yieldgap/Kansas/index.html

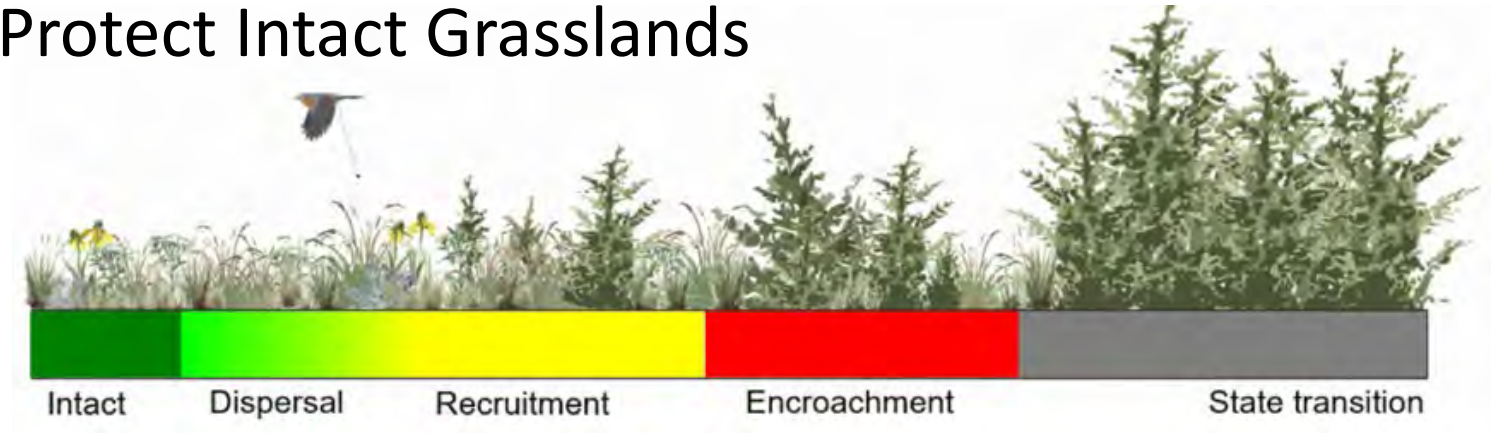
Monitor this…

$$\text{Carrying Capacity (Proper Stocking Rate)} = \frac{\text{Total Annual Forage Production} \times \text{Harvest Efficiency}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Adjust these…

Proper planning accounts for ungrazable acres due to woody encroachment

Protect Intact Grasslands



Risk and Vulnerability: Seed Dispersal

- *Every Tree* is/can be a grassland threat, focus on seed source removal.
- Prescribed Fire is the most effective way to combat woody encroachment and remove seed from our landscape.

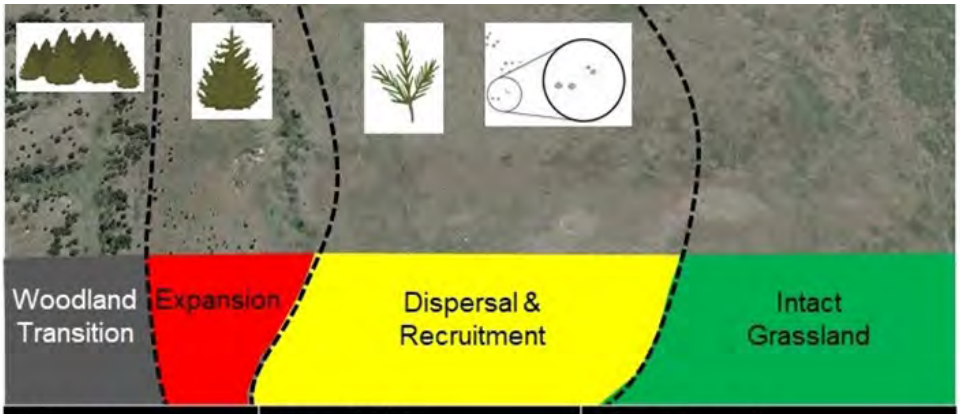
Eastern Redcedar

- Female trees produce seed and seed production starts ~7-10 years of age
- Each female cedar tree is a prolific seed producer and 95% those seeds get deposited within 200 yards of the parent tree. (Fogarty et al 2022)
    - A single cedar tree will affect 26 acres of surrounding grassland.

