Ranching in Forested Landscapes

2025 Forestry Institute for Teachers

Dan Macon
UCCE Livestock and Natural Resources Advisor
Central Sierra

June 18, 2025

UC CE
UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
UC Cooperative Extension

Overview

- My background
- What are Rangelands and why do they matter?!
- Transhumance and the Connection between Private and Public Lands
- Targeted Grazing and Livestock Species
- Climate Change Adaptation and Mitigation
- Questions (and maybe some Answers)

What are Rangelands?

Society for Range Management Definition:

(Noun) *Land supporting vegetation that either is grazed or that has the potential to be grazed, and is managed as a natural ecosystem. Range includes grassland, grazable forestland, shrubland, and pastureland. Range is not a use.*

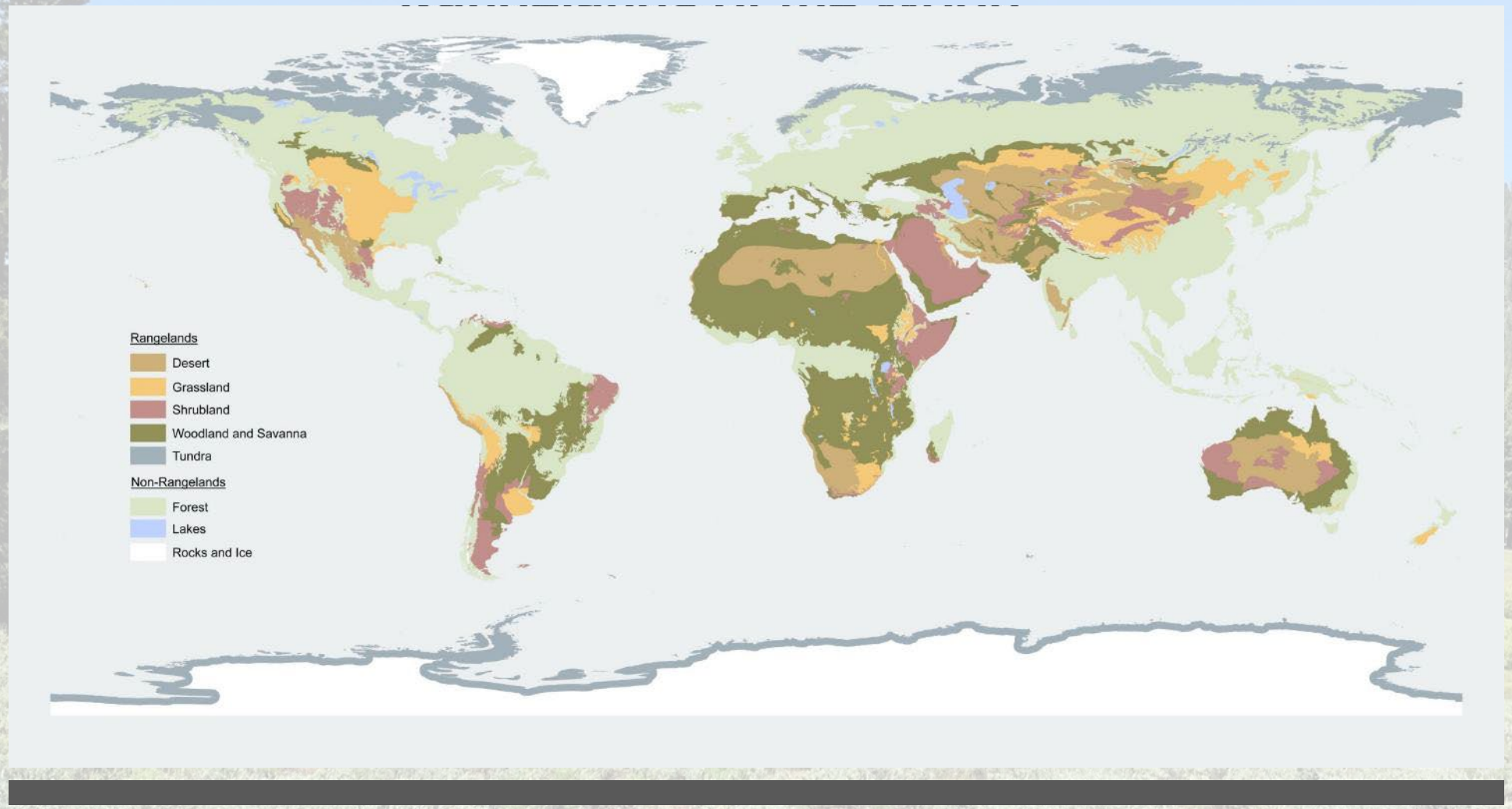
(Adjective) Modifies resources, products, activities, practices, and phenomena pertaining to rangeland.

What are Rangelands?

Sheepherder Definition:

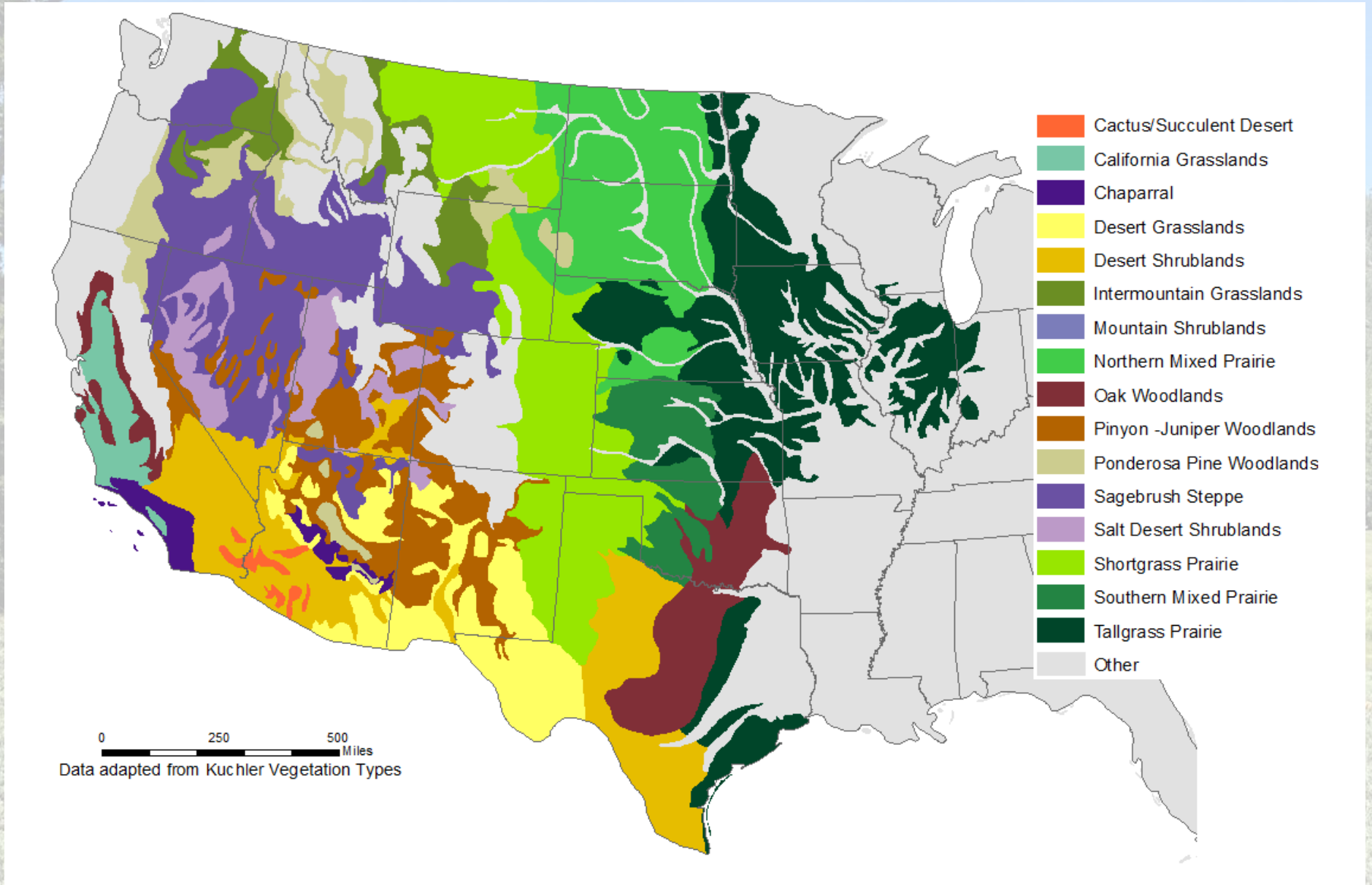
Land that is too hot, too cold, too dry, too wet, too steep, too… something, to support cultivation.

