



# Grazing Considerations for Soil Health

# Objectives

1. Describe advantages and challenges of grazing related to soil health
2. Describe impacts of grazing on soil function and animal performance
3. Introduce the principles of adaptive grazing management
4. Explain management strategies

# Advantages of Grazing

- Livestock manure as primary source of nutrients for crop production cycling nutrients from crops through animals and back to land\*
- Biological acceleration, improving soil health at faster rate
  - Add biology
  - Incorporation of organic matter
- Additional source of income
- Increased nutrient cycling (C/N ratio impacts)



# Advantages of Grazing



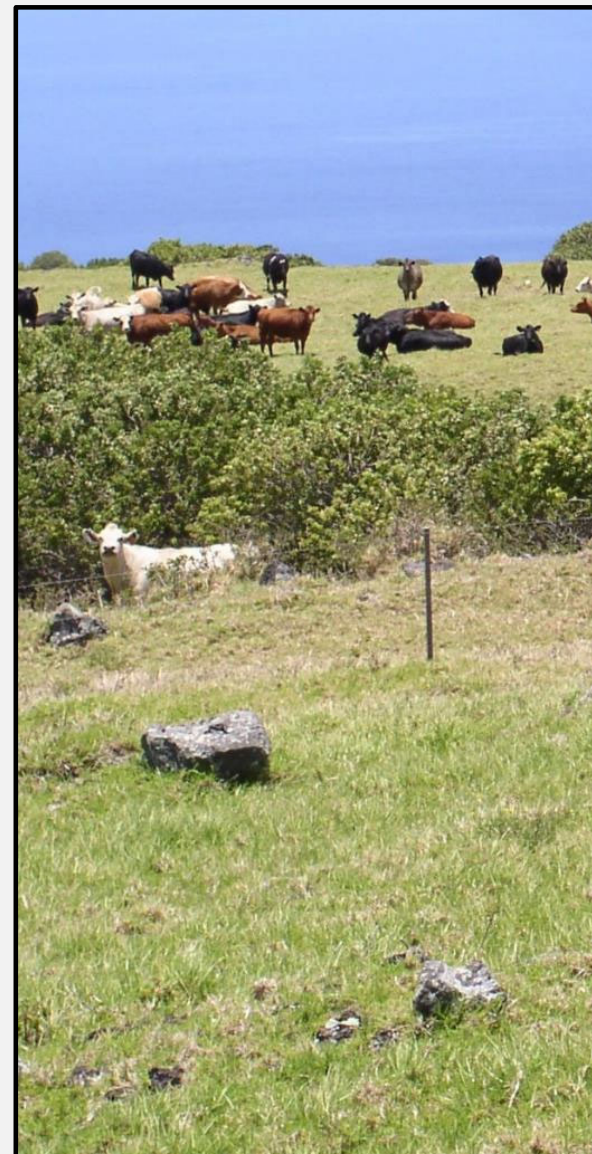
No-Till Farmer

- Increase mycorrhizal fungi abundance
- More rapid building of soil aggregates
- Improved infiltration
- Salinity remediation; grazing can better utilize areas where perennial vegetation is required
- Minimize import of feedstuffs to farm\*



# Advantage Of Grazing

- High quantity & quality forage for livestock from perennials
- Grazing that provides adequate recovery will:
  - Maintain adequate cover
  - Increase infiltration
  - Decrease evaporation
  - Improve plant vigor
- Grazing can be managed to improve diversity
- Minimize feeding and improve animal health
- Biological acceleration – greater improvements and at a faster rate
  - Add biology
  - Incorporation of organic matter



# Advantages of Grazing

- Potential increase in diversity of insects to help reduce pest species
- Livestock serve as a sink for agricultural byproducts\*
- Encourages establishment of perennial forages as the primary feedstuff for ruminant livestock\*



King's Agriseeds

# Challenges of Grazing



Megapixl.com

- Lack of knowledge/familiarity about:
  - Livestock management/herd health
  - Equipment/infrastructure needed; how to use
- Increased time/level of management to prepare operation, move fence, livestock, water, etc.
- Lack of grazing infrastructure: no fences, fences in poor condition, no water nearby



# Challenges of Grazing

- Potential hassle working out lease agreement with livestock owner
- Potential risk of livestock not being moved frequently enough causing compaction
- Liability if livestock cause accident on public roads



No-Till Farmer



# Impacts on Soil Health

- Research grazing cover crops:
  - MN and IA: ↑ fertility, total organic carbon, inorganic C, total C, total living microbial biomass
  - GA: grazing cover crops did not cause substantial physical damage to soil
- Research grazing crop residues:
  - IA in winter: utilizing corn stover as an inexpensive feed source is a viable option; posing minimal reductions to soybean yield
  - NE in fall and spring: long-term corn residue grazing had little to no effect on soil properties and did not affect crop yields

# Impacts on Soil Health

- On-farm field testing in ND grazing cover crops with no-till compared to farms without cover crops and/or no-till:
  - 7 times higher N
  - 4 times higher P
  - 9 times higher K
  - 4 times higher water extractable organic carbon
  - 4 times higher OM
  - 43 times higher water infiltration



Brown's Ranch

# Impacts on Soil Health

- Research on grasslands in TX – compared to heavy or light continuous grazing, multi-paddock grazing offered:
  - Greater soil cover
  - Lower soil penetration resistance
  - Lower sediment loss
  - Higher OM and CEC
  - Increased fungal population



Texas A&M University



# Impacts on Soil Health

- On-farm trial in MS comparing high stock density rotational grazing to continuous grazing:
  - Several times higher total soil carbon in topsoil and subsoil
  - Significantly greater soil organic matter in topsoil and subsoil

