

MANAGING GRAZERS TO ENHANCE CO2 CAPTURE



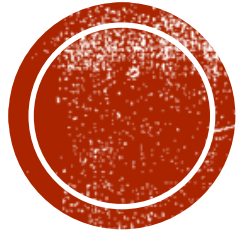
Burleigh County Soil Conservation District Meeting

April 3, 2024

Lewis Heaton, Rancher and Project Strategist and Dr. Rebecca Phillips, Ecological Insights Corporation

Jesse Beckers, ND Natural Resources Trust

OUTLINE



1. THE CARBON MARKET

2. TYPES OF CO₂ CAPTURE

3. THE EXPERIMENT

4. PRELIMINARY RESULTS

What Are Carbon Markets?

A carbon market is a specialized type of financial market, through which carbon credits can be bought and sold.

Carbon is a commodity, just like gold, that is traded on exchanges.

“Carbon credit” and “carbon offset” have become virtually interchangeable terms, especially in reference to the carbon markets. However, some draw a distinction between the two, associating “credits” with mandatory cap and trade systems and “offsets” with the voluntary market.

Each carbon credit is equal to one metric ton of carbon dioxide (CO₂).



Reduction or Removal of Carbon Dioxide

Entities can create carbon credits, or offsets, by either reducing or removing carbon dioxide, which they can then sell.

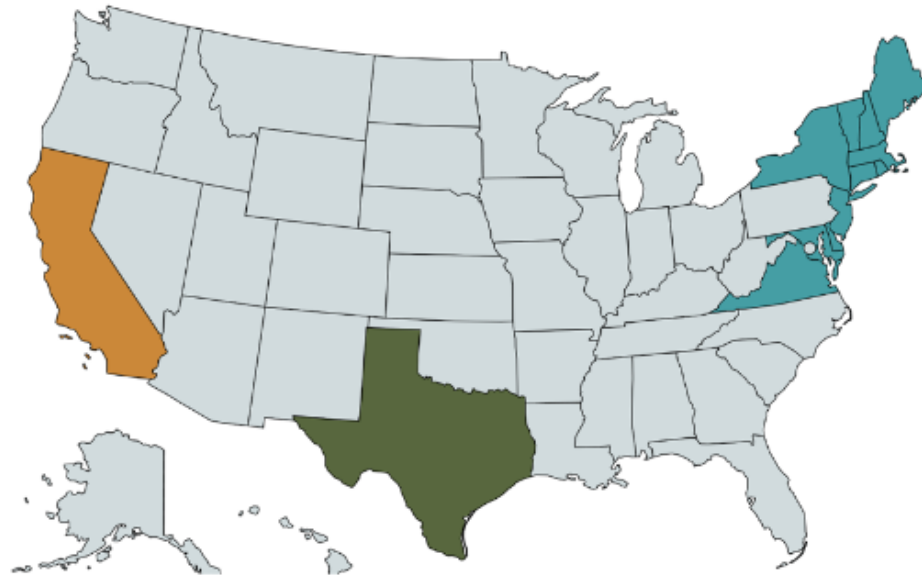
Reduction refers to initiatives that serve to lower emissions, such as adding solar panels or building a wind farm.

Removal refers to projects that remove and then store CO₂, such as through terrestrial ecosystems or industrial carbon capture.

Each carbon credit is equal to one metric ton of carbon dioxide (CO₂).



Example: Tesla in California
“credited” with reducing CO2 emissions through sales of electric cars.



Compliance Markets

California’s Cap-and-Trade Program and the Regional Greenhouse Gas Initiative (blue) are compliance markets in the United States, which set limits on GHG emissions. Apart from carbon, Texas’ Highly Reactive Volatile Organic Compound Emissions Cap-and-Trade Program is a compliance market.



The Future of Carbon Markets

Despite the well-publicized problems, the investment firm Morgan Stanley says in a 2023 report that “**the voluntary carbon-offsets market** is expected to grow from around \$2 billion in 2022 to about \$100 billion in 2030 and around \$250 billion by 2050.”



