COLORADO STATE UNIVERSITY
ENGAGEMENT AND EXTENSION

Why drought management matters: Long and short-term drought impacts to rangeland

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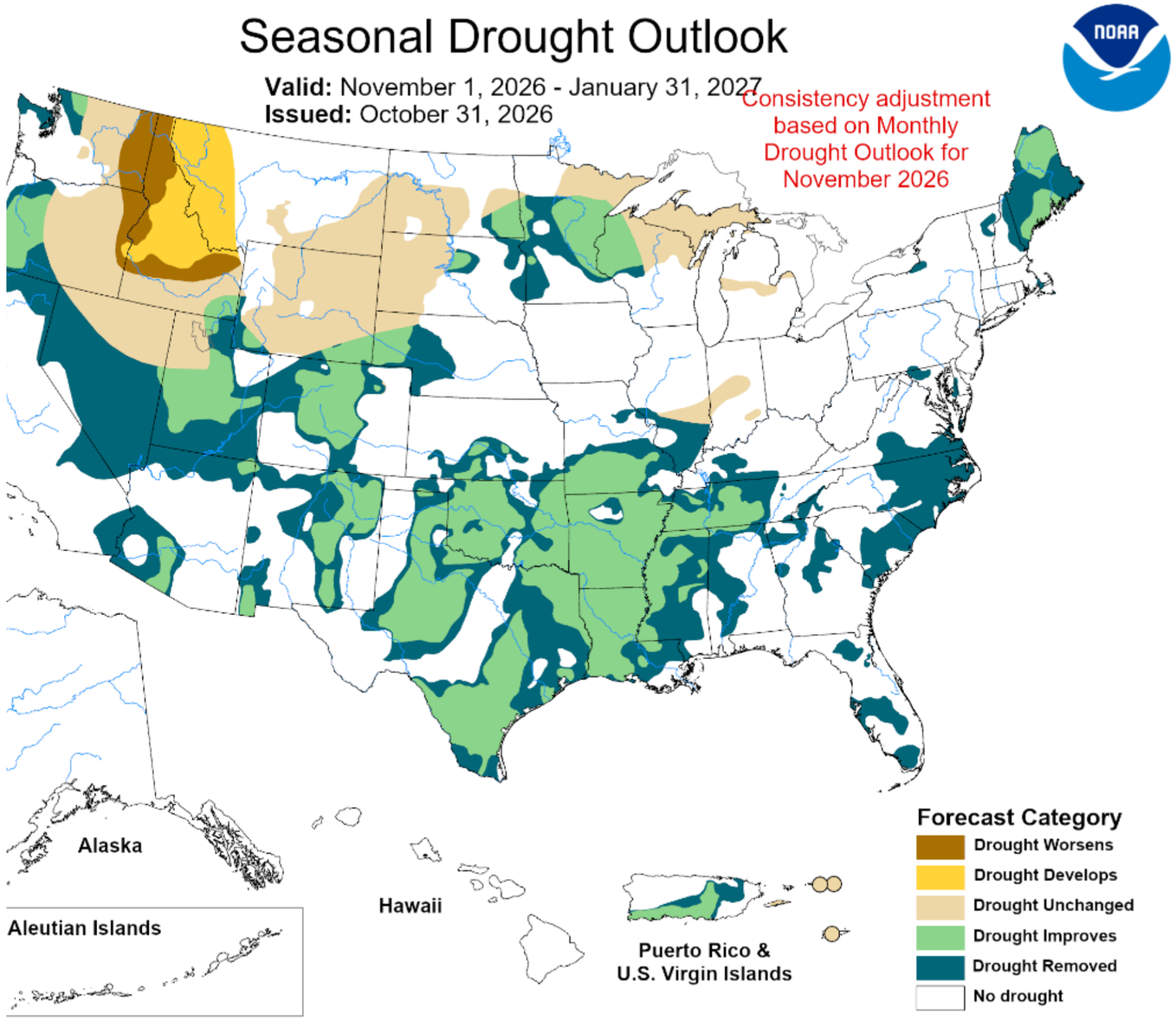
Photo Credit: Todd Winslow Pierce, EagleValleyWild.org