Overview of Rangeland Ecosystems



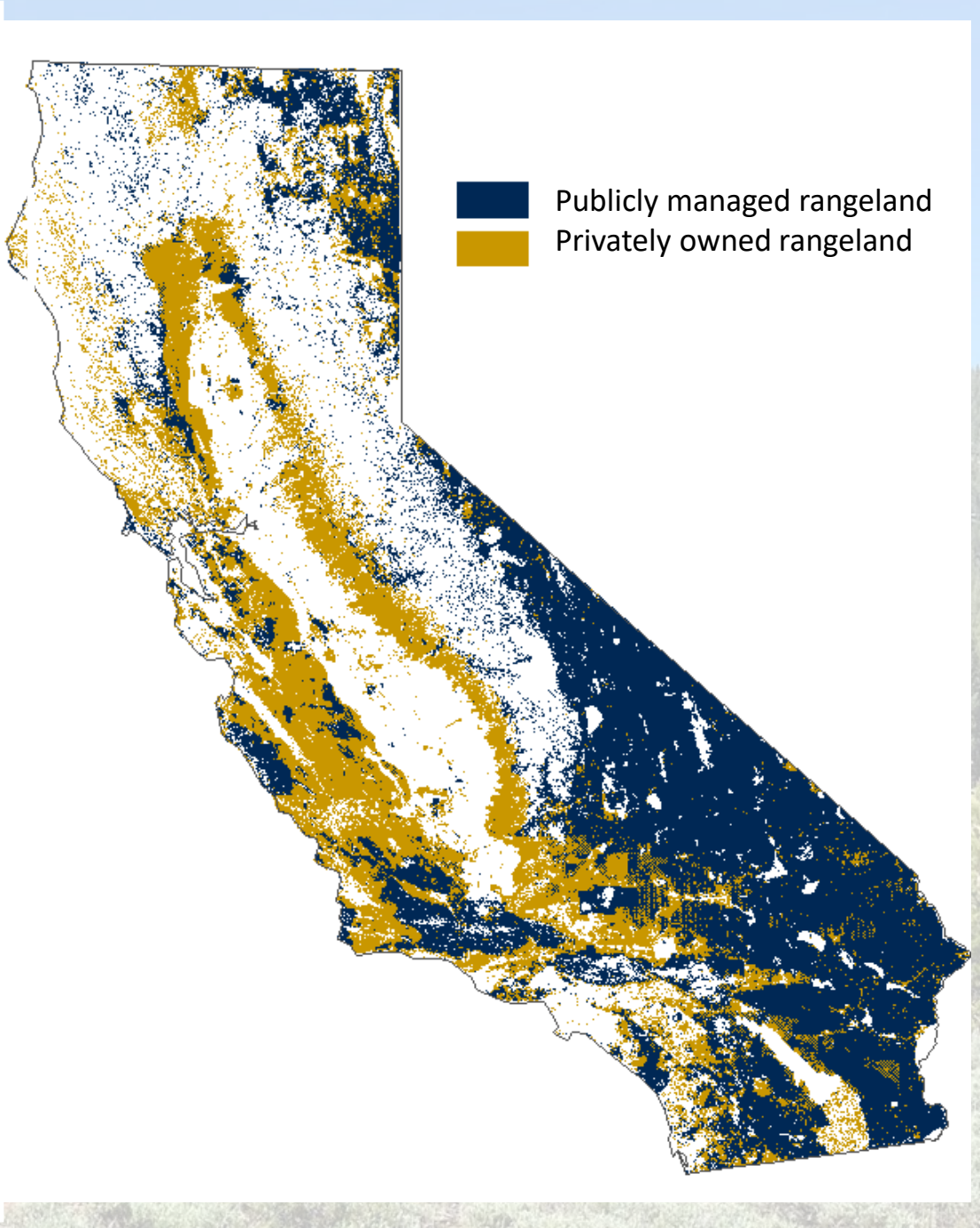
47% of Earth's land surface

Rangelands (Continental US)

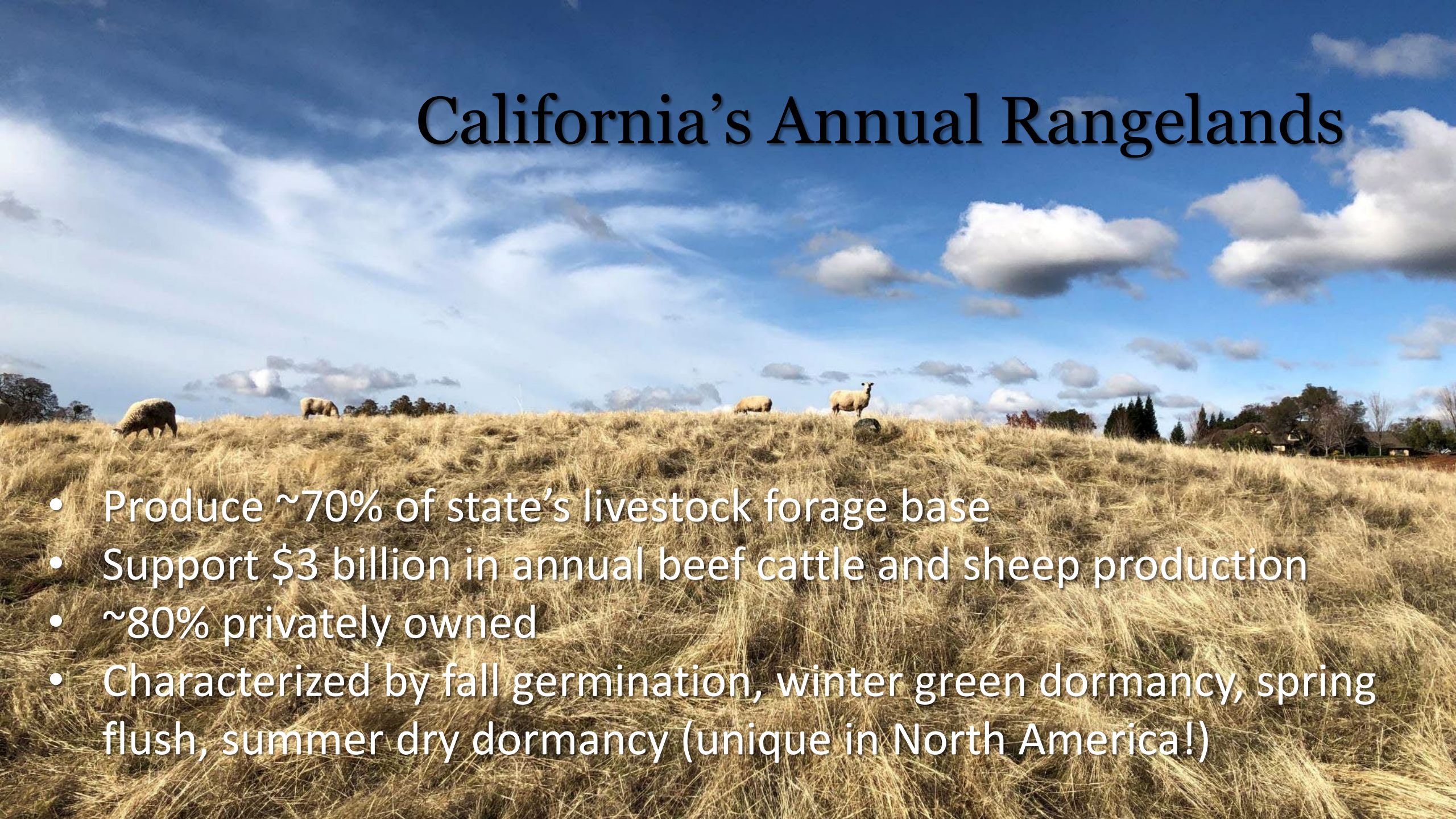


California Rangelands

- 57 M acres of rangeland
  - ~34 M acres are grazed (~half are public lands)
- >2/3 surface water supplies pass through or are stored on rangelands
- Commonly at nexus of wildland, agricultural, and urban landscapes