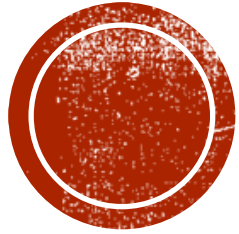
Are Carbon Markets a Good Investment?

Individuals cannot buy many types of carbon credits directly, but there are a number of ways to invest in them.

Some voluntary carbon credits are sold to investors through brokers that specialize in this market.

There are also exchange-traded funds (ETFs) that offer exposure to the carbon market, chiefly in the form of carbon credit futures contracts. These funds are small and relatively new, so it's too early to tell how good an investment they'll be.





INDUSTRIAL VS. RANGELAND CO2 CAPTURE

EACH CARBON CREDIT IS EQUAL TO ONE METRIC TON OF CO2.

INDUSTRIAL CO₂ CAPTURE

- For capture of industrial CO₂, there needs to be large plumes of CO₂ from a point source
- Legislation rewards capture of the over 40,000,000 tons of CO₂ emitted from ethanol plants each year.
- Price for direct CO₂ capture is \$85 per ton
- If 20,000,000 tons is captured, companies yield 1.7 billion dollars per year.

Irwin, S. "CO₂ Production by the U.S. Ethanol Industry and the Potential Value of Sequestration." *Farmdoc Daily* (14): 34, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 19, 2024

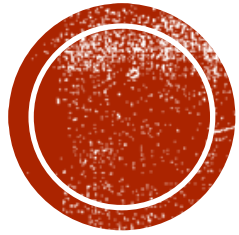


RANGELAND CO₂ CAPTURE

- Living plants can capture CO₂ anywhere there is sun, nutrients, and water. They can draw down ambient levels of atmospheric CO₂.
- If ND grasslands capture 0.5 tons C/acre/year, this is 1.8 tons of CO₂ captured/acre/year.
- 12,000,000 acres of grasslands in ND would then potentially capture 22,000,000 tons of CO₂ per year.
- At \$30 per ton CO₂, this is \$660,000,000 per year.
- At \$60 per ton CO₂, this is \$1.3 billion per year.



-PREVIOUSLY, MEASUREMENTS WERE LIMITED TO SOIL CARBON COLLECTED ONCE A YEAR AT A FEW POINTS



-NOW, WE CAN MEASURE THE CAPTURE OF CO₂ YEAR-ROUND, EVERY ½ HR. WITH MICRO MET

-THIS MEANS WE CAN TRACK HOW MUCH CO₂ IS CAPTURED AND RELEASED CONTINUOUSLY FOR A 50-ACRE PASTURE

This means we can track how management affects CO₂ capture

PERENNIAL GRASSLANDS SEQUESTER CO2 BECAUSE A LARGE FRACTION OF PHOTOSYNTHATE IS TRANSFERRED BELOW GROUND

Rangeland Ecol Manage 63:16–39 | January 2010 | DOI: 10.2111/REM-D-09-00072.1

Productivity, Respiration, and Light-Response Parameters of World Grassland and Agroecosystems Derived From Flux-Tower Measurements

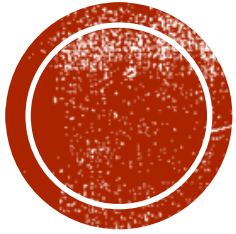
Tagir G. Gilmanov,¹ L. Aires,² Z. Barcza,² V. S. Baron,³ L. Belelli,² J. Beringer,² D. Billesbach,³ D. Bonal,² J. Bradford,² E. Ceschia,² D. Cook,² C. Corradi,² A. Frank,⁴ D. Gianelle,² C. Gimeno,^{2,3} T. Gruenwald,² Haiqiang Guo,² N. Hanan,² L. Haszpra,² J. Heilman,^{2,3} A. Jacobs,² M. B. Jones,³ D. A. Johnson,⁴ G. Kiely,² Shenggong Li,² V. Magliulo,² E. Moors,² Z. Nagy,^{2,3} M. Nasyrov,³ C. Owensby,³ K. Pinter,^{2,3} C. Pio,² M. Reichstein,² M. J. Sanz,^{2,3} R. Scott,² J. F. Soussana,^{2,3} P. C. Stoy,² T. Svejcar,⁴ Z. Tuba,^{2,3,5} and Guangsheng Zhou²

We know that grasslands worldwide capture CO₂.