Outline

- The do know and don’t know
  - How to fit management within what we know
- How rangelands are changing with prolonged drought
- How to respond and recover from drought
- How to evaluate if rest is needed for root and plant regrowth

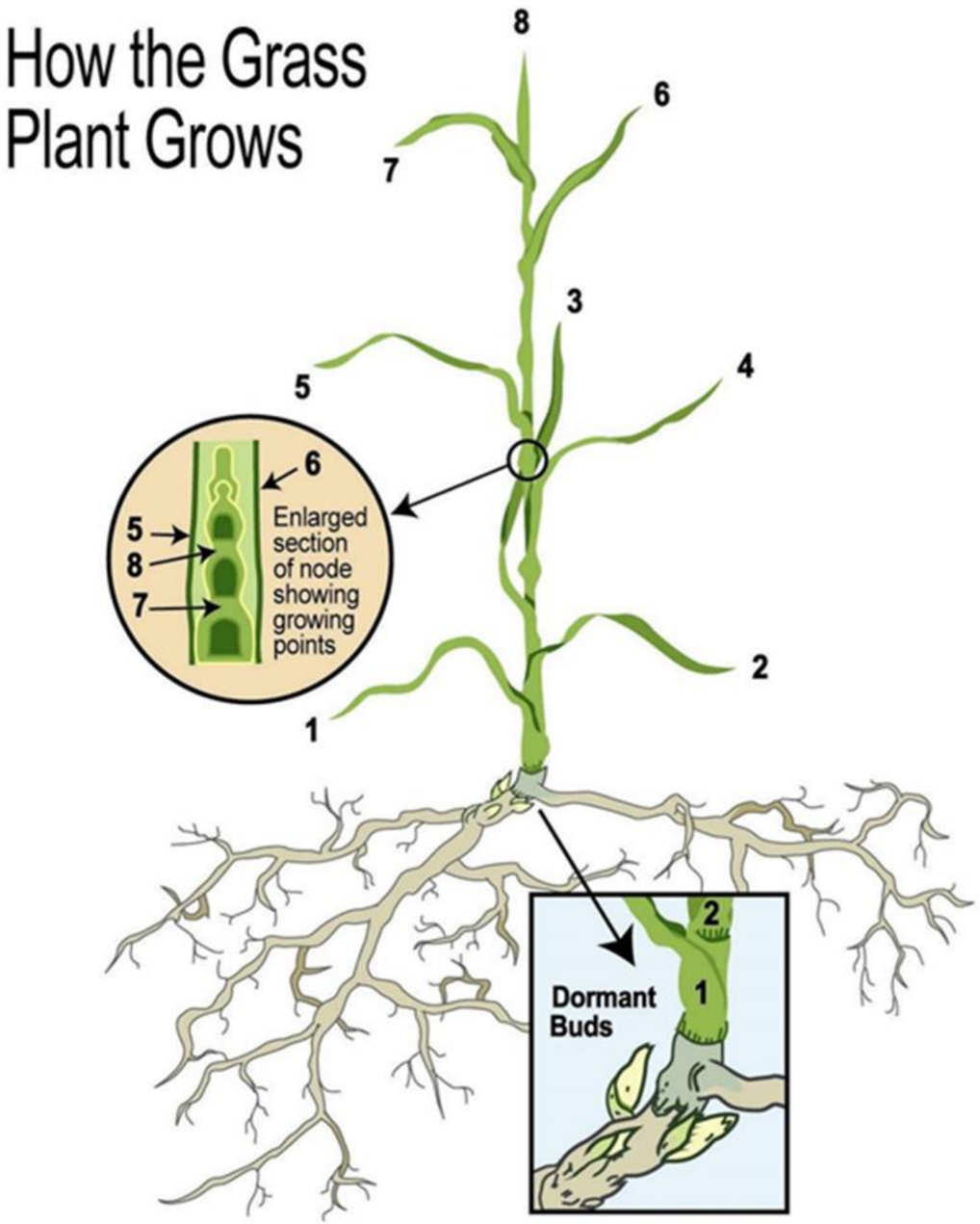
Don’t know: what the weather will be like in growing season 2027.



Do know: *Most of* 2026 was not a great year for grass plants.

(Plants (could) have reduced vigor because of dry conditions)





If leaves didn’t grow, roots didn’t either.