California's Annual Rangelands

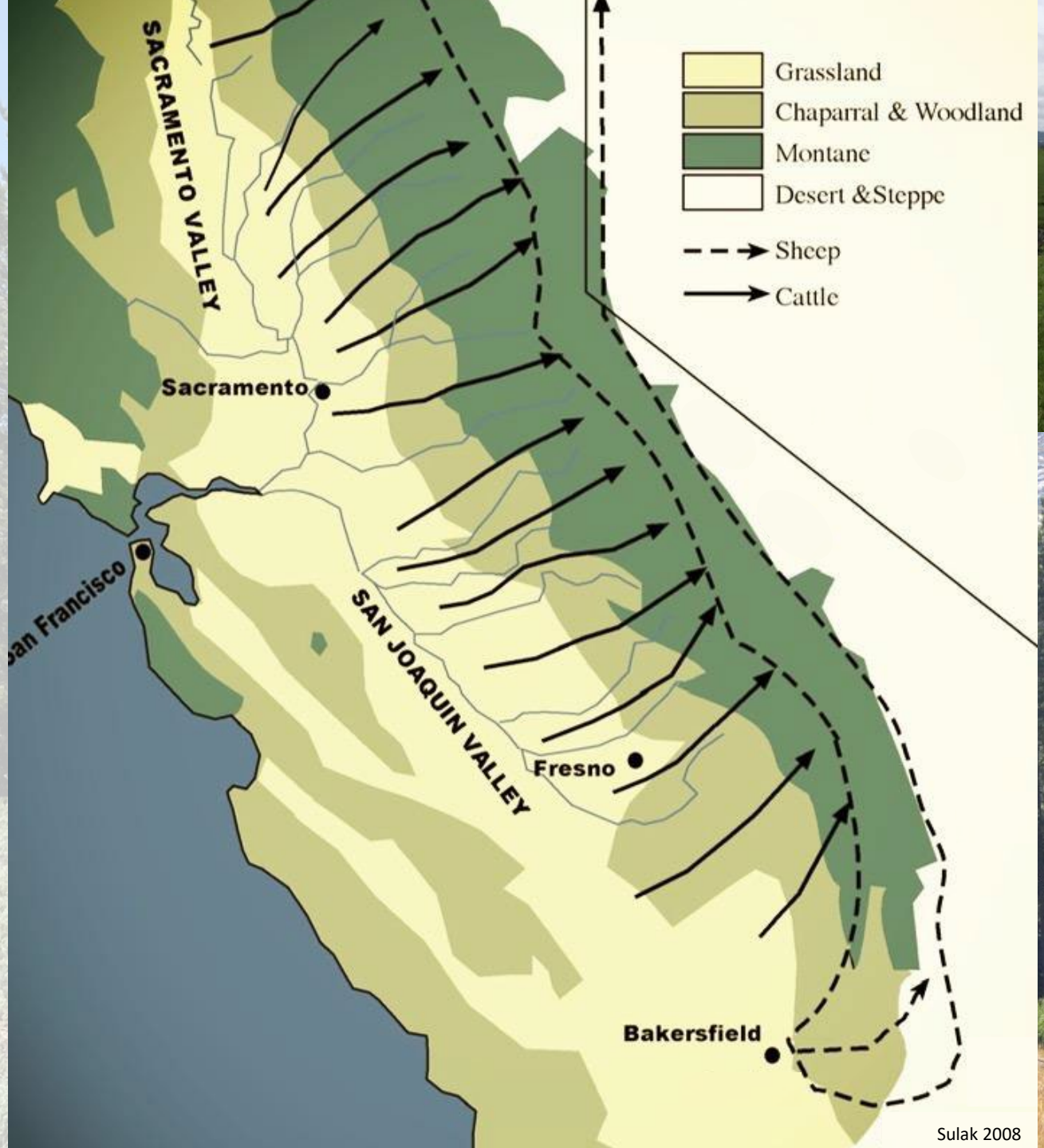


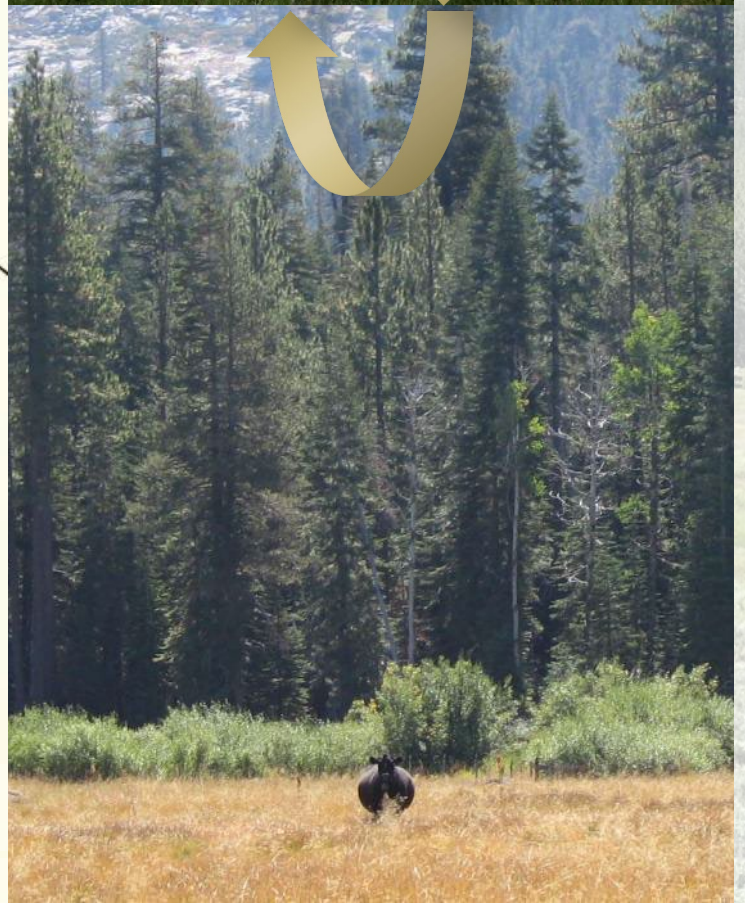
- Produce ~70% of state's livestock forage base
- Support $3 billion in annual beef cattle and sheep production
- ~80% privately owned
- Characterized by fall germination, winter green dormancy, spring flush, summer dry dormancy (unique in North America!)

California's Annual Rangelands

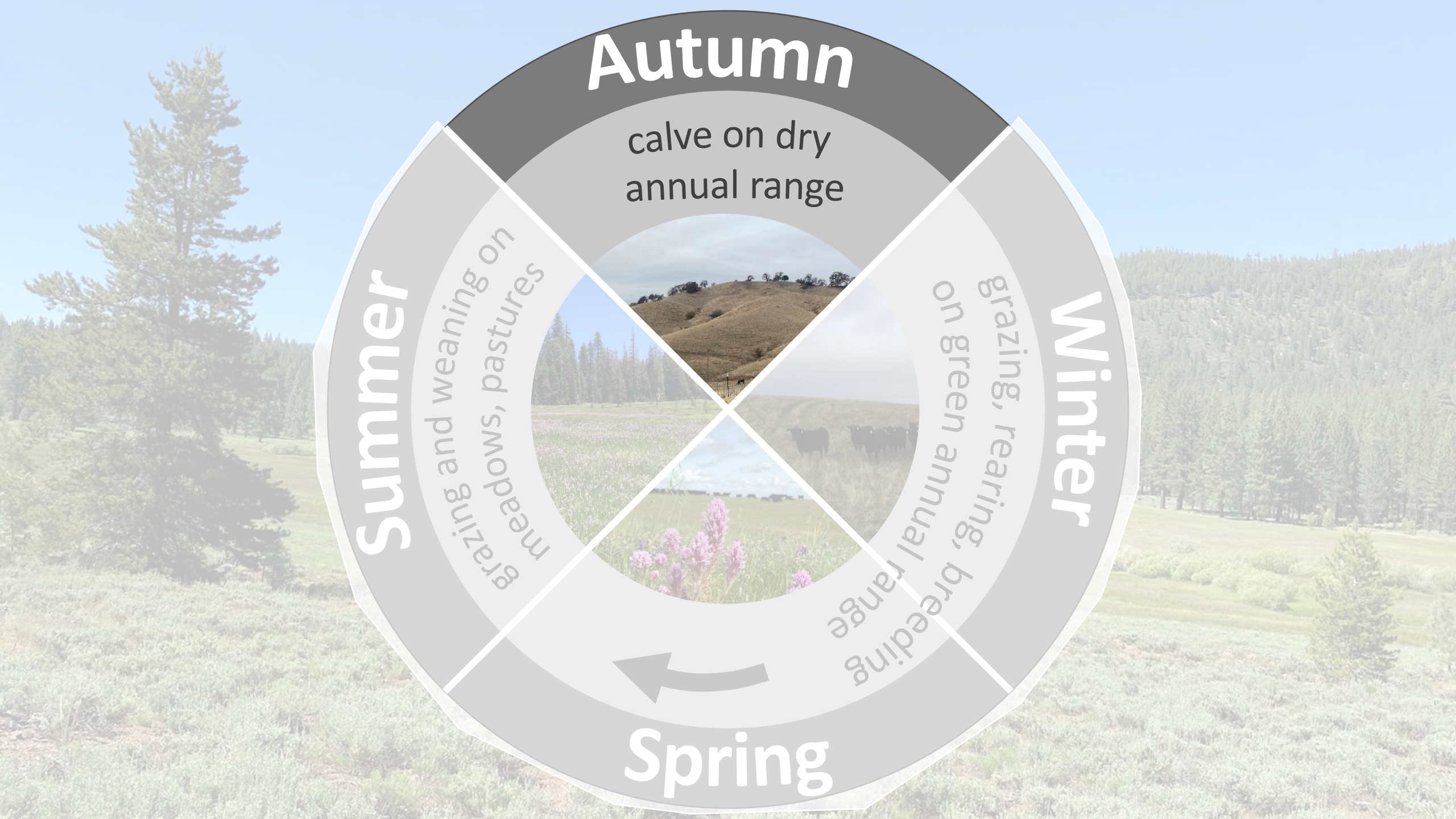
- ~15M acres of annual grasslands, savannas, and woodlands
- >300 vertebrate, 5000 invertebrate, and 2000 plant species
- Recreation opportunities
- Open space and viewsheds
- MORE than just inventory of land that can be used for a "higher and better" use!