We do not know how grazing management alters CO₂ capture.

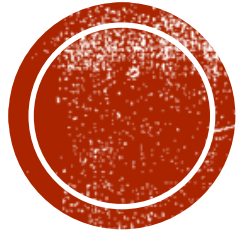


THE EXPERIMENT



- **USE WORKING LANDS TO ADDRESS CO2 QUESTION**
- **COW-CALF PAIR OPERATION, 150 PAIR**
- **SECTION OF REMOTE, HISTORICALLY NATIVE RANGELAND**
- **RANCHER PARTICIPATION**

GRAZING MANAGEMENT FOR THIS EXPERIMENT



- 1. ALTER SEASON OF USE**
- 2. MONITOR SPECIES COVER**
- 2. TARGET 50% LEAF AREA REMOVAL**
- 3. HIGH-INTENSITY, SHORT DURATION GRAZING**
- 4. TRACK FORAGE RECOVERY WITH CO₂ AND BIOMASS DATA**

TEST IF MANAGED GRAZING ALTERS RATES OF CO₂ CAPTURE

CO2 MEASUREMENT

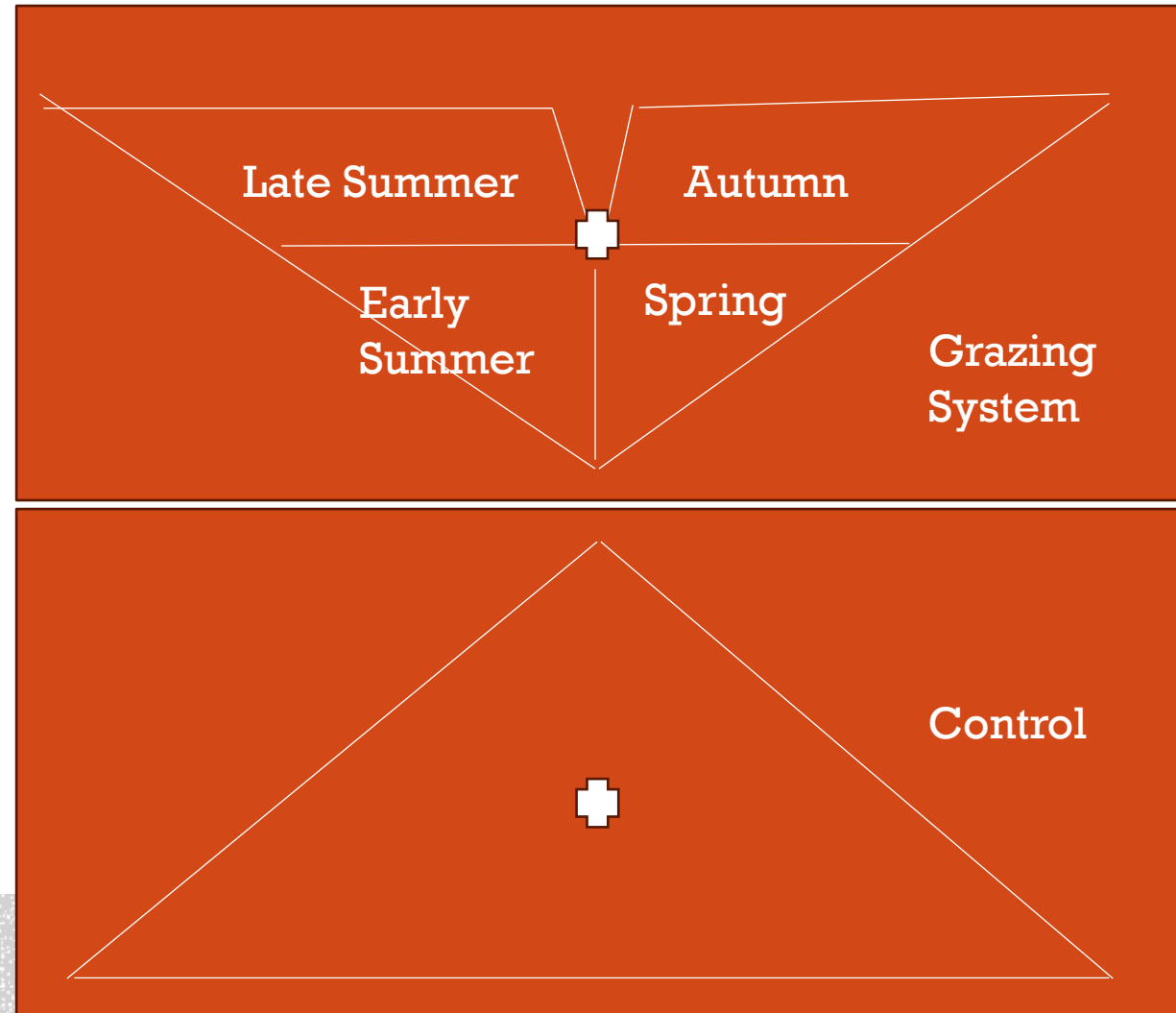
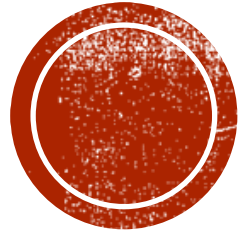
Annual CO2 Capture =