Root growth is driven by carbohydrate generation in the leaves. In drought (or with heavy defoliation) root growth is limited because plants are not generating excess to store in the roots

Loss of root mass limits the plant's ability to survive adversity

Which plant would you rather be in drought?

Moderately grazed grasses can continue to extract soil moisture when it drops as low as 1-2%.

Heavily grazed grasses can permanently wilt at 6-8% soil moisture.

Plant mortality two times as high in heavily compared with more lightly grazed plants following multi-year droughts in the 1950s (Albertson et al. 1957)



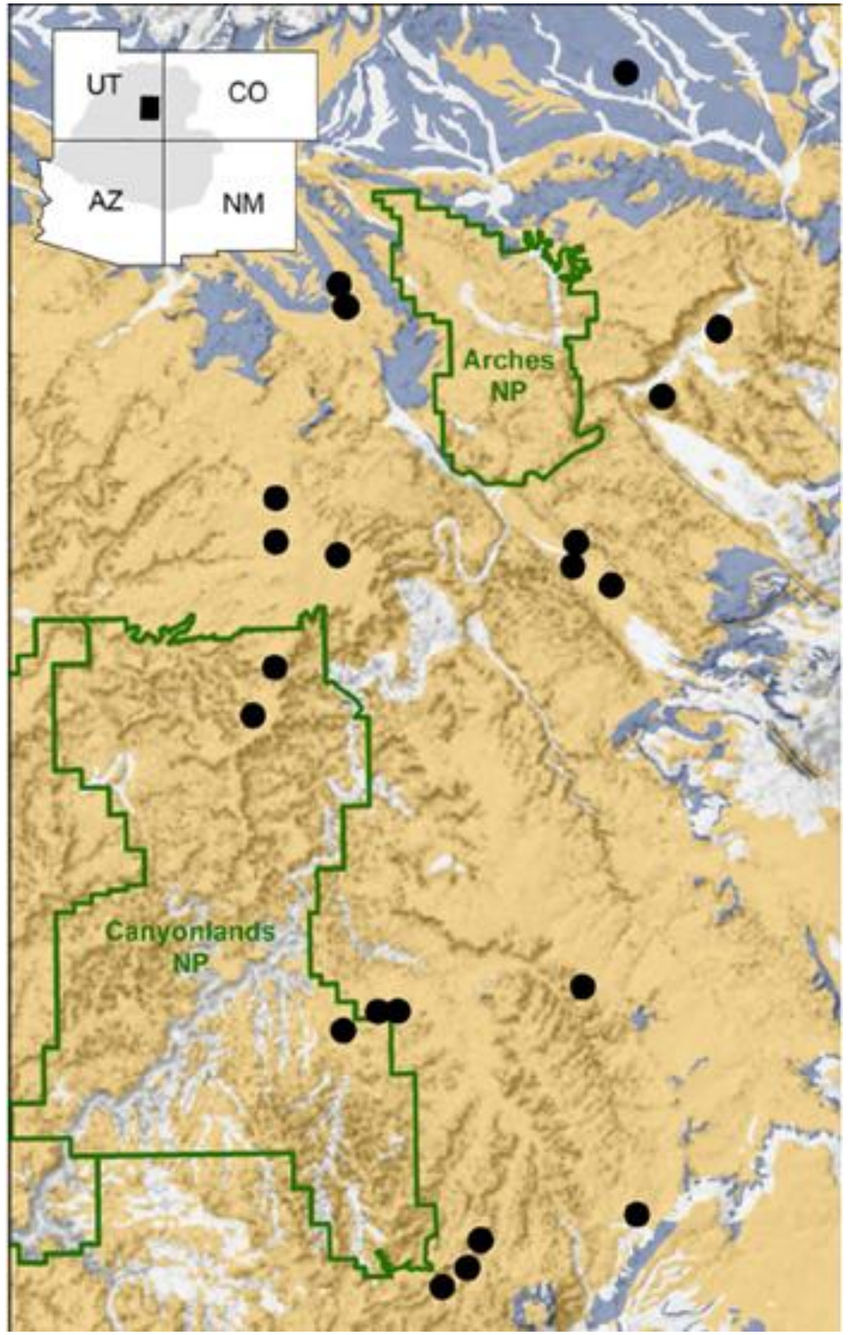
Albertson, F. W., G. W. Tomanek, and Andrew Riegel. "Ecology o drought cycles and grazing intensity on grasslands of central Great Plains." Ecological Monographs 27.1 (1957): 27-44.