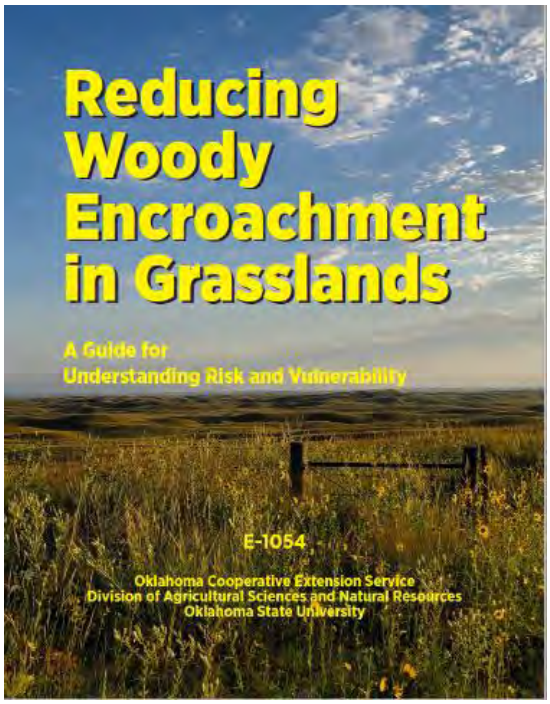
Osage Orange (Hedge): Each hedge ball contains 200-300 seeds. (Waynia 2011)

- All sprouting species must be cut/stump treated with chemical for control.

Reference the K-State Chemical Weed Control Handbook for proper chemical selection and application rates. https://bookstore.ksre.ksu.edu/pubs/CHEMWEEDGUIDE.pdf



Stages	Description	Management
Woodland Transition	Woody plant dominance	Heavy machinery - mechanical removal, fire
Expansion	Scattered producing trees	Hand tools, heavy machinery - mechanical removal, fire
Dispersal & Recruitment	Intact with seedlings or incoming seed	Fire, hand cutting, haying, mechanical removal, browsers
Intact Grassland	Treeless with no seed	Avoid introducing seed



Virtual Copy: https://neinvasives.com/E-1054-WoodyEncroachment.pdf

Cattle Diet Selection: Forage Not Just in Grass

Cows consumed more grasses and fewer forbs on burned, compared to unburned, pastures. Cattle selection consisted of 71-75% grasses and 25-29% forbs throughout growing season.

Grass: 70-75% of cattle diets

Sampling Dates:	June 15	July 15	August 15	Sepetember 15
Total grasses, %				
Lactating	74.1	70.8	72.3	72.7
Non-lactating	76.7	71.3	73.6	72.4
Big bluestem + little bluestem, %				
Lactating	6.1	12.9	13.9	10.9
Non-lactating	8.2	11.9	13.2	11.8
Indiangrass, %				
Lactating	50.4	37.7	35.2	29.4
Non-lactating	51.6	37.6	38.3	31.3
Switchgrass, %				
Lactating	4.2	4.4	7.5	10.4
Non-lactating	3.7	5	7.1	10.8
Blue grama, %				
Lactating	1.8	2.3	5.4	14.9
Non-lactating	2.5	2.5	4.5	10.8
Sideoats grama, %				
Lactating	8.6	11.7	8.6	4.7
Non-lactating	7.5	11.9	8.6	5.5

Forbs: 25-30% of cattle diets

Sampling Dates:	June 15	July 15	August 15	Sepetember 15
Total forbs, %				
Lactating	25.9	29.2	27.7	27.3
Non-lactating	23.3	28.7	26.4	27.6
Purple prairie clover, %				
Lactating	7.4	6.9	6.9	7.9
Non-lactating	7.5	6.5	6.9	8.5
Leadplant, %				
Lactating	0.6	0.8	1.7	3.4
Non-lactating	0.9	0.9	1.5	4
Dotted gayfeather, %				
Lactating	15.5	19.8	15.9	8.8
Non-lactating	12.7	19.5	15.1	8.6
Heath aster, %				
Lactating	0.6	0.9	2.5	6.2
Non-lactating	1	0.9	2.1	5.2

Table 4.2 Plant composition of diets (%) selected by lactating cows with calves or non-lactating, non-pregnant cows grazing the Kansas Flint Hills during summer.

Source: Aubrey N.A., 2011

Old World Bluestem Treatment – Recommendations by Walt Fick – Kansas State University

Chemical	Rate	Rate of non-ionic Surfactant	Rate of Water	Date
Arsenal Herbicide (apply this rate once)	0.5 lbs (2pt)/ac	8 oz/ac	15-20 gallons/ac	June 15th optimum date (4-5 leaf stage of plant)

Here is the suggested rates for a 2 lb/gallon formulation of Arsenal (imazapyr):

- 1 tablespoon of Arsenal per gallon of water = 0.4 lbs/acre if you apply 50 gpa with your backpack sprayer.
- 2 tablespoons of Arsenal per gallon of water = 0.3 lbs/acre if you apply 20 gpa with your backpack sprayer (about 1/2 cup of Arsenal in 4 gallons of water)
- Use 1/2 cup of Arsenal in 4 gallons of water + 2 teaspoons of non-ionic surfactant.
- A tablespoon is 0.5 fl oz.