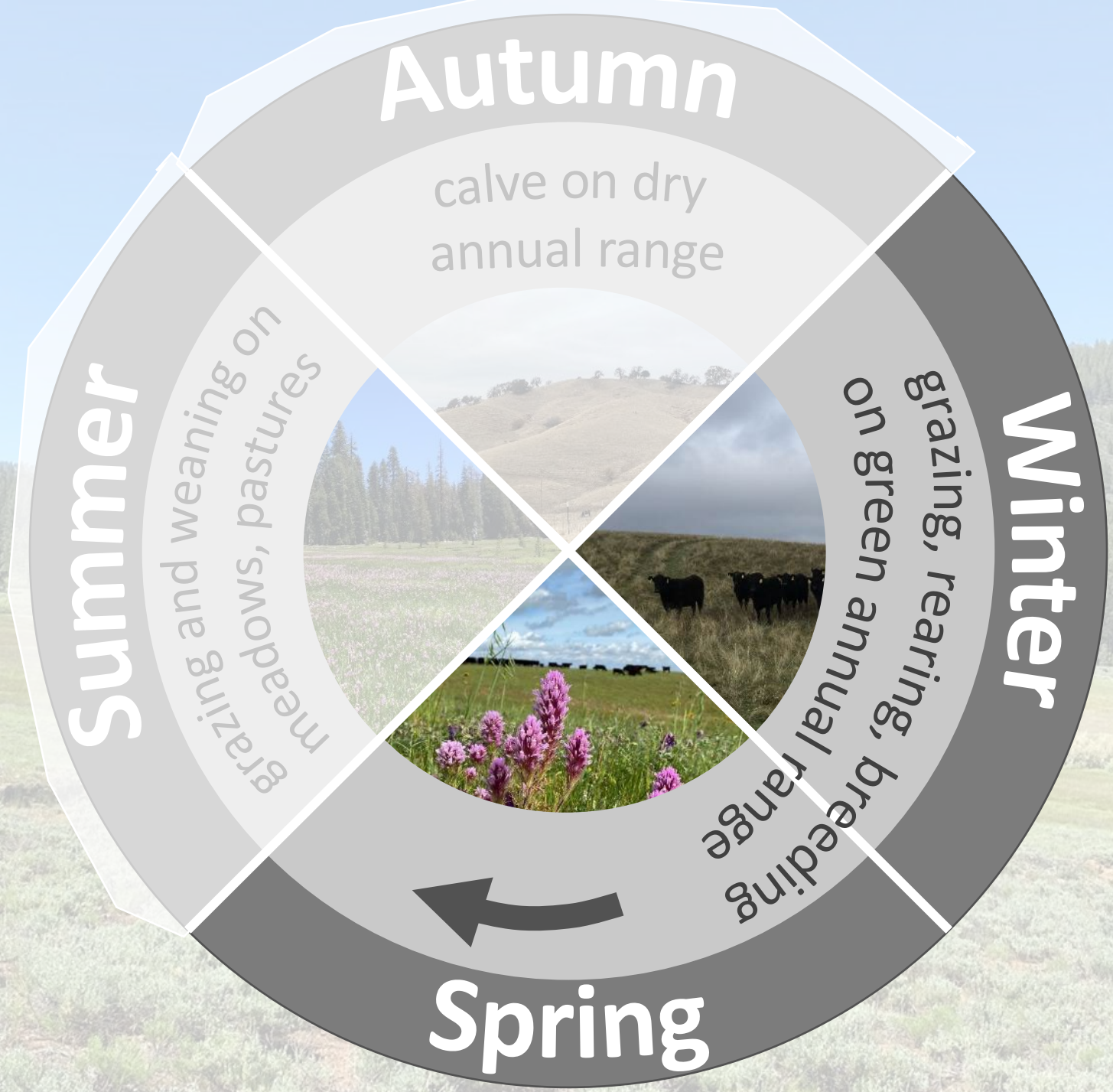
Connections: Private and Public Rangelands

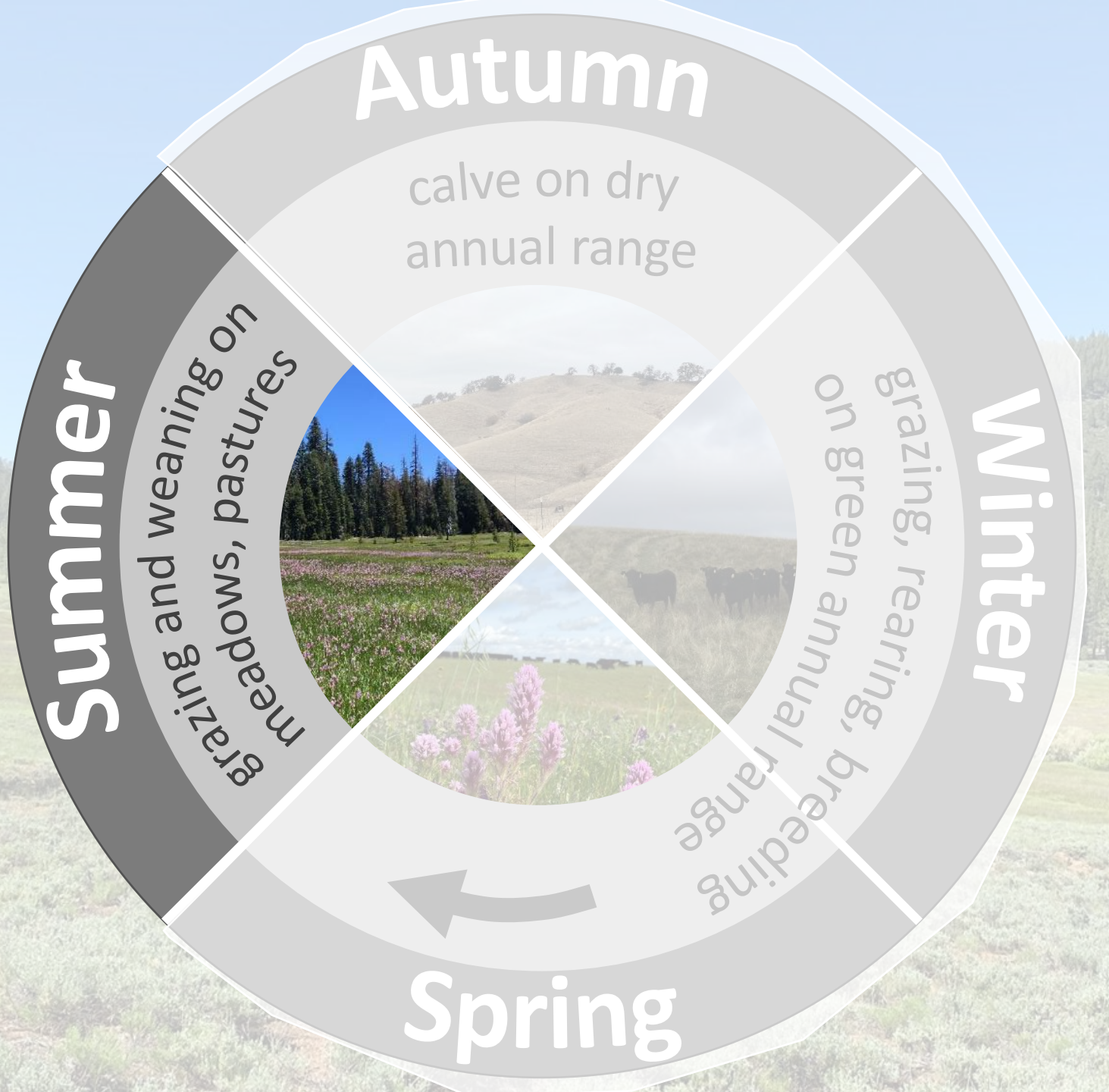

Grassland
Chaparral & Woodland
Montane
Desert &Steppe
Sheep
Cattle
SACRAMENTO VALLEY
Sacramento
San Francisco
SAN JOAQUIN VALLEY
Fresno
Bakersfield