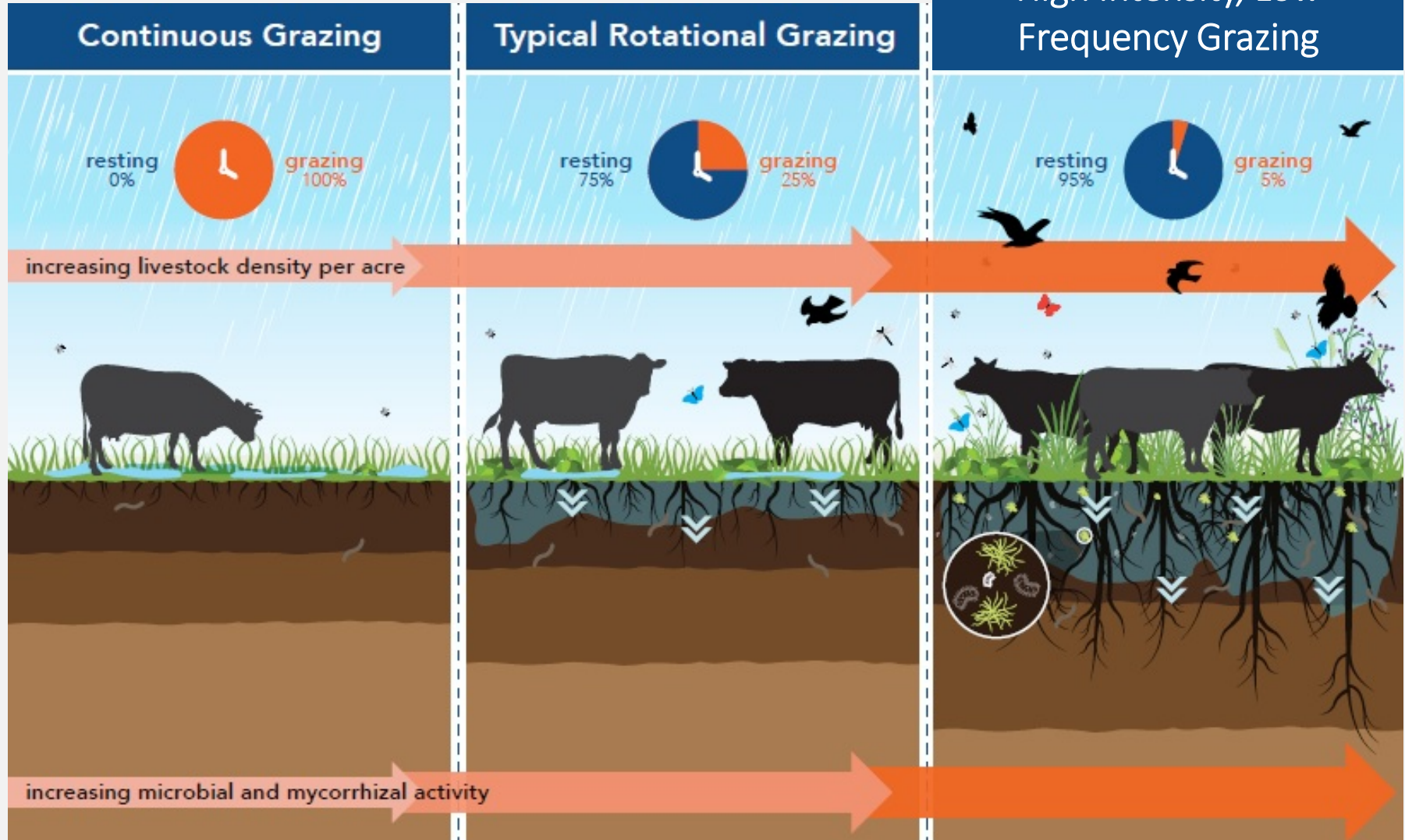


Joyce Farms

# Effect of Recovery Period

4-paddock system

20-paddock system



Modified from the Pasture Project

# Impacts of Grazing Grasslands for Soil Health

<b>% Leaf Removed</b>	<b>% Root Growth Stopped</b>
10	0
20	0
30	0
40	0
50	2 to 4
60	50
70	78
80	100
90	100