Stocking Rate Guide - Number of Head

Name: _____ **Field:** _____

1. Determine the Forage Available (lbs of Air-Dry Forage):

From a forage summary analysis. (weighted average of site productions)

Acres in Field		Estimated Dry Matter (Lbs per Acre)		Total Lbs of Forage Dry Matter in Field		Grazing Period Utilization Rate		Available Lbs of Forage Dry Matter in Field
	x		=		x	25%	=	

2. Determine the Individual Animal's Forage Demand (Animal Intake x Length of Grazing Event):

Animal Type		Average Live Weight of each Grazing Animal (lbs)		Forage Intake Rate (% of body weight per day)		Forage Dry Matter Demand per Head per Day (lbs)		Number of Grazing Days		Forage Dry Matter Demand per Head per Grazing Event (lbs)
			x	3.0%	=		x		=	

3. Determine the Suggested Number of Head:

Available Lbs of Forage Dry Matter in Field		Forage Dry Matter Demand per Head per Grazing Event (lbs)		**Suggested Number of Head**		***Suggested Acres per Head**
	÷		=		or	

[1] Standard rate is 25% for rangeland and 30% for pasture.

[2] Suggested Acres per Head = (Acres in Field ÷ Suggested Number of Head)

Stocking Rate Guide - Number of Days

1. Determine the Forage Available (lbs of Air-Dry Forage):

From a forage summary analysis. (weighted average of site productions)

Acres in Field		Estimated Dry Matter (Lbs per Acre)		Total Lbs of Forage Dry Matter in Field		Grazing Period Utilization Rate[1]		Available Lbs of Forage Dry Matter In Field
	x		=		x	25%	=	

2. Determine the Herd's Daily Forage Demand (Animal Intake x # of Head):

Animal Type		Average Live Weight of each Grazing Animal (lbs)		Forage Intake Rate (% of body weight per day)		Forage Dry Matter Demand per Head per Day (lbs)		Number of Head		Forage Dry Matter Demand per Day per Herd (lbs)
			x	3.0%	=		x		=	

3. Determine the Number of Grazing Days for the Herd:

Available Lbs of Forage Dry Matter In Field		Forage Dry Matter Demand per Day per Herd (lbs)		**Suggested Number of Grazing Days**
	÷		=	

[1] Standard rate is 25% for rangeland and 30% for pasture.

Sources:

- **Aubel N.A. 2011.** "Factors Affecting Foraging Behavior of Beef Cattle Grazing Native Tallgrass Range in the Kansas Flint Hills". *K-State Research Exchange – Dissertation*. http://hdl.handle.net/2097/8540
- **Bidwell T., Elmore D., and Hickman K. 2017.** "Stocking Rate Determination on Native Rangeland". *Oklahoma Cooperative Extension Service, Id: NREM-2886.* https://extension.okstate.edu/fact-sheets/stocking-rate-determination-on-native-rangeland.html
- **Crider F.J. 1955.** "Root-Growth Stoppage Resulting From Defoliation of Grass". *Technical Bulletin No. 1102. Soil Conservation Service.*
- **Fogarty, D.T., Peterson, R.B. & Twidwell. 2022.** *"D. Spatial patterns of woody plant encroachment in a temperate grassland." Landsc Ecology* 37:2835–2846 (2022). https://doi.org/10.1007/s10980-022-01511-y
- **Johnson S. and Harmoney K. 2020.** "Evaluating Rules of Thumb for Grazing Management". *Kansas Beef Tips, Kansas State University Research and Extension. https://enewsletters.k-state.edu/beeftips/2020/01/02/evaluating-rules-of-thumb-for-grazing-management/*
- **Weaver J.E. 1950. "**Effects of Different Intensities of Grazing on Depth and Quantity of Roots of Grasses". *Agronomy & Horticulture -- Faculty Publications*
- ***Wynia, R. 2011. "***Plant fact sheet for Osage orange (Maclura pomifera)". USDA-NRCS, Manhattan Plant Materials Center. Manhattan, KS 66502

Equal Opportunity

KANSAS STATE UNIVERSITY | Extension

Grass Turnout Decisions in Western Kansas

Following dry conditions, ranchers in western Kansas face difficult decisions regarding how many cattle to turn out on summer pastures, and when, or even if, turnout should occur. This publication provides guidance for producers explaining general concepts of how pastures respond to growing-season precipitation and defoliation, and guidance on making subsequent adjustments to stocking rates.