Do know: Grasses impacted by increased drought.

Hoover, D. L., et al. (2015). "Pulse-drought atop press-drought: unexpected plant responses and implications for dryland ecosystems." Oecologia **179**(4): 1211-1221.

Winkler, D. E., Belnap, J., Hoover, D., Reed, S. C., & Duniway, M. C. (2019). Shrub persistence and increased grass mortality in response to drought in dryland systems. Global Change Biology, 25(9), 3121-3135.







“Major shifts in plant community composition”

- Ricegrass – *Achnatherum hymenoides* – most sensitive – 50% higher mortality in drought treatments compared to control
- Grass species (Galletta, Needle-and-thread and sand dropseed less effected (but still effected).

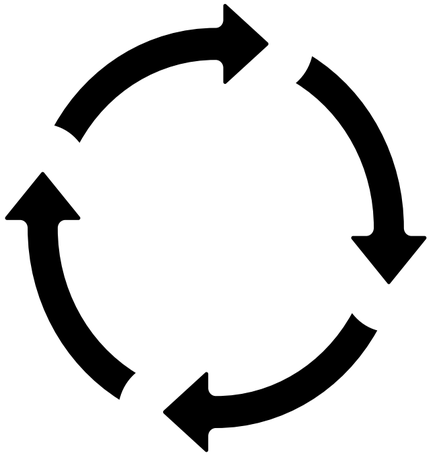
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Do know: Sustained overuse in drought reduces grass vigor.

Less vigorous grass



More opportunity for shrubs / weeds

*4-year average herbaceous/ non-woody production

Do know: Undesirable changes are expensive & challenging to reverse



566 lbs./acre
(usable)

T1 Reduction of the herbaceous understory, caused by heavy grazing and/or drought, combined with lack of disturbance that reduces shrub cover.



236 lbs./acre
(usable)

Pritchett, J., Kachergis, E., Parsons, J., Fernandez-Gimenez, M., & Ritten, J. (2012). Home on a transitioning range: a ranch simulation game demonstrating STMs. *Rangelands*, *34*(3), 53-59.



Bottom line...

Plants compete for:

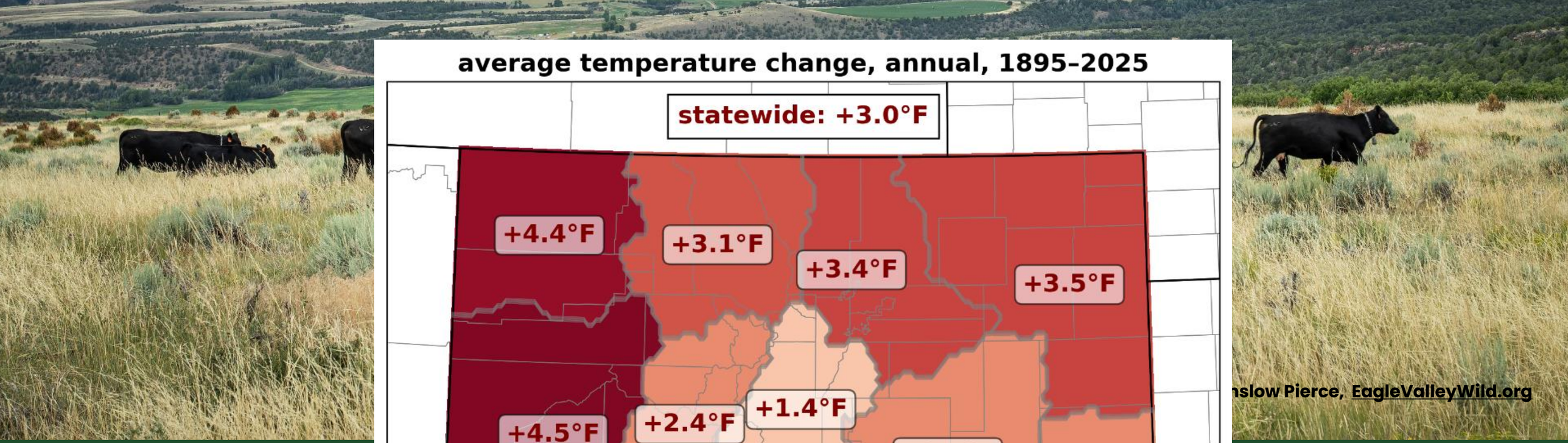
- Light
- Space
- Water
- Nutrients.