Production (CO2) - Harvest + Deposits

This takes a full year of data to determine

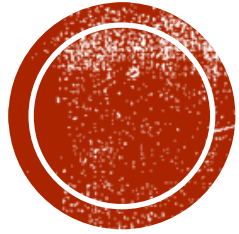


THE EXPERIMENTAL DESIGN



Paddock Layout: Grazed paddocks north and idle control south.

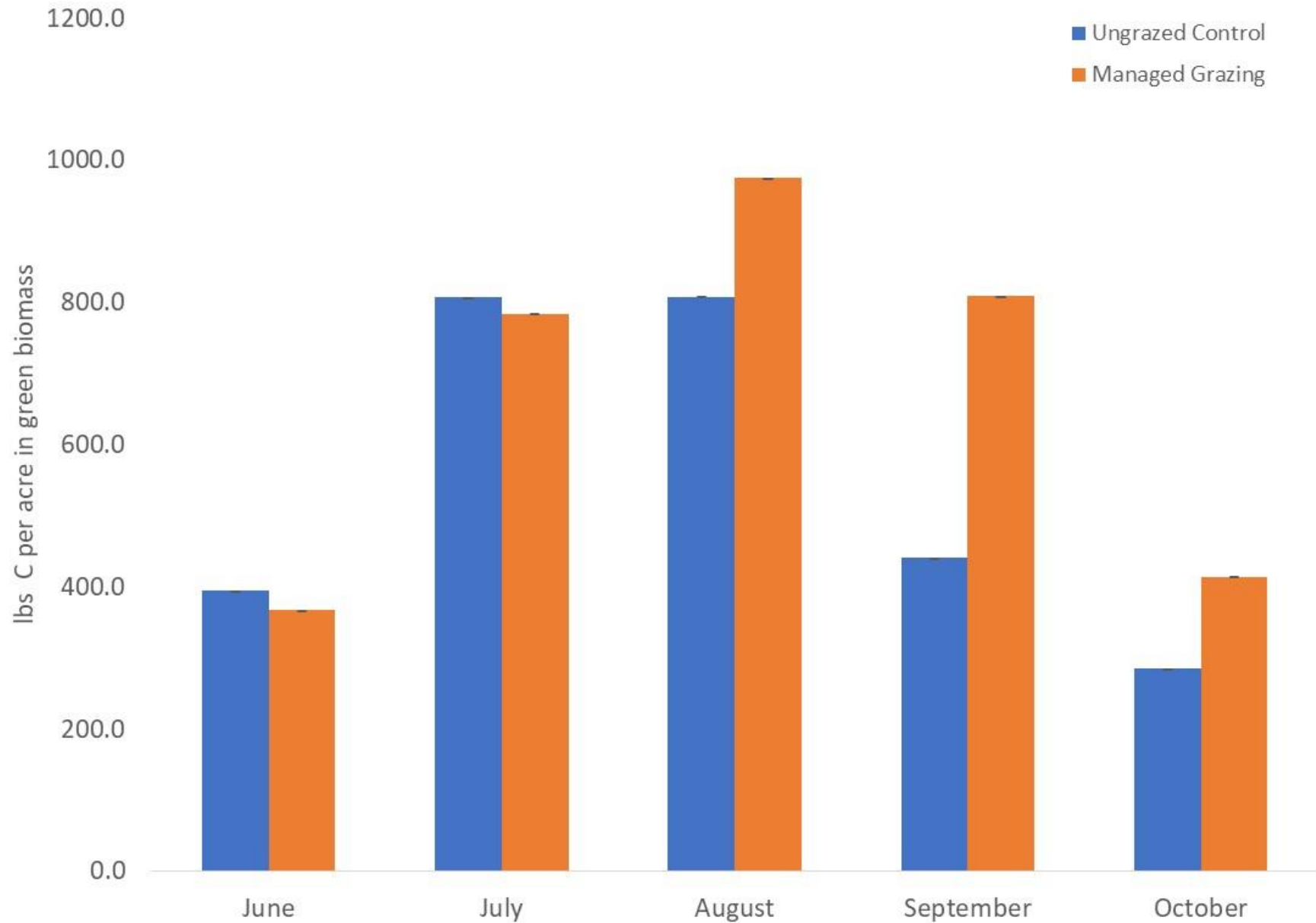