# When You Overgraze the Shoot You Overgraze the Root!



Tall Fescue  
Rotational

Tall Fescue  
Continuous

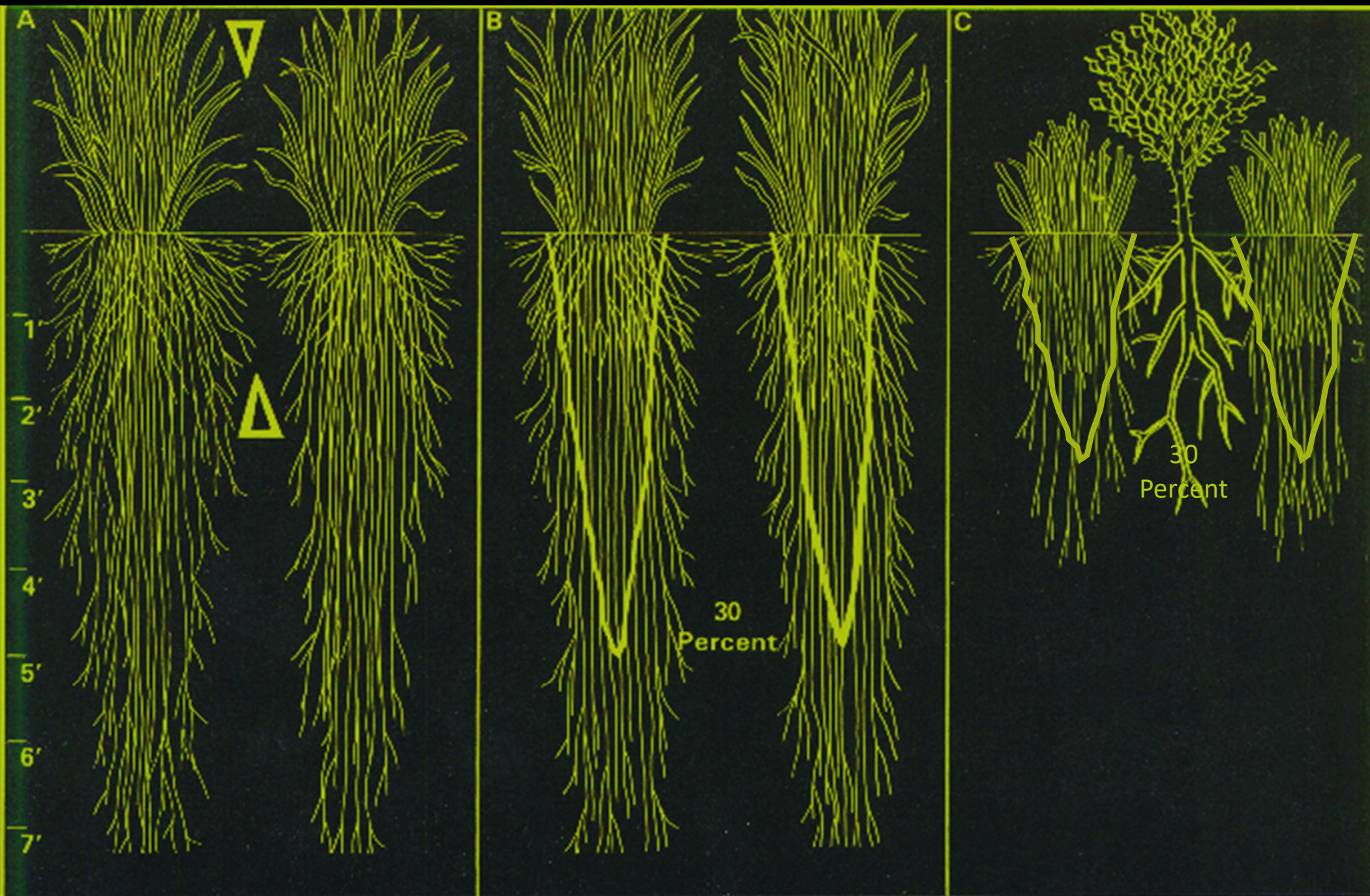
Tall Fescue  
Continuous

Orchardgrass  
Rotational

Orchardgrass  
Rotational

Fescue/Bluegrass  
Rotational







# Leaves – The Facts of Growth



 **Roots uptake and send water, minerals, and micronutrients to leaves.**

 **Roots DO NOT transport carbohydrates to the leaves.**

 **Leaves use carbohydrates to respire.**

 **5-10% of new leaf growth is from residual sheath & crown carbohydrate reserves.**

 **90-95% of new leaf growth comes from carbohydrates resulting from current photosynthesis.**

 **Bottom line – it takes leaves to make leaves.**



# Knowledge check – poll question

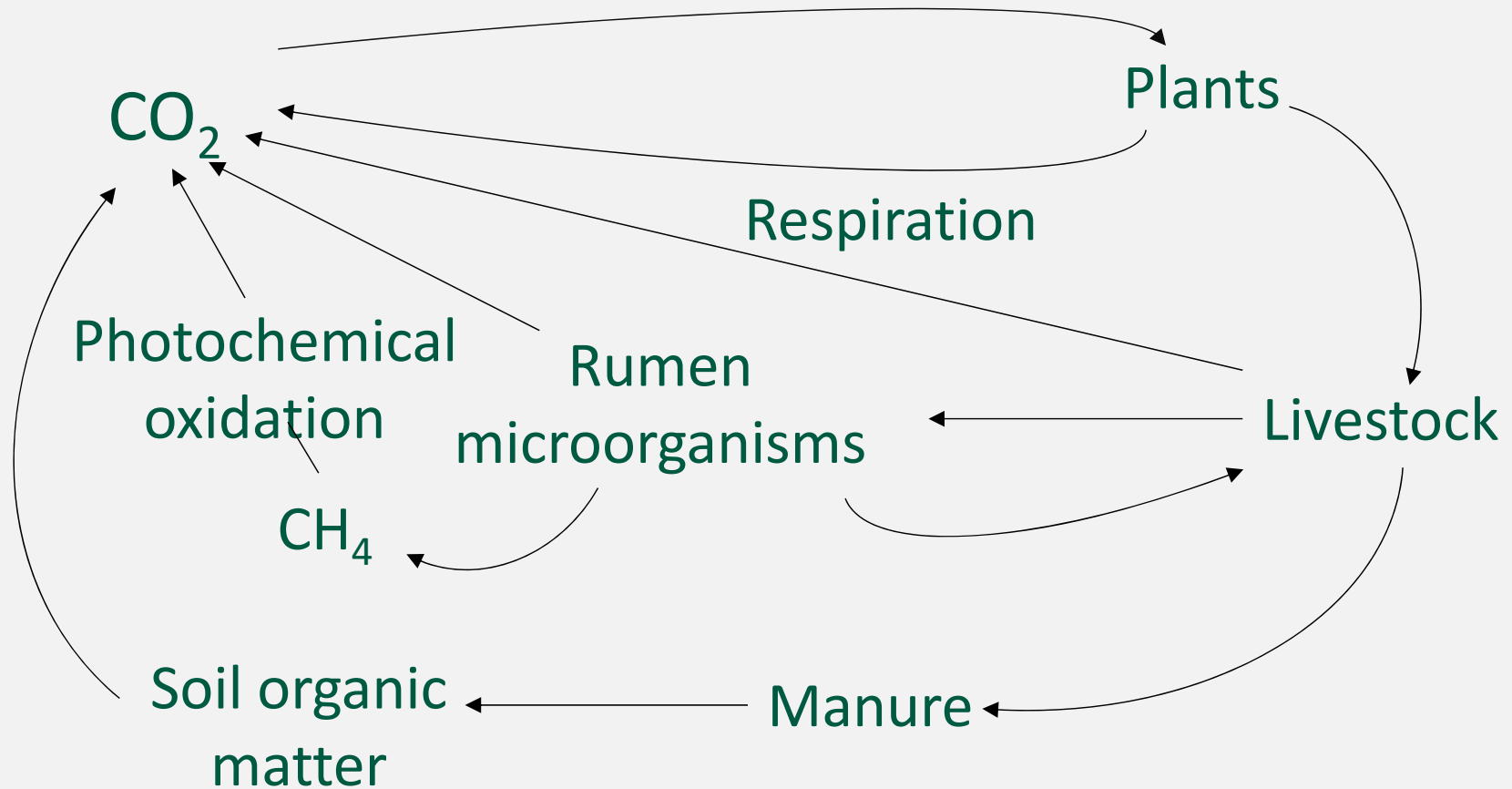


On perennial grasses, what percentage of leaf area can be removed without significantly affecting root growth?