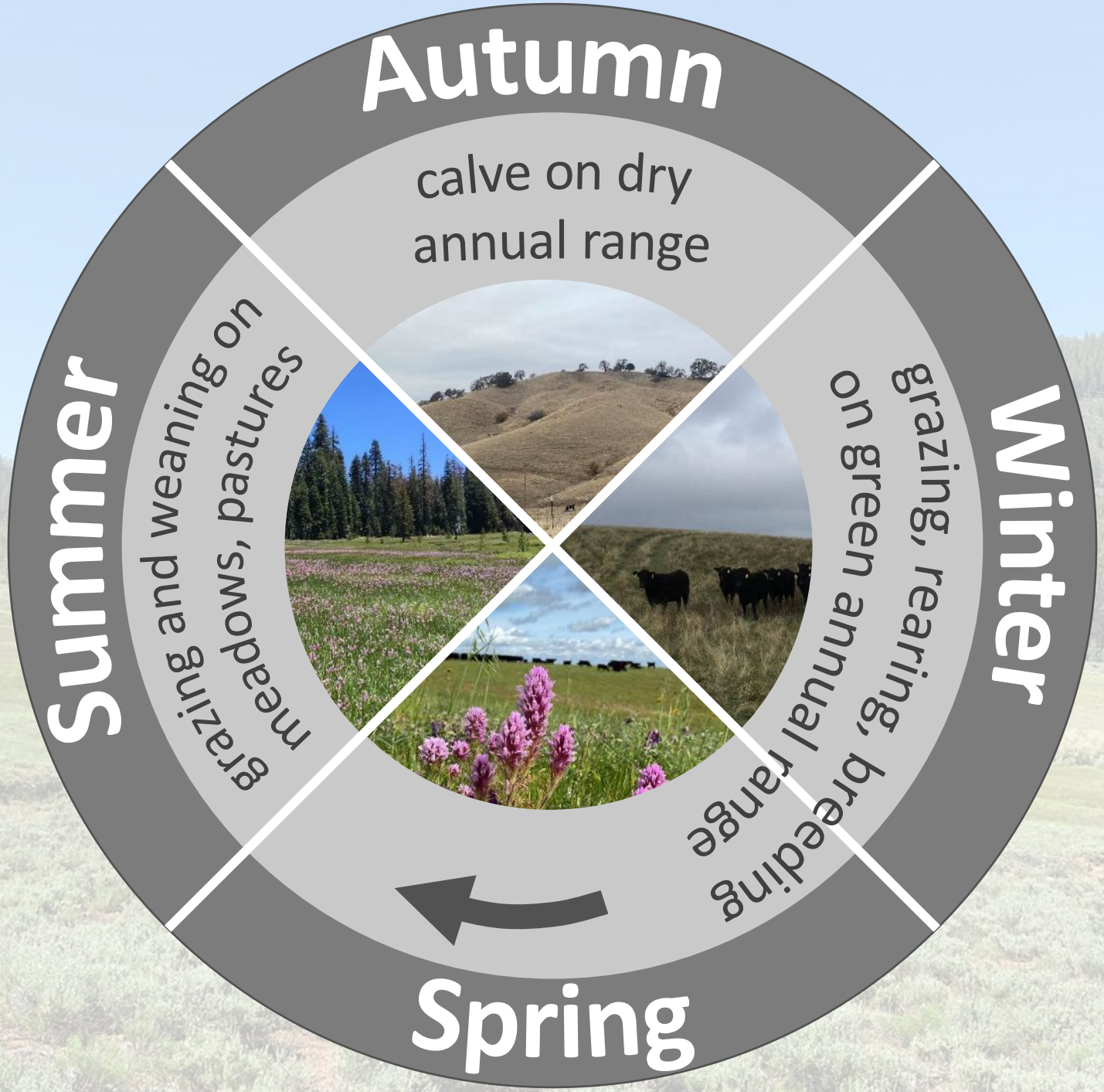


Sulak 2008


Autumn
calve on dry annual range
Winter
grazing, rearing, breeding on green annual range
Spring
Summer
grazing and weaning on meadows, pastures


Autumn
calve on dry annual range
Winter
grazing, rearing, breeding on green annual range
Spring
Summer
grazing and weaning on meadows, pastures


Autumn
calve on dry annual range
Winter
grazing, rearing, breeding on green annual range
Spring
Summer
grazing and weaning on meadows, pastures


Autumn
calve on dry annual range
Winter
grazing, rearing, breeding on green annual range
Spring
Summer
grazing and weaning on meadows, pastures

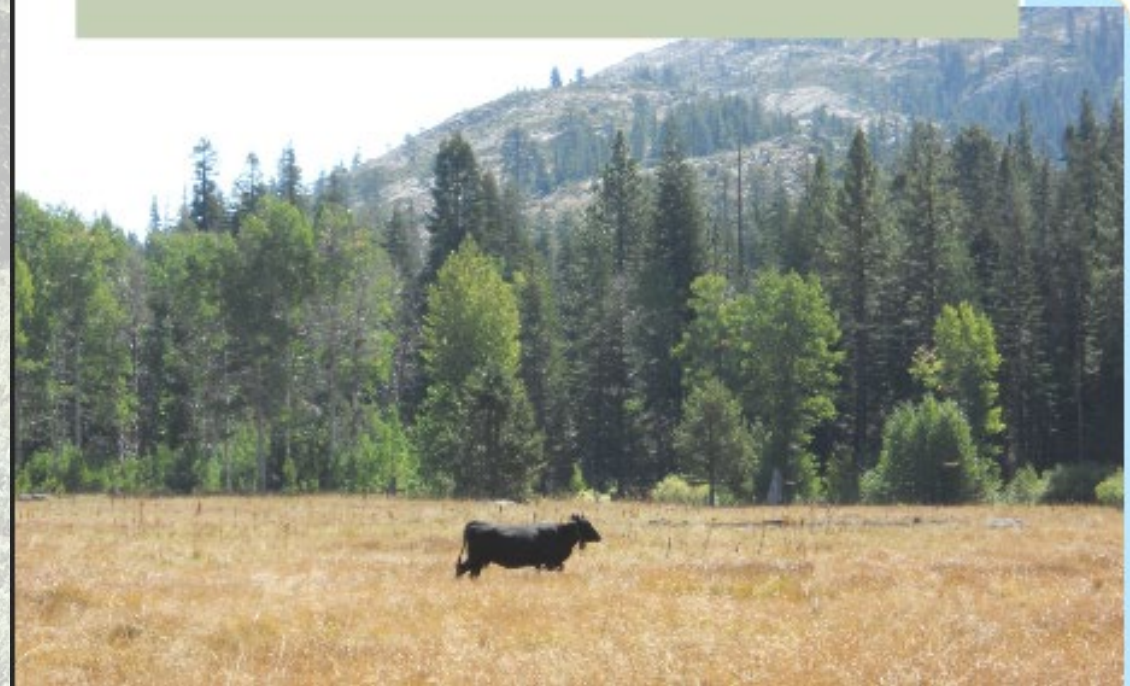
USFS Public Grazing Allotments in CA

500 active allotments

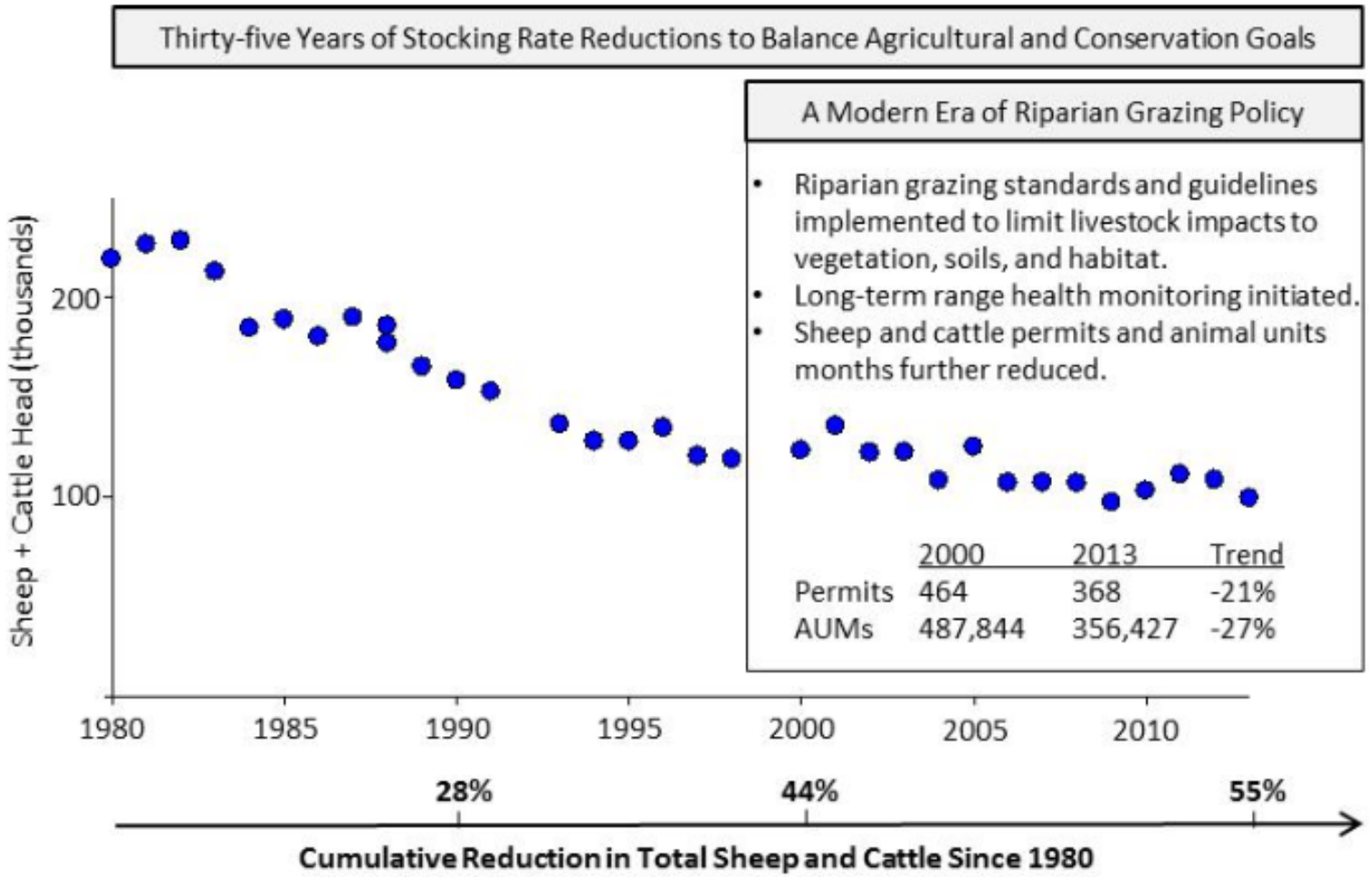
200 vacant allotments

8,000,000 acres

430,000 Animal Unit Months



Trends in livestock numbers on USFS forest lands in CA – 1980 through 2013.