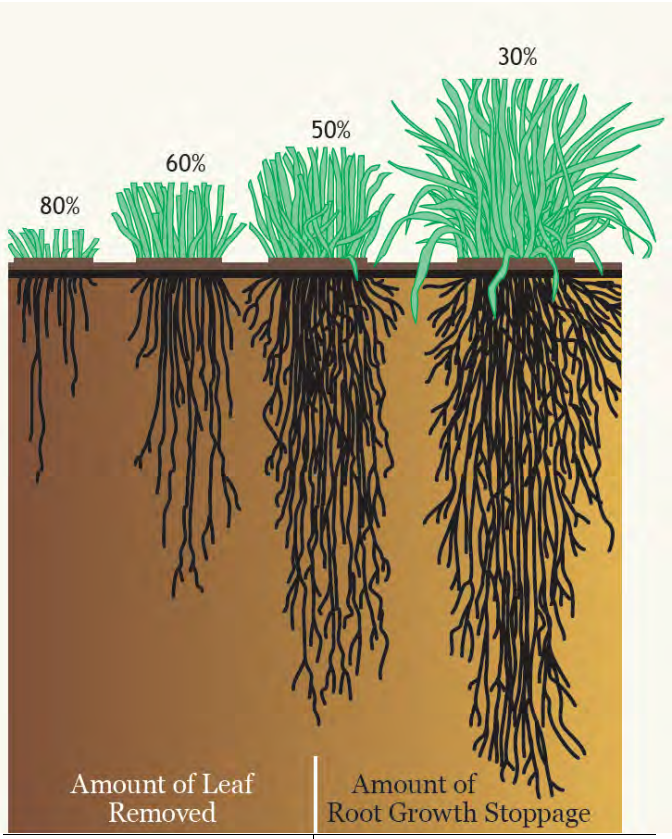
The numbers used in the pasture stocking decision tree are particularly adapted to rangelands west of Russell, Kansas, and the 99th meridian. In this area of Kansas, blue grama, western wheatgrass, and sideoats grama are the primary species in the grassland landscape. Other rangeland regions of the state may have varying, but similar responses.

Although it is impossible to precisely predict how much forage will be available over a summer growing season, simple calculations using readily available data allow ranchers to develop strategies to predict end-of-season forage production and subsequent adjustments to stocking rate, regardless of the year's precipitation.

Forage demand versus forage available

Forage availability drives the overall decision on whether to adjust animal demand over time (stocking rate). If animal demand exceeds the available forage, excessive leaf removal occurs. With excessive leaf removal from grazing (greater than 50%), overall plant photosynthesis is reduced, resulting in less carbohydrate production and energy available for the plant. Ultimately, this inhibits bud and root production as well as energy for starting next year's growth.

The root is often overlooked as a part of the plant that suffers the consequences of excessive grazing. Studies show that when 70% of a plant's leaf material is removed, well over half of the roots stop growing for 17 days (Figure 1). When 90% of the leaf area is removed, all root growth stops for 17 days. If only 50% of the leaf area is removed, almost all roots continue to grow. Roots are essential for absorbing water and nutrients from the soil, and healthy plants have more root mass, potentially reaching a greater soil volume to access more nutrients and water. Ranchers should target 50% or less leaf removal to maximize the following year's plant growth.



Amount of Leaf Removed	Amount of Root Growth Stoppage
10–40%	0%
50%	2–4%
60%	50%
70%	78%
80–90%	100%

If 80% of plant leaf material is removed, plant root growth can cease for 12 full days, which slows plant regrowth considerably (Crider 1955, Dietz 1989, USDA-NRCS 2016). If only 10% to 40% of plant leaf material is removed, plant root growth doesn't stop, and the plant regrows faster and remains healthier; but this effect varies by species (USDA-NRCS 2016).

Figure 1. Effects of leaf removal on root growth

Alternatively, drought conditions can lead to early dormancy during the growing season. The combination of drought-induced early dormancy and excessive leaf removal from grazing can be stressors for the next year's grass growth.

An added benefit of having more leaf material and residual forage is improved water infiltration. Heavily stocked pastures (66% of forage removed) were found to infiltrate water at approximately 0.7 inch per hour, while almost 1.6 inches per hour was recorded in lightly stocked pastures (38% of forage removed). This means that in a rain event where 1.6 inches of rain fell within an hour, less than half of this rainfall amount would be retained in the soil at the heavy stocking rate, but all would be retained at a light stocking rate.