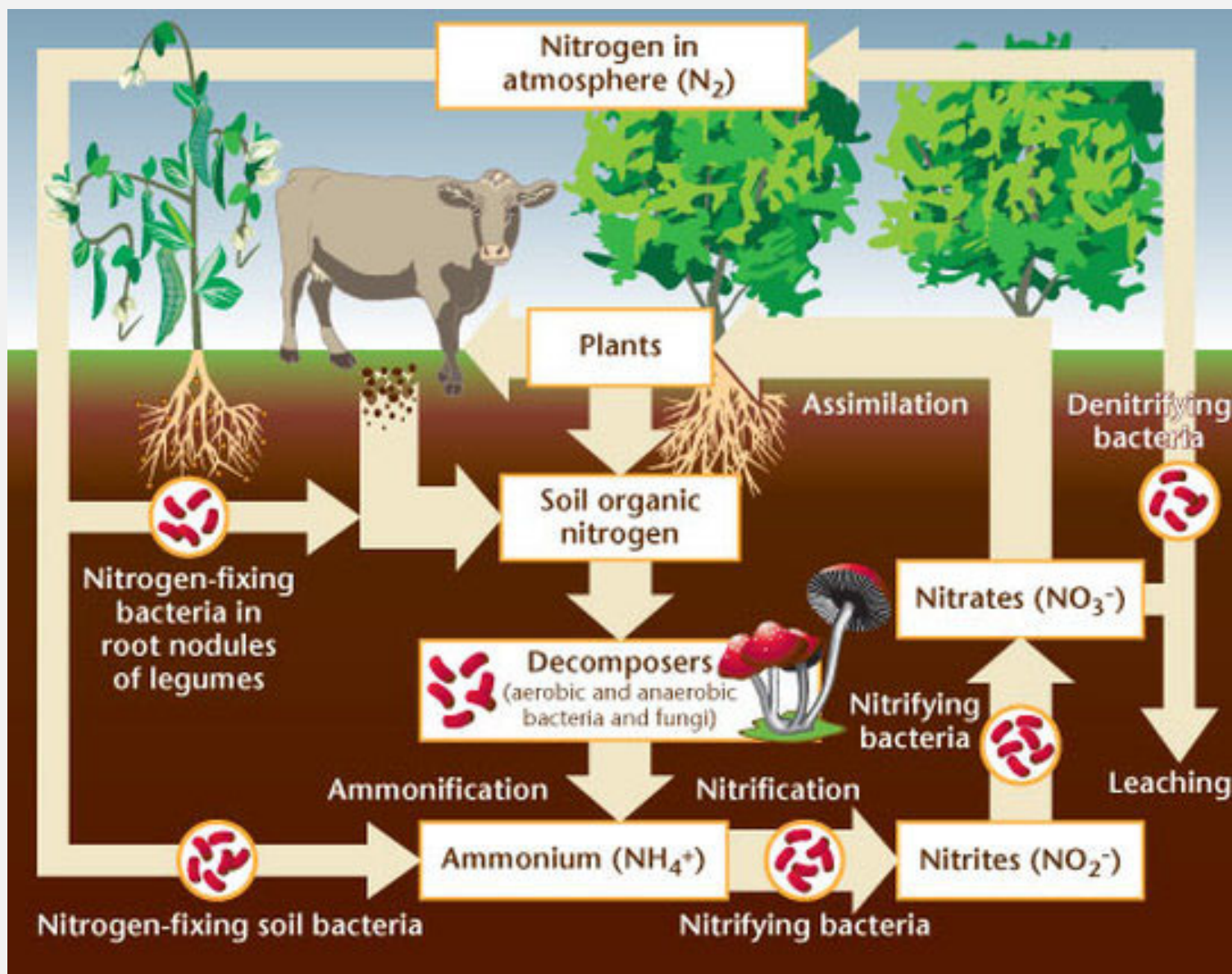


# Effect on Carbon Cycle with Livestock



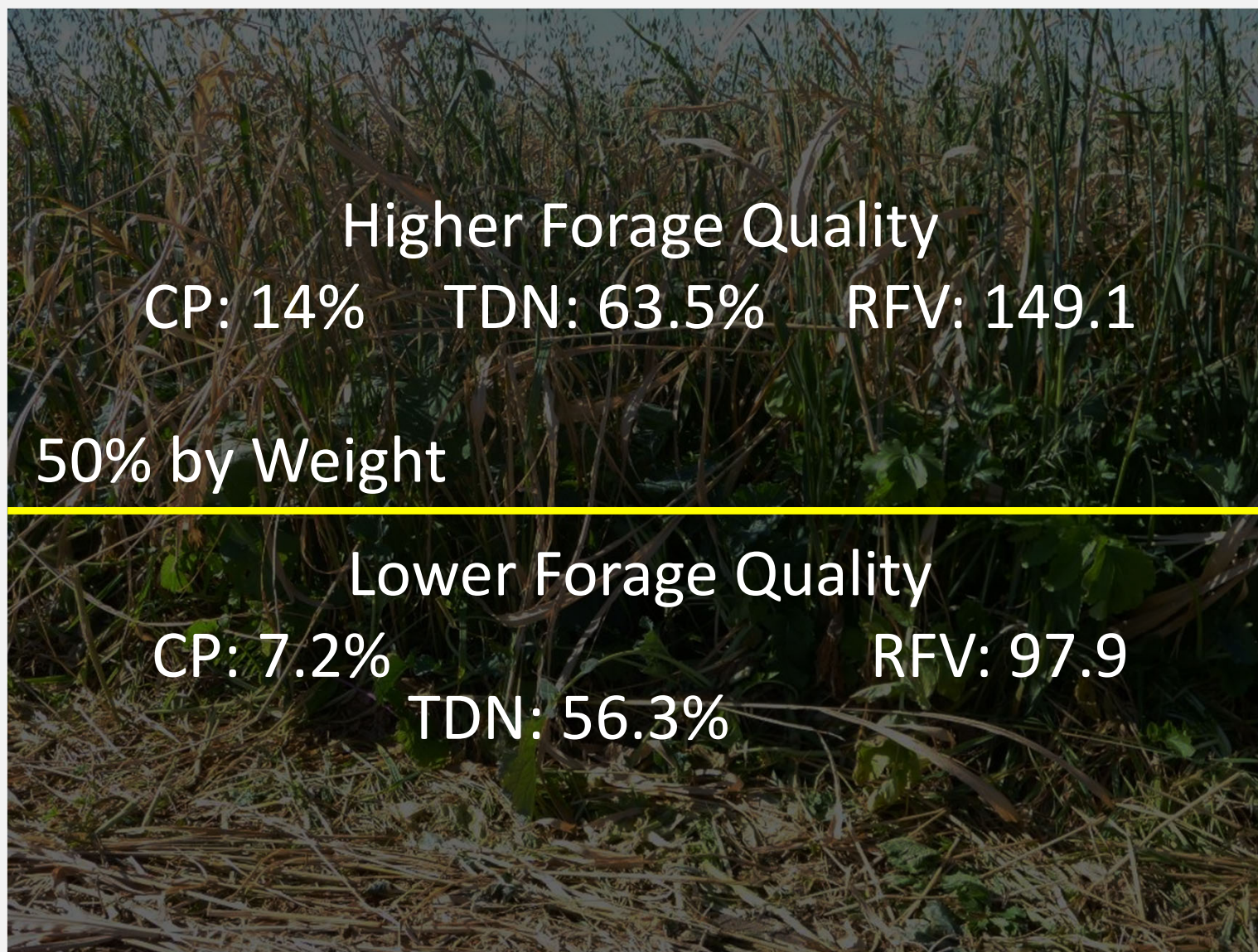


# Effect of Grazing on Nitrogen Cycle

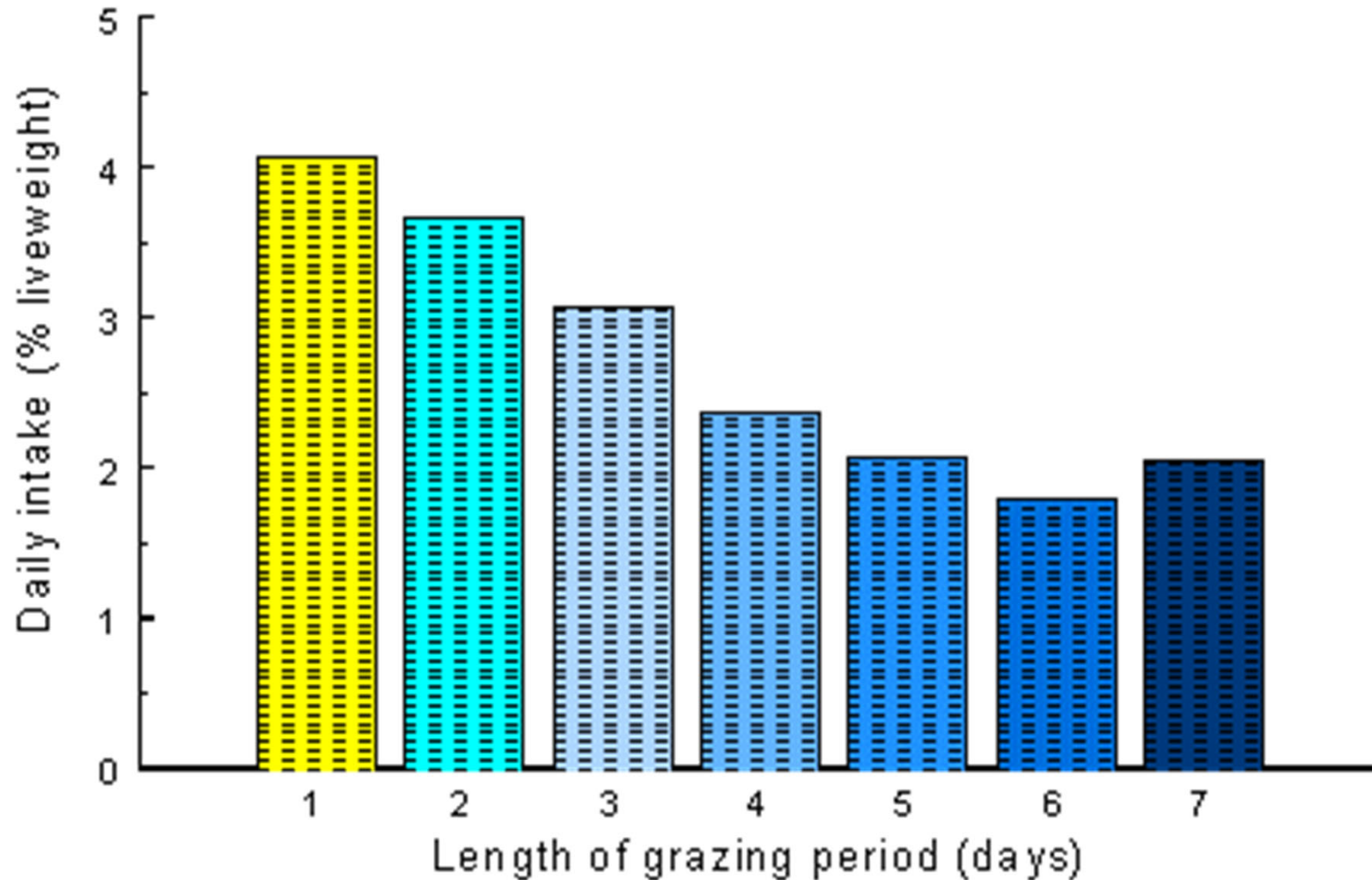




# Forage Quality Declines as Livestock Graze Closer to the Soil



# Effect of Graze Period on Animal Performance



University of Missouri Forage Systems Research Center



# Grazing System Objectives

- Grazing is a tool that can....
  - Improve the resource
  - Degrade the resource
- Grazing System Objective:
  - Provide adequate nutrition
  - Protect and feed soil: feed above/below-ground herd