Grazing on USFS Lands

- Many grazing allotments on National Forest Lands in the Sierra Nevada have been grazed by the same families since before the Forest Service existed.
- Permit system requires base property, annual operating plans, and adherence to environmental standards and guidelines.
- Summer forage in the Sierra Nevada is critical to keeping private land ranches intact.
- Legacy of checkerboard land ownership means many ranching families graze on timber land intermixed with USFS lands.

Sustainable Public Lands Grazing

- Work at UC Davis and elsewhere demonstrates that grazing is compatible with ecosystem goals!
  - "Cattle grazing, recreation, and clean water can be compatible goals across these national forest lands." **Roche et al. 2013 PLOS ONE**
  - "Livestock grazing compliant with USFS riparian grazing standards did not degrade or hamper recovery of meadow plant communities." **Freitas et al. 2014 Envir. Manage.**

Biophysical Science vs. Policy

- The biophysical science is clear:
  - Poor grazing management without conservation goals degrades resources.
  - Proper grazing management with conservation goals enhances and conserves multiple ecosystem services.
- Policy making is less clear!

For more information:

https://rangelands.ucdavis.edu/

Targeted Grazing & Livestock Species

Targeted Grazing Defined…

“Targeted grazing is the application of a specific kind of livestock at a determined season, duration and intensity to accomplish defined vegetation or landscape goals….

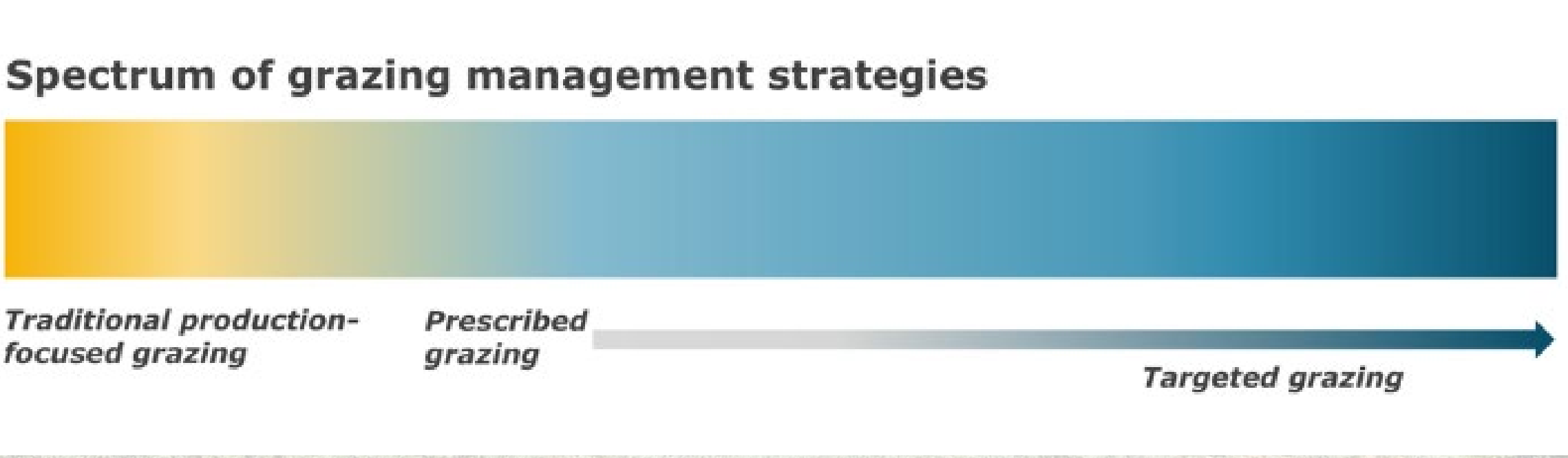
Targeted Grazing Defined…

"Targeted grazing is the application of a specific kind of livestock at a determined season, duration and intensity to accomplish defined vegetation or landscape goals…. **The major difference between good grazing management and targeted grazing is that targeted grazing refocuses outputs of grazing from livestock production to vegetation and landscape enhancement.**"

Targeted Grazing Handbook

Grazing and prescribed fire are the ONLY fuels management tools that actually remove fuel!

The Grazing Spectrum



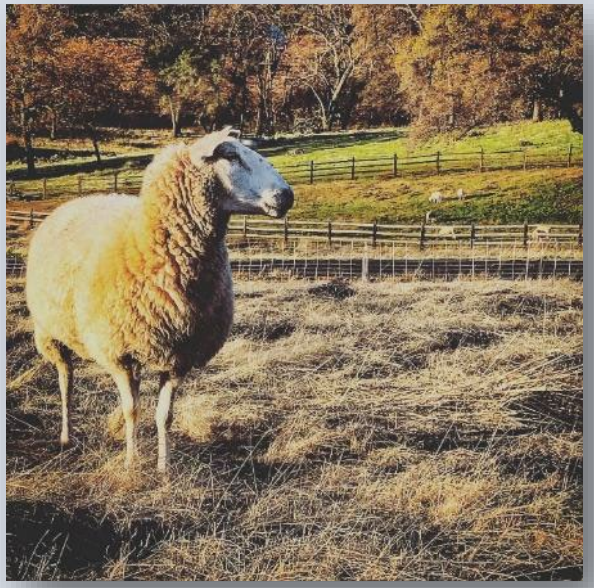
Comparing Grazing to Other Fuels Management Tools

	Grazing	Prescribed Fire	Mechanical Treatment	Hand Treatment	Herbicide Application
Removes fuels/weeds from landscape	✓	✓			
Modifies fuel profile (moisture content, oxygen access, etc.)	✓	✓	✓	✓	
Can be used across a wide range of topographic, land use, and ecological constraints	✓				
Tools can be stored in a shed when the job is done		✓	✓	✓	✓
May damage or destroy equipment and/or infrastructure		✓			

The Players

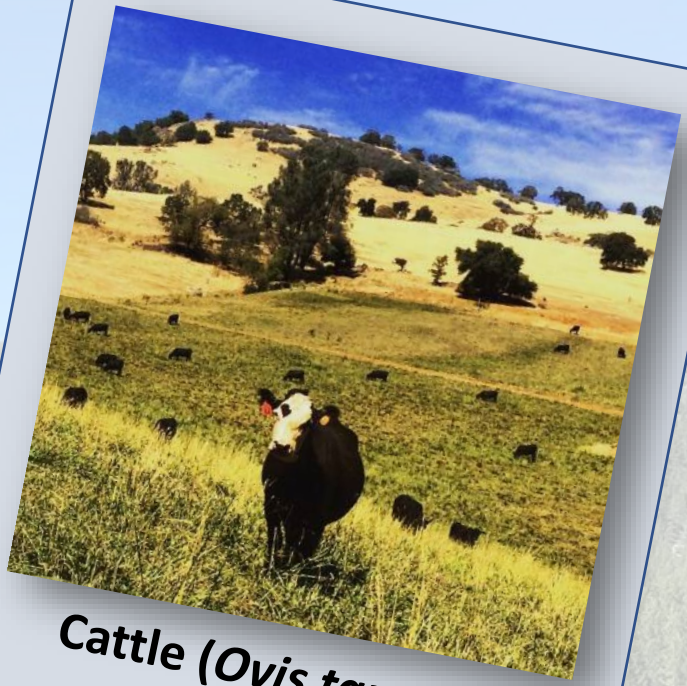
Goat (*Capra hircus*)

Preferred forage: broadleaf plants, brush.
Grazing habit: likes to browse on plants from shoulder level and up. Small mouths enable goats to clip vegetation closely.
Gestation: 5 months
Terms: buck/billy, doe, kid



Sheep (*Ovis aries*)

Preferred forage: mix of grasses and broadleaf plants (including some brush)
Grazing habit: likes to graze on plants from shoulder level and down. Small mouths enable sheep to clip vegetation closely
Gestation: 5 months
Terms: buck/ram, ewe, lamb



Cattle (*Ovis taurus or indicus*)

Preferred forage: mostly grass, with some broadleaf plants (including some brush)
Grazing habit: likes to graze on plants from shoulder level and down. Bigger mouth = bigger bites.
Gestation: 9 months
Terms: bull, cow, calf

Choosing the Right Critter!