Early-season rainfall versus growing-season production

Combining precipitation amounts from April, May, and June is a valuable tool for predicting end-of-year forage production in western Kansas. This relationship is very direct when rainfall totals are less than average. The most concerning years are those in which precipitation in April through June is less than 75% of average, because yields are often much lower than average. For example, in 2006 and 2012, when April through June precipitation totaled close to 5.5 inches (60% of average), total pasture production for those growing seasons was just above 2,300 pounds per acre (67% of average). If less than 75% of the average precipitation from these three months is recorded, the percentage reduction in predicted forage yield is similar to the percentage deficit in precipitation, and it may become critical to make decisions on reducing stocking rate for the remainder of the growing season. On the contrary, when rainfall totals are greater than average, the direct relationship disappears, and yield is usually adequate but harder to predict. In years when April through June precipitation was 75% or more of the average, forage yield was 90% or more of the average 90% of the time.

An objective approach to early-season stocking can be taken using a decision tree related to soil and plant parameters (Figure 2).

Beginning at the top of Figure 2, a pasture assessment should take place. Dry matter left at the end of the prior season should be evaluated and compared with previous years. This can be accomplished simply by measuring biomass or end-of-season forage height each year (a factor strongly correlated to biomass), comparing photos of the same location within a pasture, or, if no past data is available, using memory of past years' standing biomass amounts.