  - Work within manager's labor; social constraints
- Fast track to soil health → mimic nature as closely as possible



Echo-Y, Inc.

# Dimensions of Disturbance

- Timing
- Frequency
- Intensity
- Duration

Natural disturbance patterns that generally lead to improved soil health:

- Variable timing
- Low frequency
- High intensity
- Variable duration (condition dependent)



# Knowledge Check

Where is the highest quality forage on a plant?

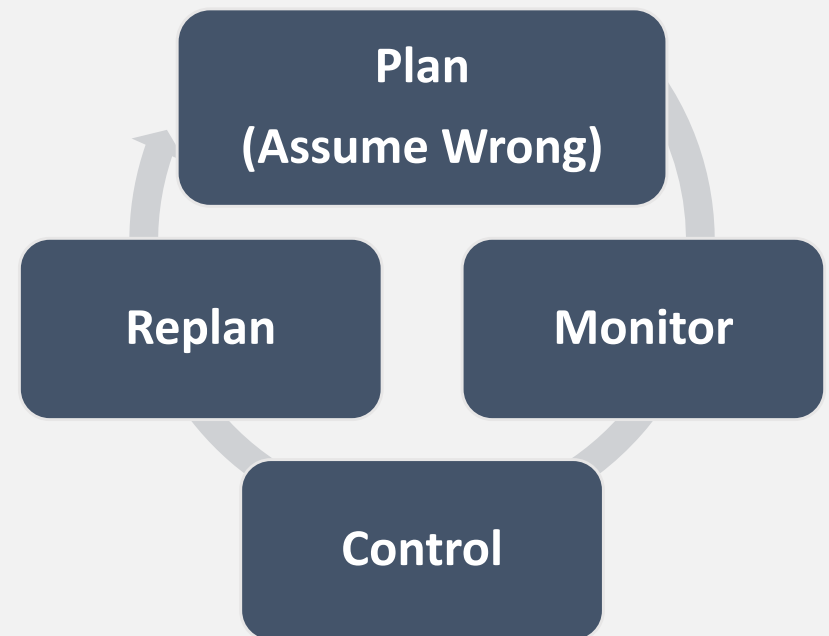
- a) lower leaves
- b) middle leaves
- c) upper leaves
- d) forage quality is the same throughout