If grass is less vigorous, other (less desirable) plants may be able to take advantage.



Photo Credit: Todd Winslow Pierce, EagleValleyWild.org

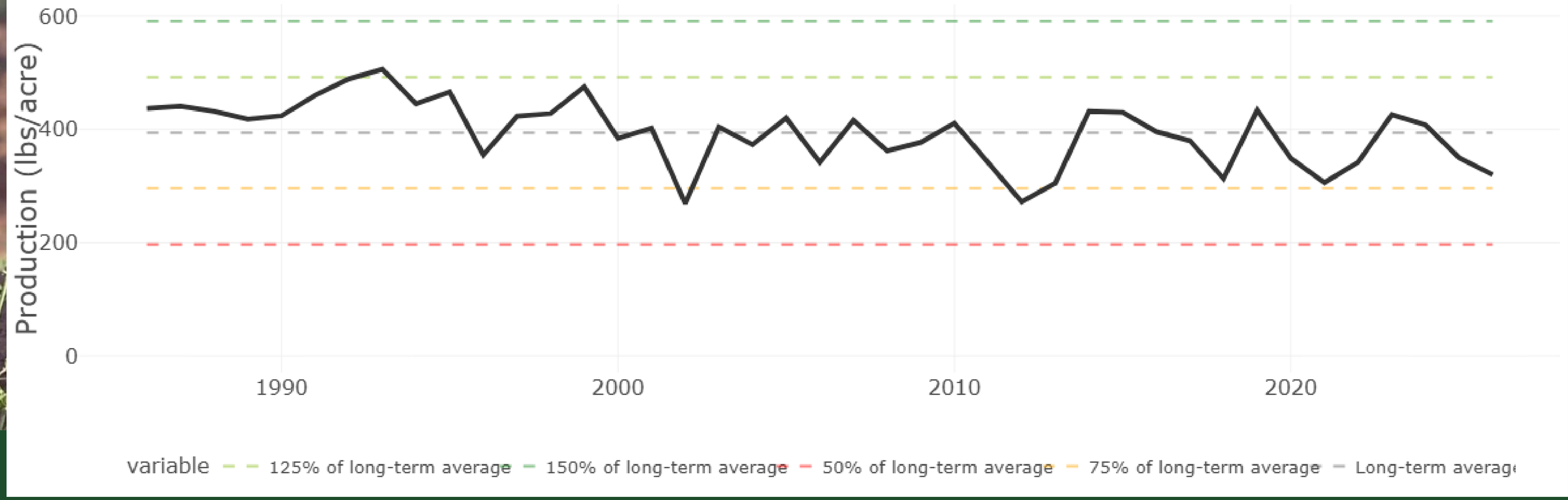
Don’t know: The future.
But we do know the trends.



nslow Pierce, EagleValleyWild.org

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The Colorado Climate Center, https://climate.colostate.edu/div_trends.html



Do know: ~ 17-24% Less productive 2001-present compared to 1986 - 2000.



Photo Credit: Todd Winslow Pierce, EagleValleyWild.org

What does this mean for management next year?

Do know: Rest would benefit forage plants.



Do know:

- Regrowth depends on… condition before drought, residual leaf area, favorable conditions.
- Stocking rate is critical to plant community composition.





Do acreages need rest?

Ask yourself:

- What was the condition before drought?
- How do the grass/ forage plants look? Did they regrow with rains? What is their leaf area?
- How much rain did you get?
  - Legacy effects of drought can be overridden with sufficient moisture.





What does the grass look like?

- Ranges may look good but have fewer plants → less forage overall, or plants may not be vigorous.

What does the grass look like?







What does this mean for management next year?