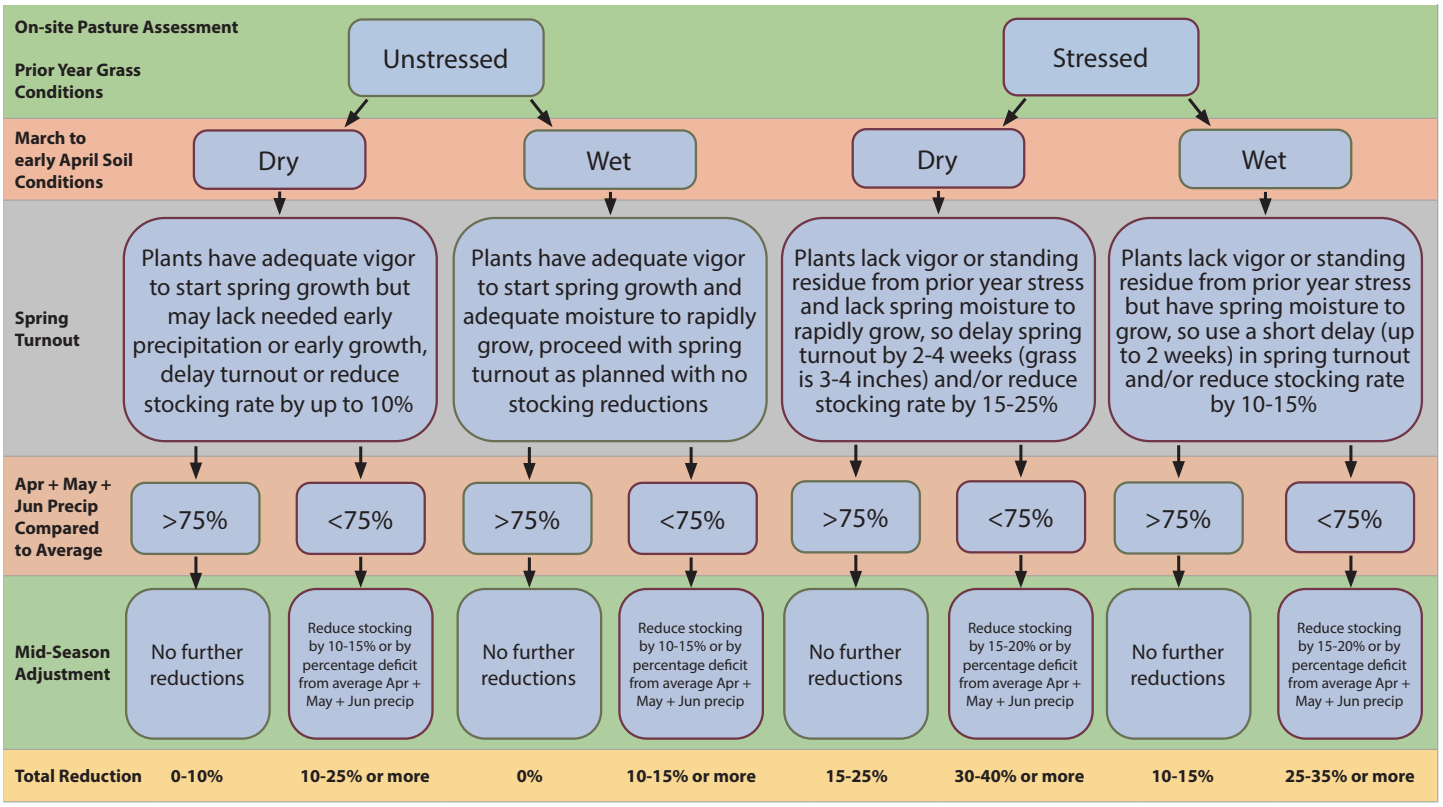


Figure 2. Stocking rate decision tree

Ranchers should evaluate if the residual forage reflects expected levels for the stocking rate, as well as expected growth from the amount of precipitation received in the given pasture. If forage height or biomass measurements have not been taken in the past, begin measuring forage annually for comparison over the years and for use in future calculations and predictions.

Some rules of thumb for forage height at 50% use of common grass species over the course of the growing season are shown in Figure 3. Pastures with forage heights below the late-season levels listed due to drought or grazing may be considered stressed entering the next year.

Another tool that helps with early stocking decisions is the Kansas Mesonet, which shows soil moisture status for given locations (Figure 4). Moist soil at the start of the growing season from winter precipitation allows grass growth to begin as soon as temperatures warm enough. Current data for locations around Kansas can be found at: *https://mesonet.k-state.edu/agriculture/soilmoist/*

When the condition of the previous year's grass growth has been determined, soil moisture at the start of green-up (March to early April) should be evaluated. Because the majority of grass roots are located within the top foot (30.5 centimeters) of soil, moist soil conditions in that upper foot will be most beneficial for spring growth. For help in determining the moisture of your soil, see the following link: *https://www.wcc.nrcs.usda.gov/ftpref/wntsc/waterMgt/irrigation/EstimatingSoilMoisture.pdf*

	Jun. 7	Jun. 21	Jul. 5	Jul. 19	Aug. 2	Aug. 16
Buffalo grass	1.2	1.7	1.9	2.0	2.0	2.0
Blue grama	1.5	2.5	2.5	3.8	3.8	3.8
Western wheatgrass	8.0	9.0	9.0	9.0	10.0	10.0
Sand dropseed	2.0	3.0	3.2	6.5	6.7	7.8
Little bluestem	2.2	3.0	3.2	3.4	4.0	4.0
Side-oats grama	2.4	2.5	2.6	2.9	3.2	3.7
Big bluestem	3.4	3.4	3.4	3.8	4.7	5.0

Figure 3. Rules of thumb for forage height (in inches) at 50% forage use at Hays, Kansas