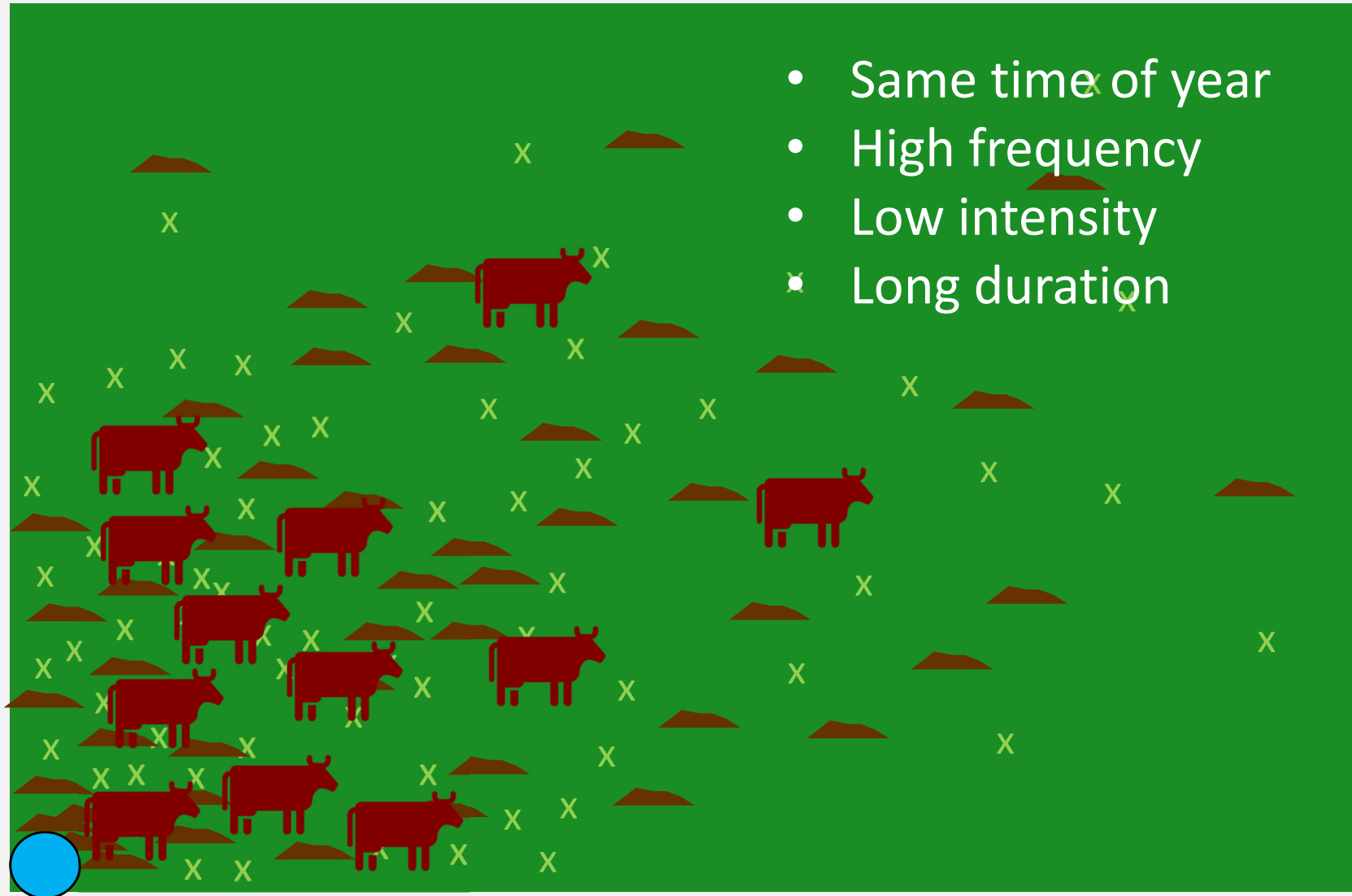
# Adaptive Grazing Management

- Uses feedback from system to adapt management to fit ecosystem
- Flexible
- Not a specific grazing system
- Realizes benefits of hands-on management:
  - Livestock comfortable with humans (better herd health)
  - Power of observation – see changes as they happen
  - Minimizes risk associated with unforeseen changes

## Feedback Loop



# Continuous Grazing



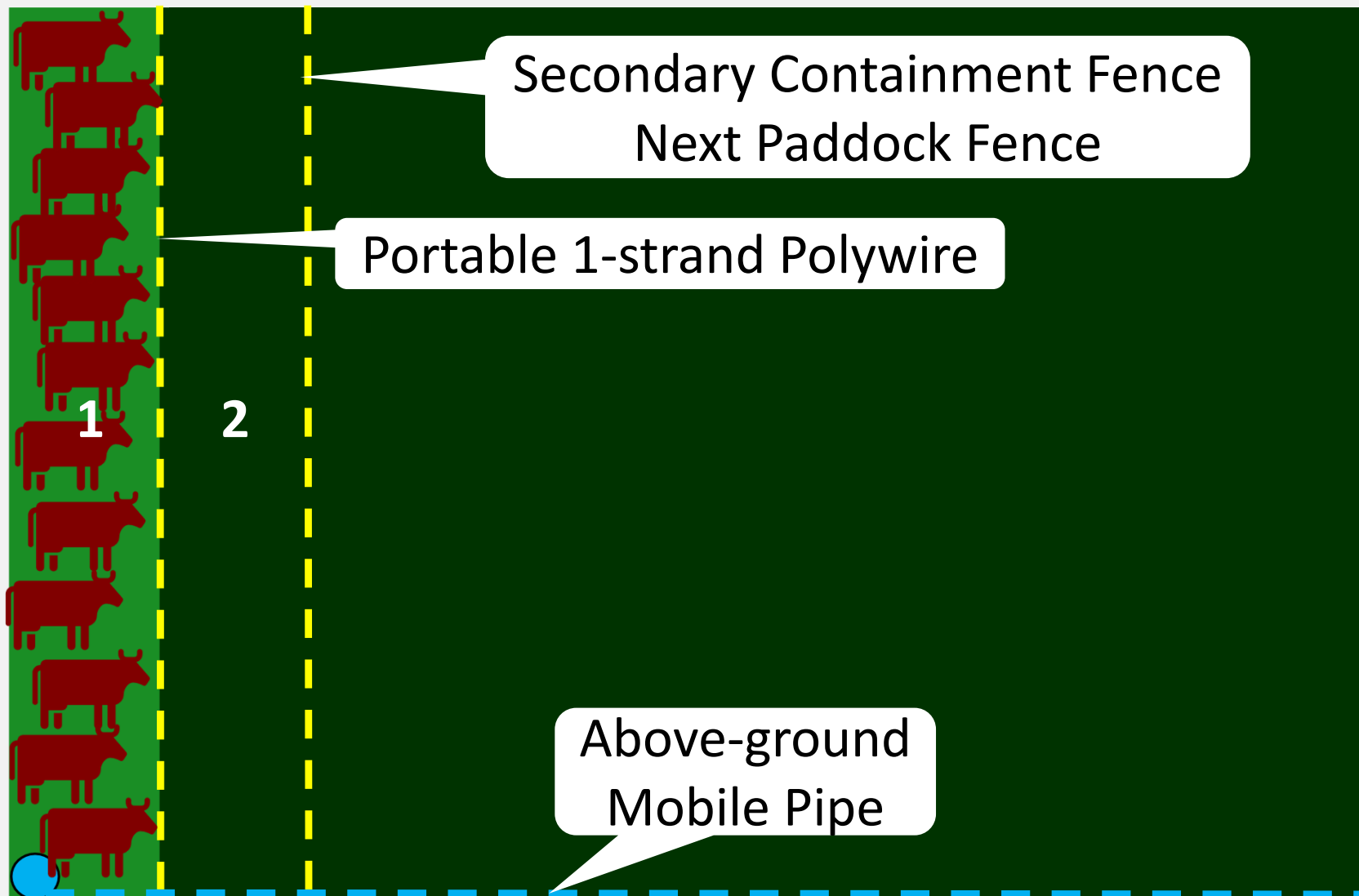
- Same time of year
- High frequency
- Low intensity
- Long duration