	Goats	Sheep	Cattle
Dietary preferences and adaptations	Brush, broadleaf plants, grass. Goats have the ability to neutralize tannins.	Broadleaf plants, grass, brush. Some sheep are adapted to browse.	Grass, broadleaf plants, brush. Some cattle are adapted to browse.
Grazing behavior	Typically browse from shoulder height UP. May pull down higher brush.	Typically graze/browse from shoulder height DOWN.	Do not clip vegetation as closely as small ruminants.
Limitations/challenges	Susceptible to predators. May be difficult to fence. May not be hardy in wet/cold weather.	Susceptible to predators. May be difficult to fence. Wool sheep need to be shorn annually.	Require more expensive infrastructure. Longer gestation limits ability to handle nutritional stress.

But will they eat it?!

- Palatability varies by species, time of year, and stage of growth.
- Many brush species are highly palatable and nutritious (research @ Blodgett!)
  - Deciduous ceanothus
  - Wedgeleaf ceanothus
  - Coyote brush
  - Himalayan blackberry
  - Live oak
  - Yellow starthistle
- Some brush species are low in fiber, which can create digestive problems.
- Livestock aren't masticators – they typically can't handle decadent brush!
  - Heavy wether goats will mob-browse taller brush plants
- Timing is everything!

But will they eat it?

- Tannins may bind protein, but goats have a compound in their saliva that can break down tannins.
- Some plants have secondary compounds that make them less susceptible to grazing/browsing
  - Manzanita
  - Coffee berry
  - Toyon
  - Poison oak (at certain times of year)
- Goats and sheep maybe better suited to grazing spiny plants (blackberries, thistles, etc.)
- Toxic plants can be problematic if animals are being stressed nutritionally

Ruminant Livestock and Climate Change

Biogenic Carbon Cycle

CO_2

Hydroxyl Oxidation

Methane (CH_4) is converted into carbon dioxide (CO_2) after 12 years through hydroxyl oxidation

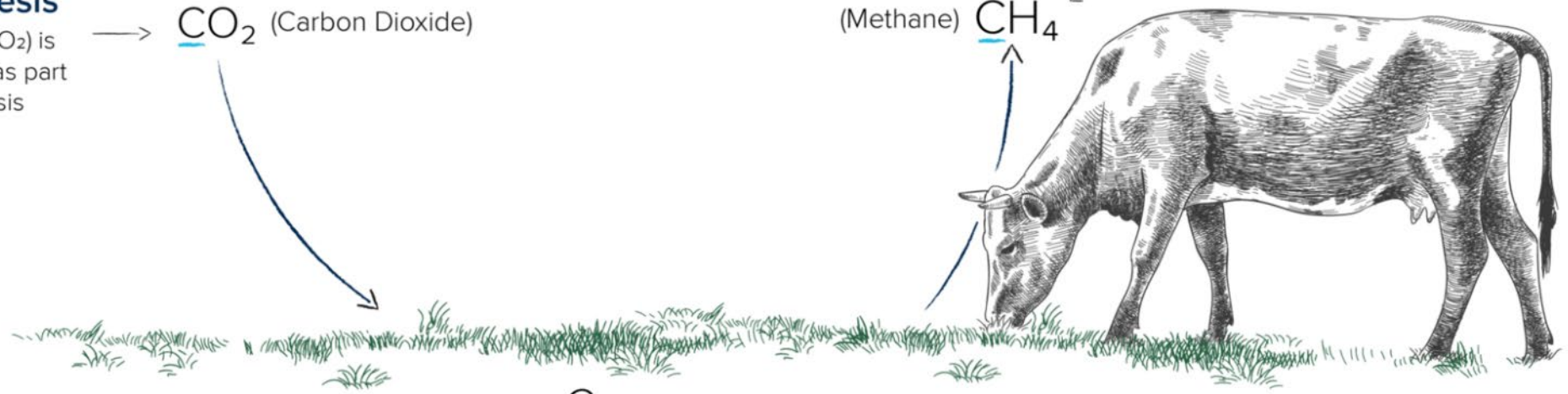
Cow manure and belches release carbon (C) as methane (CH_4)

Photosynthesis

Carbon dioxide (CO_2) is captured by plants as part of photosynthesis

CO_2 (Carbon Dioxide)

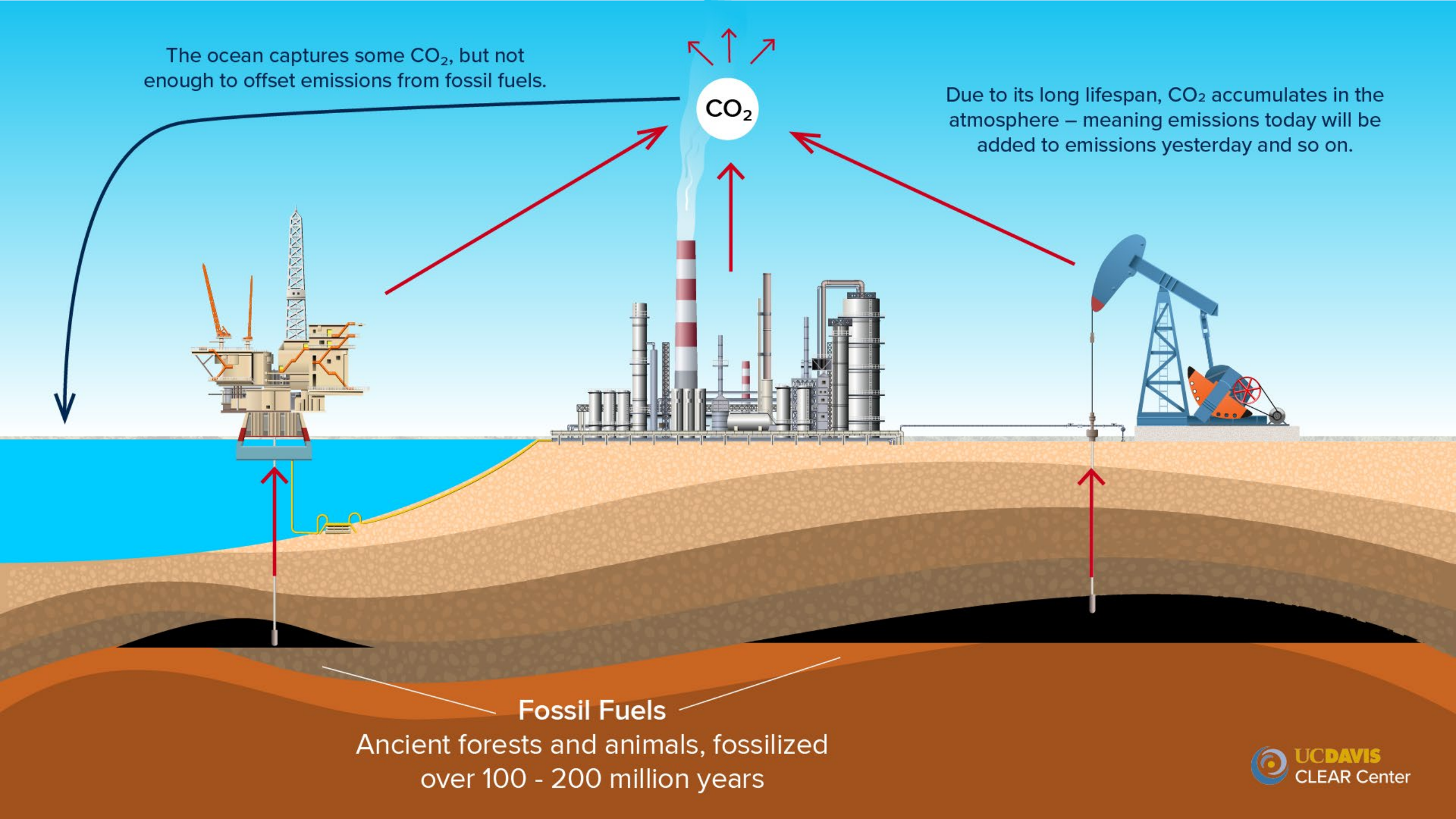
(Methane) CH_4



C (Carbon)

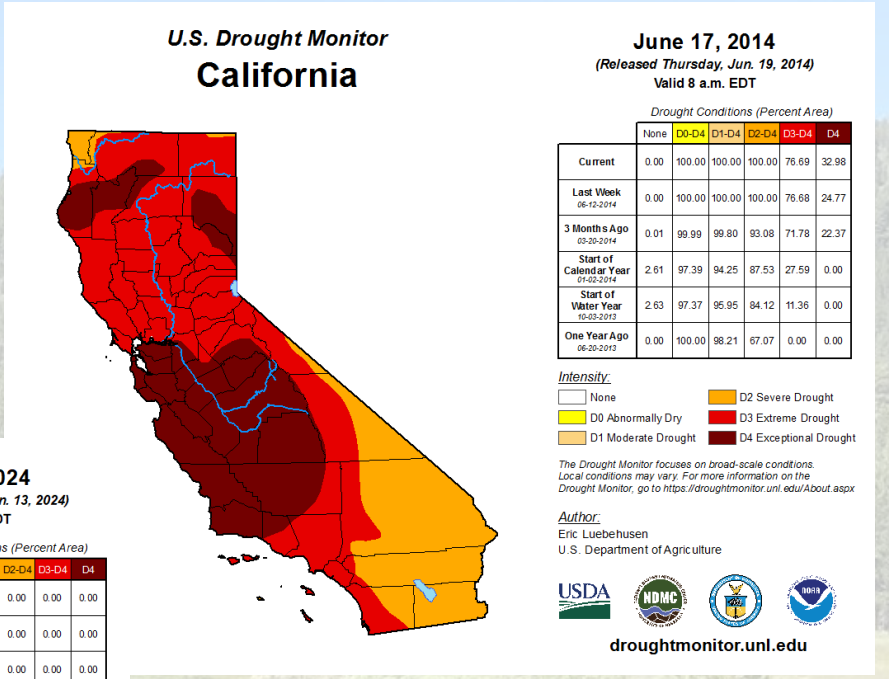
Carbon (C) is stored as carbohydrates in plants and consumed by ruminants