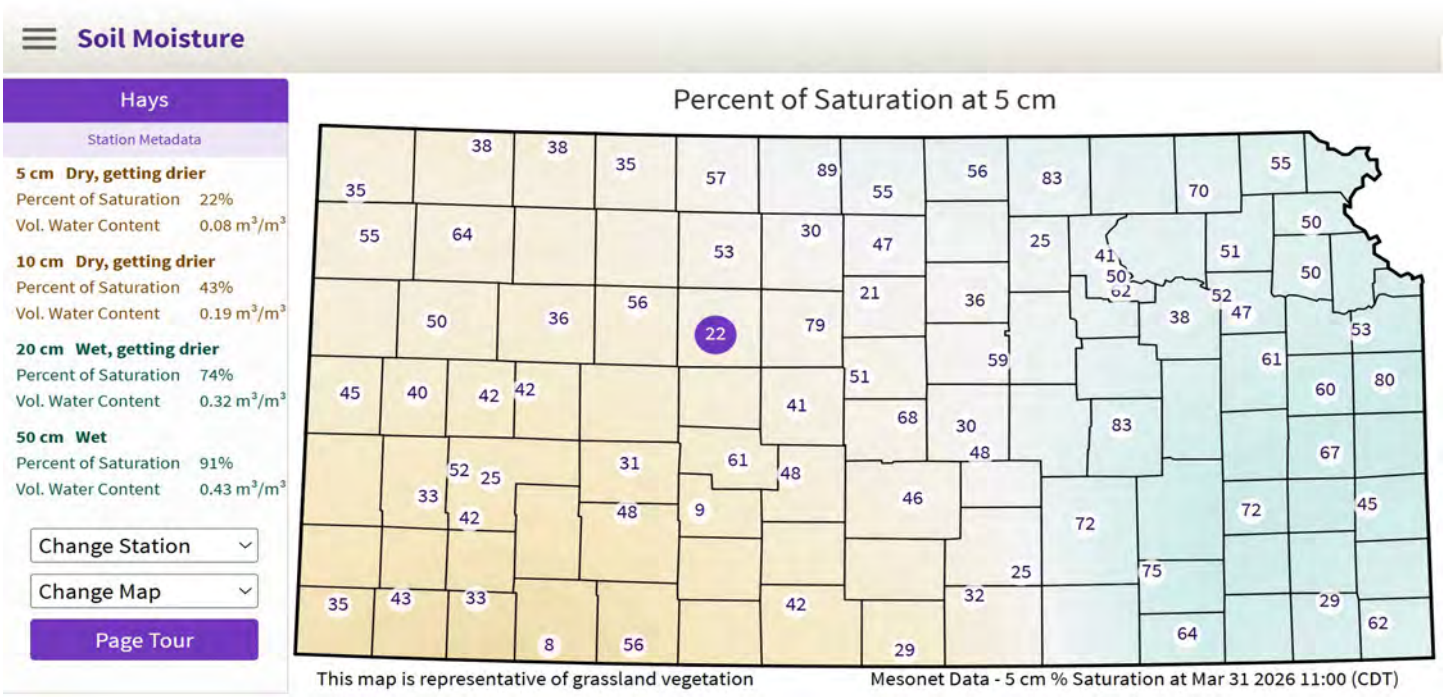


Figure 4. Example soil moisture map with station metadata for Hays, Kansas, 03/31/2026

If last year's grass was stressed, but the current soil conditions are moist, the grasses will be able to start growing, but the grasses may still lack vigor from the previous stress. Thus, it may be a good idea to reduce stocking rate or delay turnout. On the other hand, if conditions remain dry, further stocking reductions should be strongly considered. The combination of April, May, and June moisture could then be an indicator of expected forage production for the growing season. If the April through June precipitation total is less than 75% of the average, the total reduction in precipitation will approximate the reduction in forage production for the year.

Methods of reducing pasture stress

Ranchers have several options for relieving pasture stress beyond simply delaying turnout to decrease stocking rate. Some of these include early weaning; pregnancy checking and culling open cows earlier than usual; culling more strictly for poor performance, poor body composition, or other factors that might limit production; removing more easily marketable animals, such as stocker cattle; and taking animals to a dry lot or leased pasture outside of the drought-stricken region.

Summary and helpful links

Pasture stress can be mitigated by evaluating and acting upon early-season precipitation. Plant vigor from the previous season and soil moisture at turnout should be evaluated, though it should be noted that early growing season precipitation does have a greater influence on expected pasture growth than the previous year's precipitation. Because of this, many pastures can rebound in one normal growing season after a year of drought.

However, if the dry trend continues for two or more years, long-term negative impacts can present themselves in factors such as reduced plant growth, tiller density, and possibly even plant survival.

Because so many factors come into play, it is impossible to take a completely objective approach to managing cattle herds in drought conditions; however, the calculations and predictors provided here can help ranchers make proactive decisions regarding stocking pastures. Qualitative observations and record keeping also can aid management and understanding of drought responses at the ranch or pasture scale.

Some helpful links that also provide information on precipitation or estimates of forage production on rangelands that may aid with stocking decisions are as follows:

Kansas Monthly Precipitation Map (current and historic precipitation by county): *https://climate.k-state.edu/precip/county/*

GrassCast Grassland Productivity Forecast (find expected end-of-year production based on precipitation by region. Based on satellite imagery and ground truthing from historic data and current weather outlook): *https://grasscast.unl.edu/Outlook.aspx*

Rangeland Analysis Platform-Production Explorer (provides 16-day production estimates based on current satellite imagery for a specific area): *https://rangelands.app*

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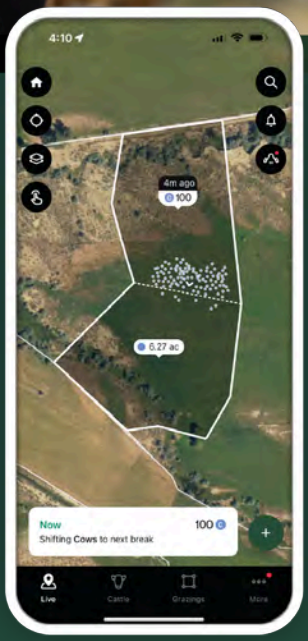
Publications from Kansas State University are available at *bookstore.ksre.k-state.edu.*

MF3716 | April 2026

Virtual fencing that's Built for Beef®



With Halter, you can graze more acres, run more cattle with less labor, and take back time in your day.