SHORT-TERM, HIGH INTENSITY, SEASONAL GRAZING EVENTS



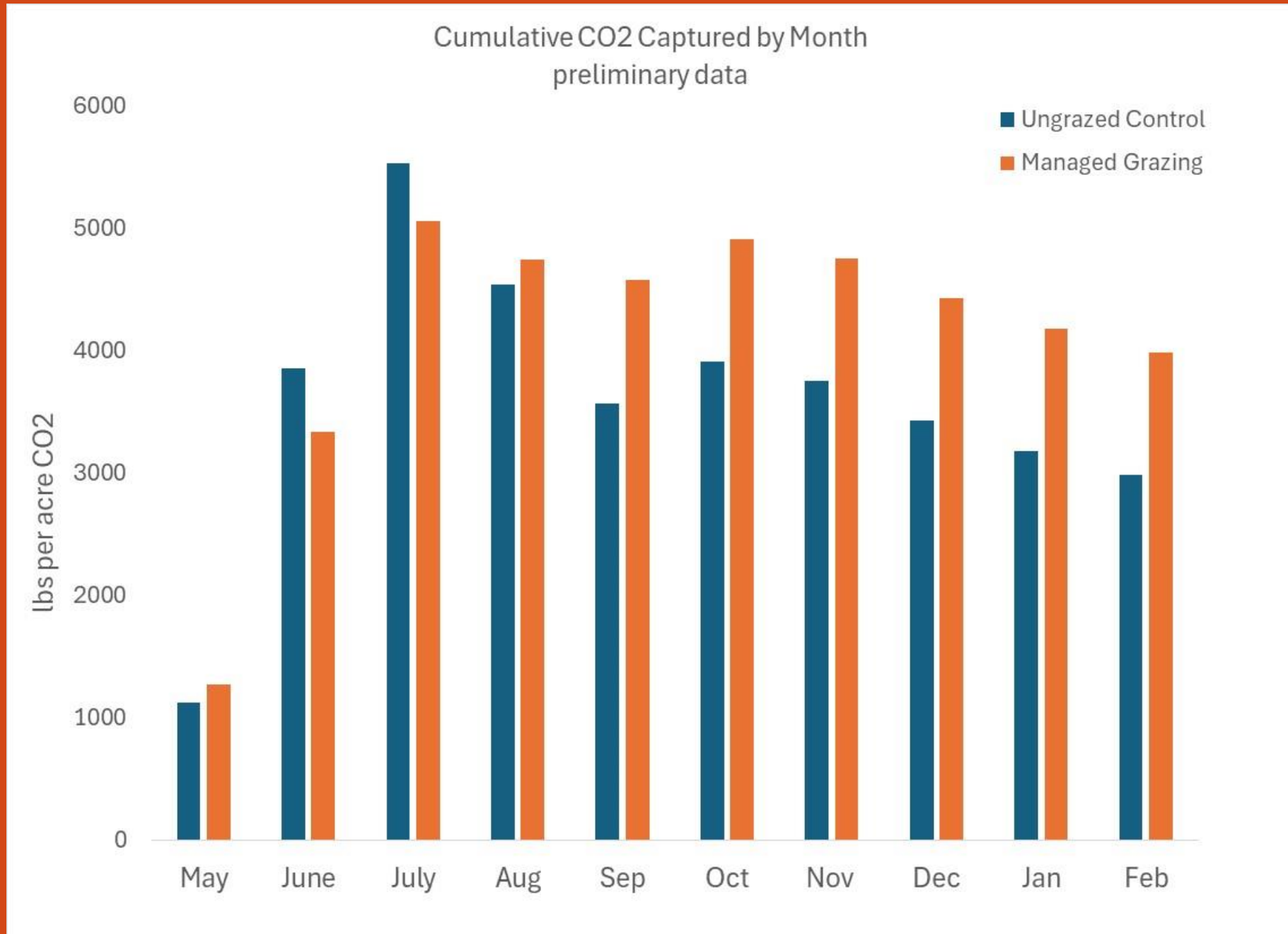
**Graze each paddock until 50% of the leaf area is removed
Measure actual leaf area and carbon in green biomass per acre**