Justin Morris, USDA-NRCS

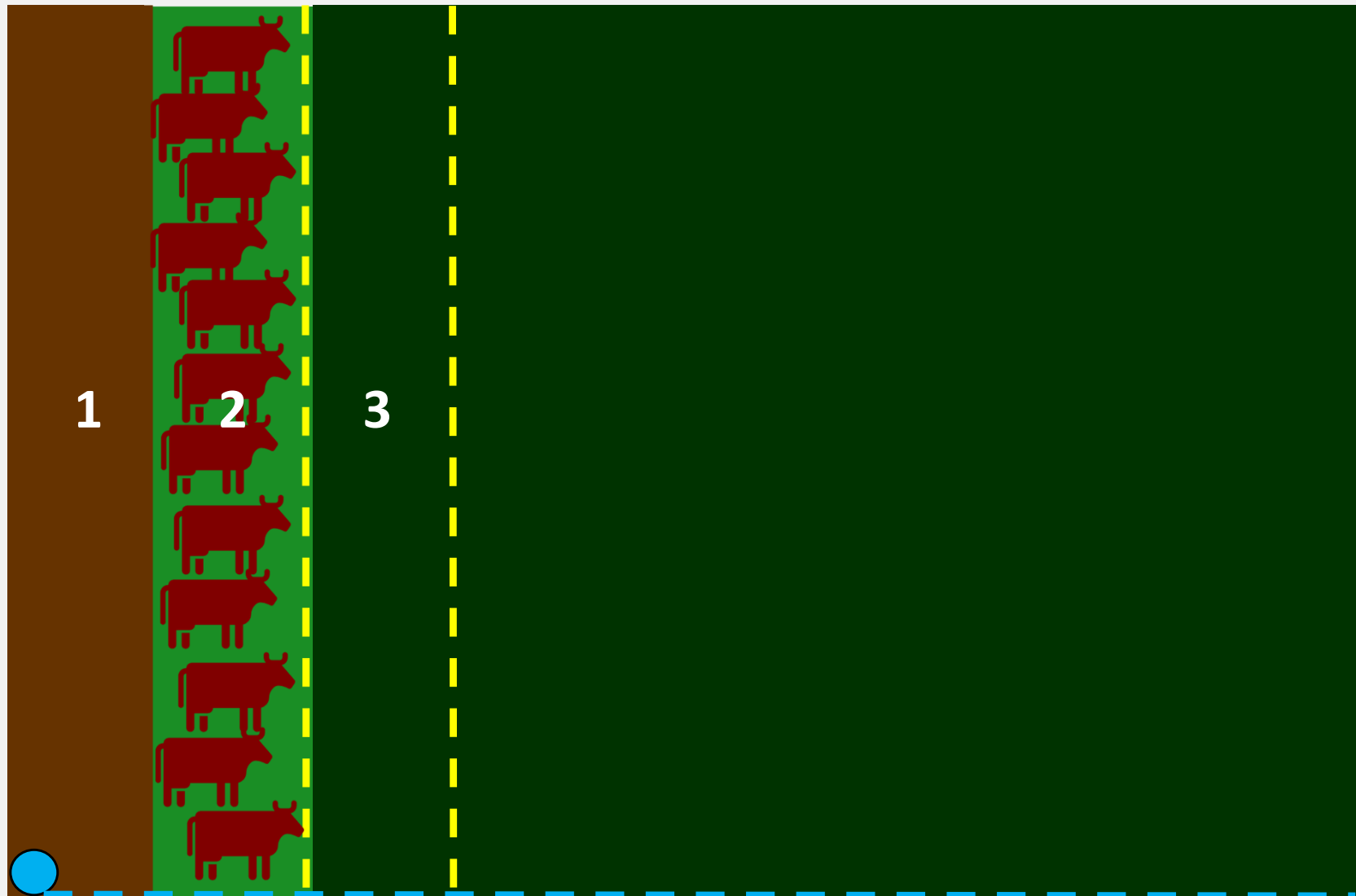


# Grazing Management for Soil Health

## Effective method for grazing cover crops

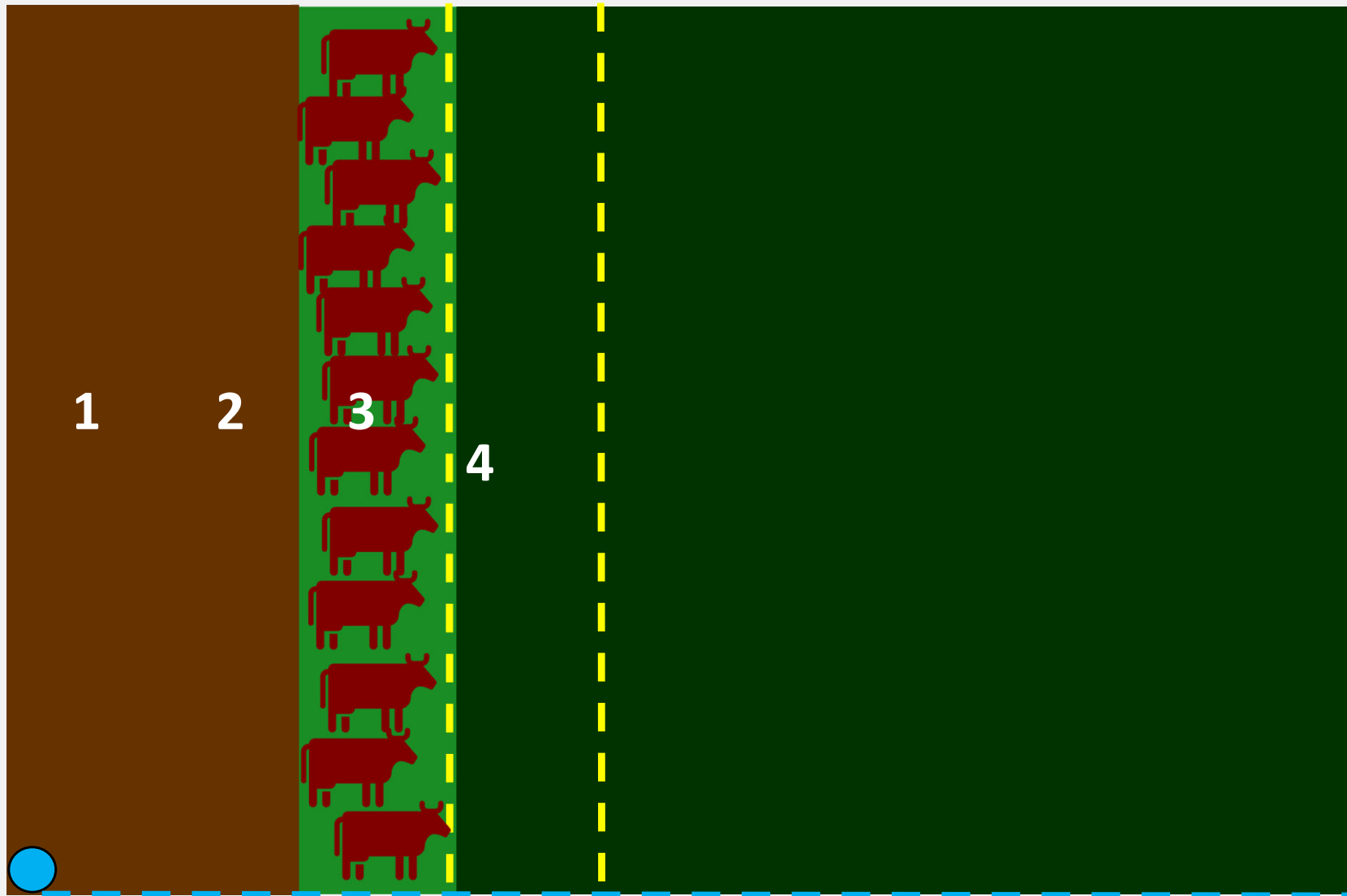