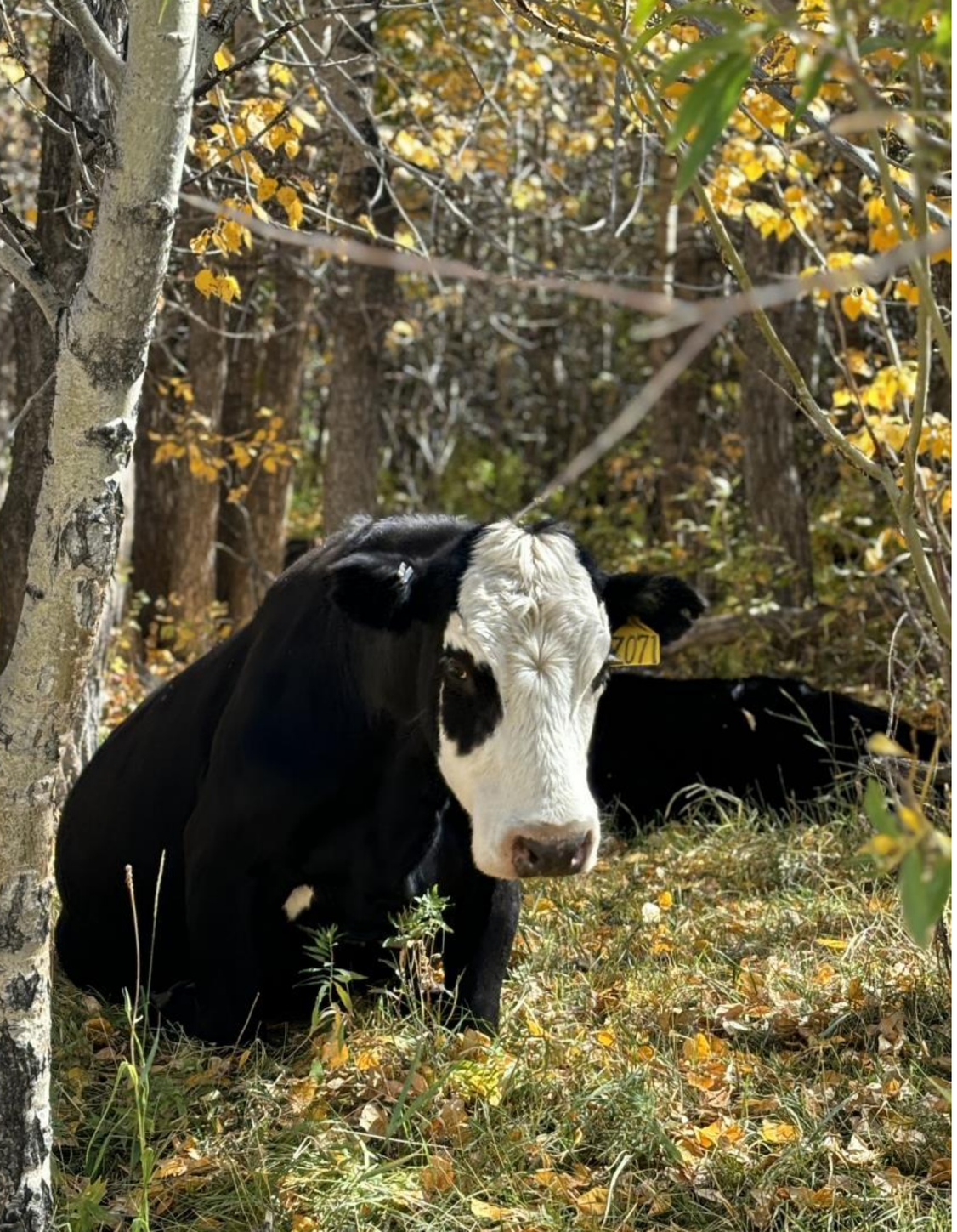
Photo Credit: Todd Winslow Pierce, EagleValleyWild.org

- Rest pastures if warranted and possible.
- **Timing:** If not possible, graze when key forages are dormant (they are less desirable to grazers)
- Use when the least desirable species are green and palatable.

Do know: Animals graze forage, not acres.