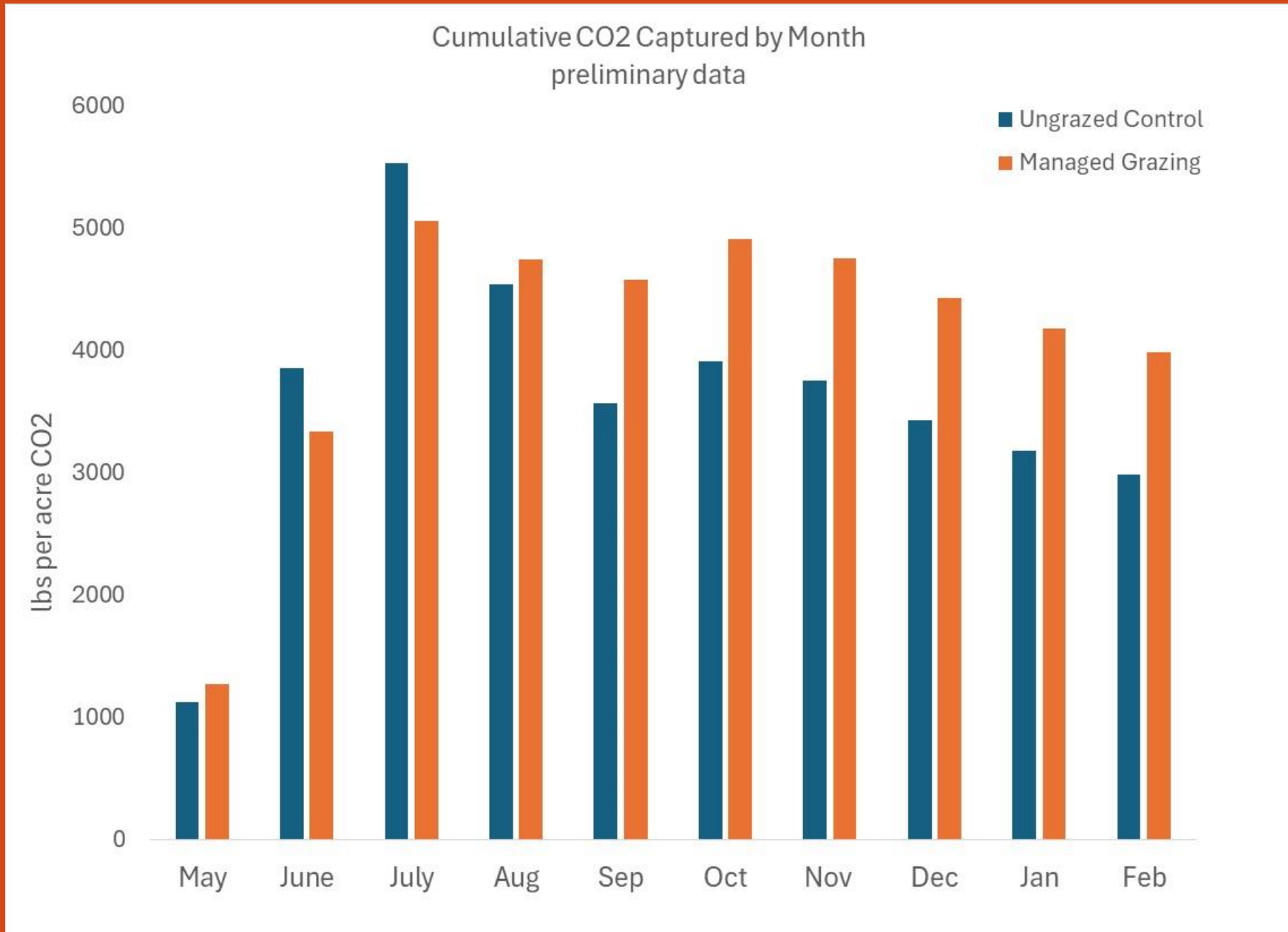
Aboveground Carbon in Green Biomass from June 1 through October 1 2023



EDDY COVARIANCE CONTINUOUS DATA



EDDY COVARIANCE CONTINUOUS DATA

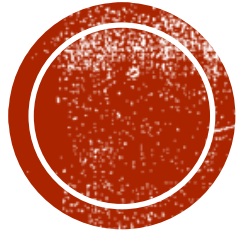


SO, IF THE MARKET IS BUYING AND SELLING CO₂ AND:

- 1) industry is paid by the ton of CO₂ they capture and bury, and**
- 2) plants capture and bury CO₂, and**
- 3) we measure fluxes of CO₂ moving into rangelands,**

then wouldn't it be reasonable to buy and sell the CO₂ captured by living plants as CO₂?

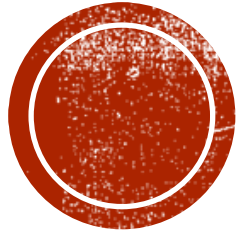




IN CONCLUSION

**WHAT CAN WE DO TO MAKE RANCHERS MORE AWARE OF RANGELAND
CARBON AND POTENTIAL BENEFITS?**

Would presenting this information to other SCD districts be a good idea?



THANK YOU



NORTH DAKOTA Game and Fish
Be Legendary.™

HESS

MERCER COUNTY
SOIL CONSERVATION
DISTRICT

North Dakota
oil & gas research program

NORTH DAKOTA
NATURAL RESOURCES
TRUST