UCDAVIS CLEAR Center


The ocean captures some CO_2, but not enough to offset emissions from fossil fuels.
CO_2
Due to its long lifespan, CO_2 accumulates in the atmosphere – meaning emissions today will be added to emissions yesterday and so on.
Fossil Fuels
Ancient forests and animals, fossilized over 100 - 200 million years
UCDAVIS CLEAR Center

Climate Change Adaptation/Mitigation

- Rangeland Drought
  - Driven by precipitation timing, temperature, and soil-environmental water deficit.
  - Tools for adaption



U.S. Drought Monitor
California

June 17, 2014
(Released Thursday, Jun. 19, 2014)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

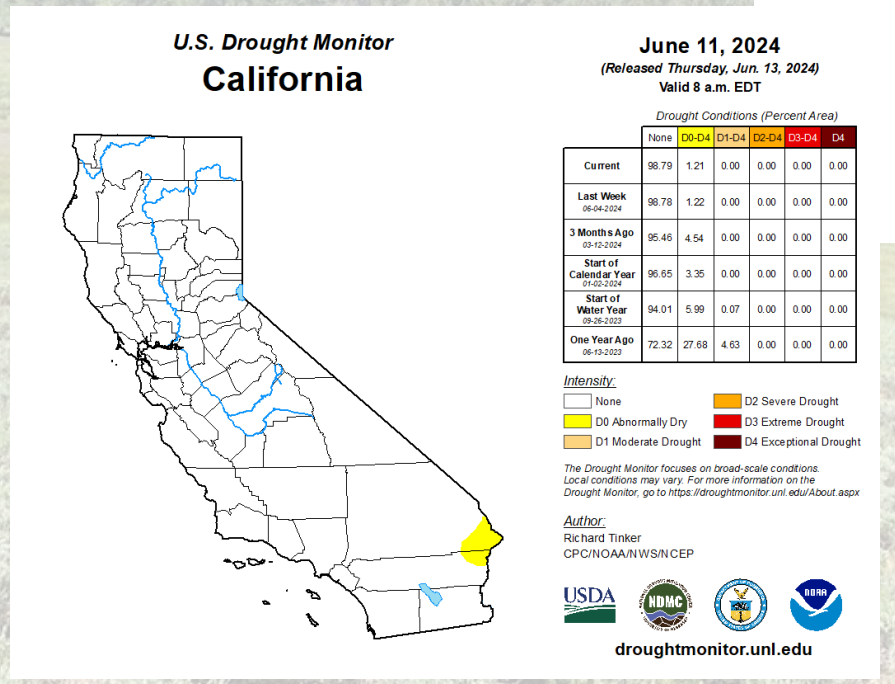
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	76.69	32.98
Last Week 06-12-2014	0.00	100.00	100.00	100.00	76.68	24.77
3 Months Ago 03-20-2014	0.01	99.99	99.80	93.08	71.78	22.37
Start of Calendar Year 01-02-2014	2.61	97.39	94.25	87.53	27.59	0.00
Start of Water Year 10-03-2013	2.63	97.37	95.95	84.12	11.36	0.00
One Year Ago 06-20-2013	0.00	100.00	98.21	67.07	0.00	0.00

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

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

Author:
Eric Luebehusen
U.S. Department of Agriculture

droughtmonitor.unl.edu



U.S. Drought Monitor
California

June 11, 2024
(Released Thursday, Jun. 13, 2024)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	98.79	1.21	0.00	0.00	0.00	0.00
Last Week 06-04-2024	98.78	1.22	0.00	0.00	0.00	0.00
3 Months Ago 03-12-2024	95.46	4.54	0.00	0.00	0.00	0.00
Start of Calendar Year 01-02-2024	96.65	3.35	0.00	0.00	0.00	0.00
Start of Water Year 09-26-2023	94.01	5.99	0.07	0.00	0.00	0.00
One Year Ago 06-13-2023	72.32	27.68	4.63	0.00	0.00	0.00

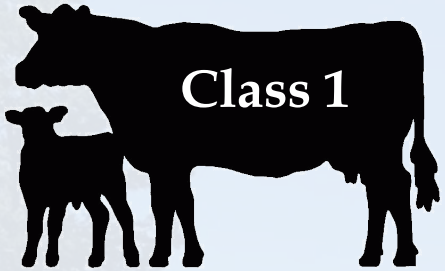
Intensity:
None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

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

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

On-ranch Drought Strategies



Increasing management intensity

Identifying practices

- *Purchase feed*

- *Reduce herd size*
- *Purchase feed*
- *Wean early*
- *Gov't assistance programs*

- *Reduce herd size*
- *Purchase feed*
- *Wean early*
- *Conserv. stocking*
- *Rest pastures*
- *Cow-calf/stockers*

- *Reduce herd size*
- *Purchase feed*
- *Wean early*
- *Govn't assistance*
- *Rent pasture*
- *Move cattle*
- *Conserv. stocking*
- *Rest pastures*
- *Cow-calf/stockers*

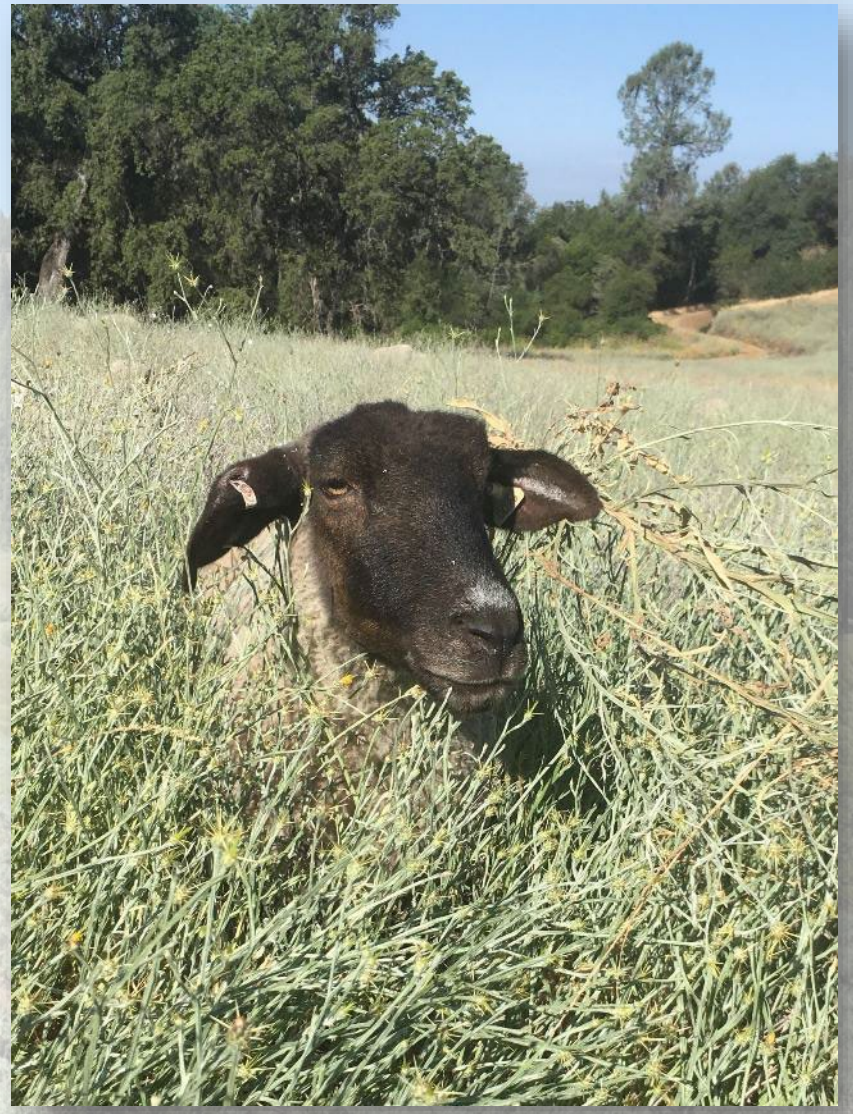
Climate Change Adaptation/Mitigation

- Wildfire
  - Direct impacts from fire/smoke
  - Loss of forage
  - Opportunities for producers to get paid for fuel reduction!


Photo: Los Angeles Times

Climate Change Adaptation/Mitigation

- Invasive Species and Disease
  - Extreme variability (precipitation, temperature, soil moisture, etc.) may favor invasive species from other parts of the world.
  - Drought stress is impacting blue oaks and other hardwood species (similar to conifer mortality).



Questions?