Build virtual fences
Set up and adjust virtual fences in minutes

Move cattle remotely
Initiate moves directly from your phone, no matter where you are

Monitor your herd 24/7
Track where every animal is, any time of day

Graze more grass
Extend your grazing season and run more cattle on the same land

Connor Chesky
Kansas Territory Manager
(785) 268-8780
connor.chesky@halterhq.com

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Halter®

With Halter, you can fence anywhere, move herds remotely, adapt to changing conditions in real time, and make the most of every acre of your land.

The collar
Solar-powered GPS collars that guide cattle with audio cues and track their location and behavior 24/7.

The app
Draw fences, move cattle, track and plan grazing, monitor individual animals, and receive alerts all from your phone.

Local support
Ranching never stops, so why should we? Our Colorado-based team of product experts are here to support you 365 days a year.

Hardware built to last
The collars are included in your subscription, are built for all seasons, and guaranteed for life. No upfront hardware costs, no repairs to worry about. Solar-powered, no battery swaps needed.

What is Beef Quality Assurance?

Beef Quality Assurance is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and consumers of how common-sense husbandry and transportation techniques can be coupled with accepted scientific knowledge to raise cattle under optimum conditions.

Why get BQA certified?

Voluntary certification to show consumers that cattle from your operation entering the food supply is safe, wholesome and quality beef.

How to get BQA certified?

1. Online at bqa.org
   a. Cow/Calf, Stocker/Backgrounder, Feedlot courses are available for
   b. BQA Professional Driver & Farmer/Rancher are available for BQAT
2. In-person training with state approved BQA trainer

Continuing Education

Continuing Education is only open to previously certified producers. BQAT & Biosecurity courses are now available.

How much does it cost?

The online BQA and BQAT certification courses are free as they are funded through the Beef Checkoff. In-person trainings may incur a nominal fee. Contact your state for details.

How long is my certification valid?

BQA Certification is valid for three years.

BQA Equivalencies

FARM

YQCA YOUTH FOR THE QUALITY CARE OF ANIMALS

CCQA

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Contact:
(303) 850-3473
bqa@beeflearningcenter.org
bqa.org

BEEF
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KANSAS LIVESTOCK ASSOCIATION

NCBA National Cattlemen's Beef Association

WORKING FOR THE AGRICULTURE INDUSTRY SINCE 1894

Advancing the business interests of its members is KLA's mission. Volunteer leaders and staff work to achieve this goal every day by working with legislators and regulatory agencies to advance KLA policy. Our affiliation with NCBA extends our influence to Washington, DC, where the NCBA legislative affairs team represents cattle producers' and landowners' interests before Congress and federal regulators. KLA and NCBA invite anyone with a financial stake in Kansas agriculture to join us in our work on their behalf. Visit kla.org and ncba.org for more details.

We've got your back.

- Protecting private property rights of agricultural producers.
- Ensuring that county and municipal zoning and building regulations do not restrict agriculture.
- Supporting increased weight limits for trucks carrying agricultural inputs, supplies and commodities.
- Defending agricultural exemptions from sales and property taxation.
- Working with state government and groundwater management districts to ensure availability of water for agriculture and other uses well into the future.

KLA/NCBA MEMBERSHIP APPLICATION

Name: _____

Spouse: _____

Farm/Ranch Name: _____

Address: _____

City: _____ State: _____

County: _____ Zip: _____

E-mail: _____

Home Phone: _____

Cell Phone: _____

Recruited By: _____

Type of Operation: _____

Kansas Livestock Association Dues.....$180.00

National Cattlemen's Beef Association Dues.....$180.00

Total Dues Investment $_____

The portion of KLA and NCBA dues not directly allocable to lobbying expenditures is tax deductible for most members as an ordinary and necessary business expense. For KLA, dues are 92% deductible; NCBA dues are 90% deductible.

Join both associations and receive discounts on:

Ambrook | AmeriWind | Big Bend Trailers | Cabela's | Bass Pro Shops Caterpillar | Cowboy Cauldron Co. | Defend by Tactacam | Dell Technologies | Elanco | Gallagher | John Deere | Montana Silversmiths New Holland | Roper & Tin Haul | Kubota | JCB Agriculture

Return this application with your dues investment to:

Kansas Livestock Association
6031 SW 37th Street • Topeka, Kansas 66614

Or join online at www.kla.org