If there is less forage, need to reduce forage demand.

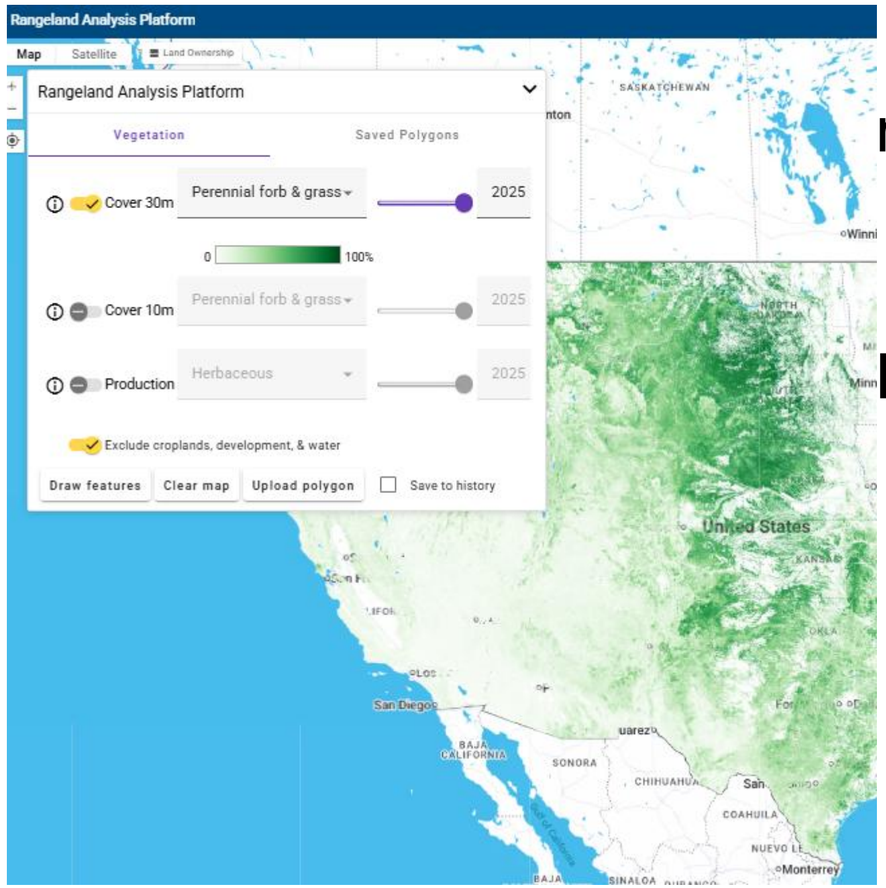




This is hard. What are some options?

- What did you learn and how does that inform…
  - Update grazing plan with drought / plan for future forage capacity.
  - Virtual fence, infrastructure projects to expand distribution and flexibility.

Re-evaluate forage amounts.



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Grazing plan for drought

- 50-70% of available forage to grazing livestock on a 10-year average
- Stocked for drought and increase stocking rate if conditions are good.
- Weekly starting May 15:
  - **Observe:** Cumulative precipitation and soil moisture.
  - Leave pastures when specified minimum residual thresholds are exceeded
  - **Observe:** Biomass values for re-grazing. If conditions are not met, create plan for moving cattle.

Colorado Department of Agriculture

- Upcoming Opportunity: Grazing Planning Through Virtual Fencing (2026–2028)
- Due mid Jan 2027

COLORADO
Department of Agriculture



Photo Credit: Todd Winslow Pierce, EagleValleyWild.org



Do know: Good management is cheaper than restoration.

- Overuse + drought can trigger undesirable long-term changes
- Low control environment. Restoration can be very uncertain and expensive relative to gains.
- Bet on what you know i.e., the cards you have in your deck
  - **Observe plant regrowth, conditions, leaf area and manage accordingly.**
- **Animals graze forage, not acres. Adjust accordingly.**

Thank you!

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Grant Project

Integrated Research and Extension to Foster Post-Wildfire Livestock Grazing and Landscape Recovery

1. Understand scope and impact of wildfire impacts to grazing lands in CO.
2. Survey past fires to understand factors in recovery.
3. Produce tools and information to inform grazing readiness following fire.