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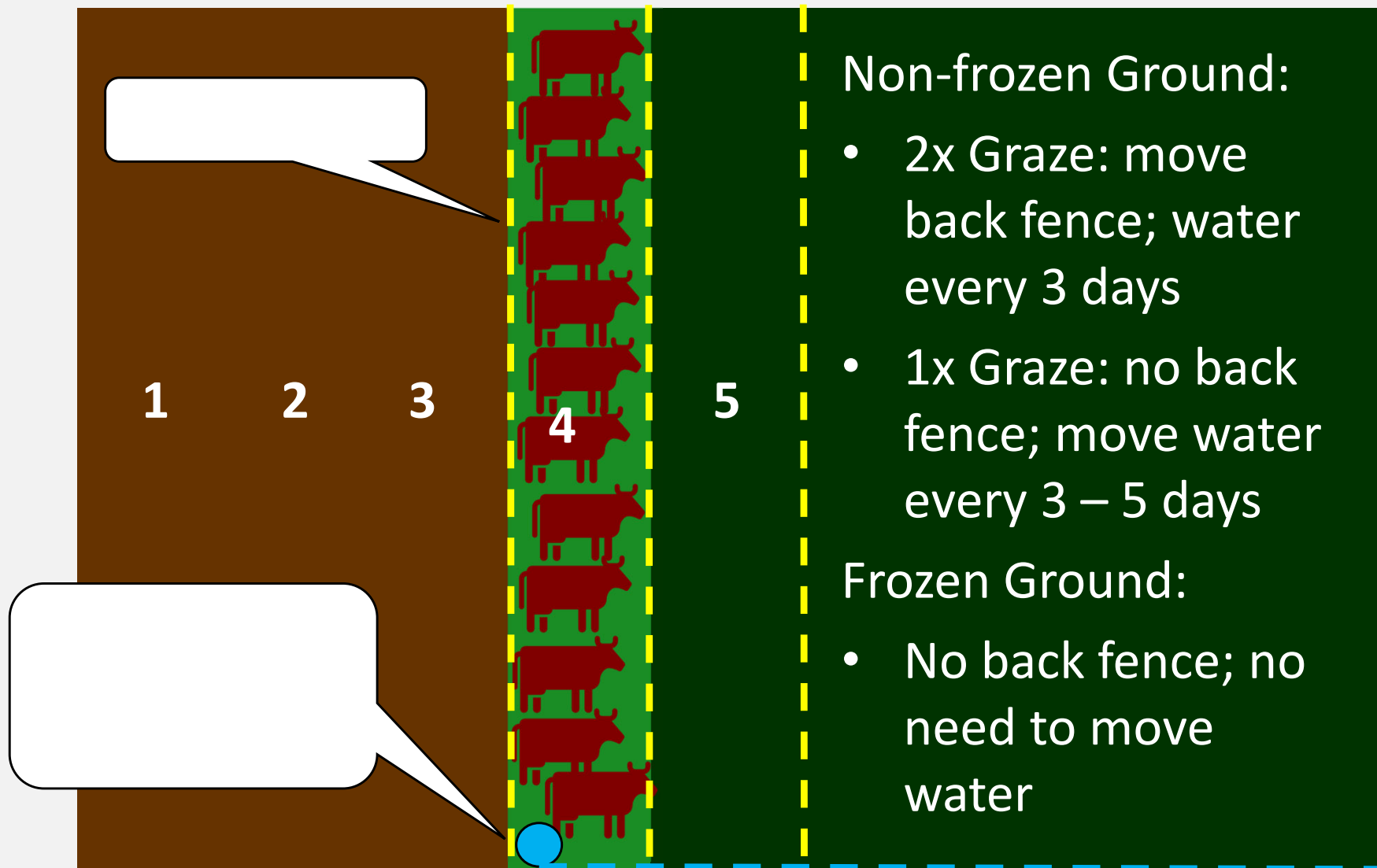




# Grazing Management for Soil Health



# Grazing Management for Soil Health





# Haying

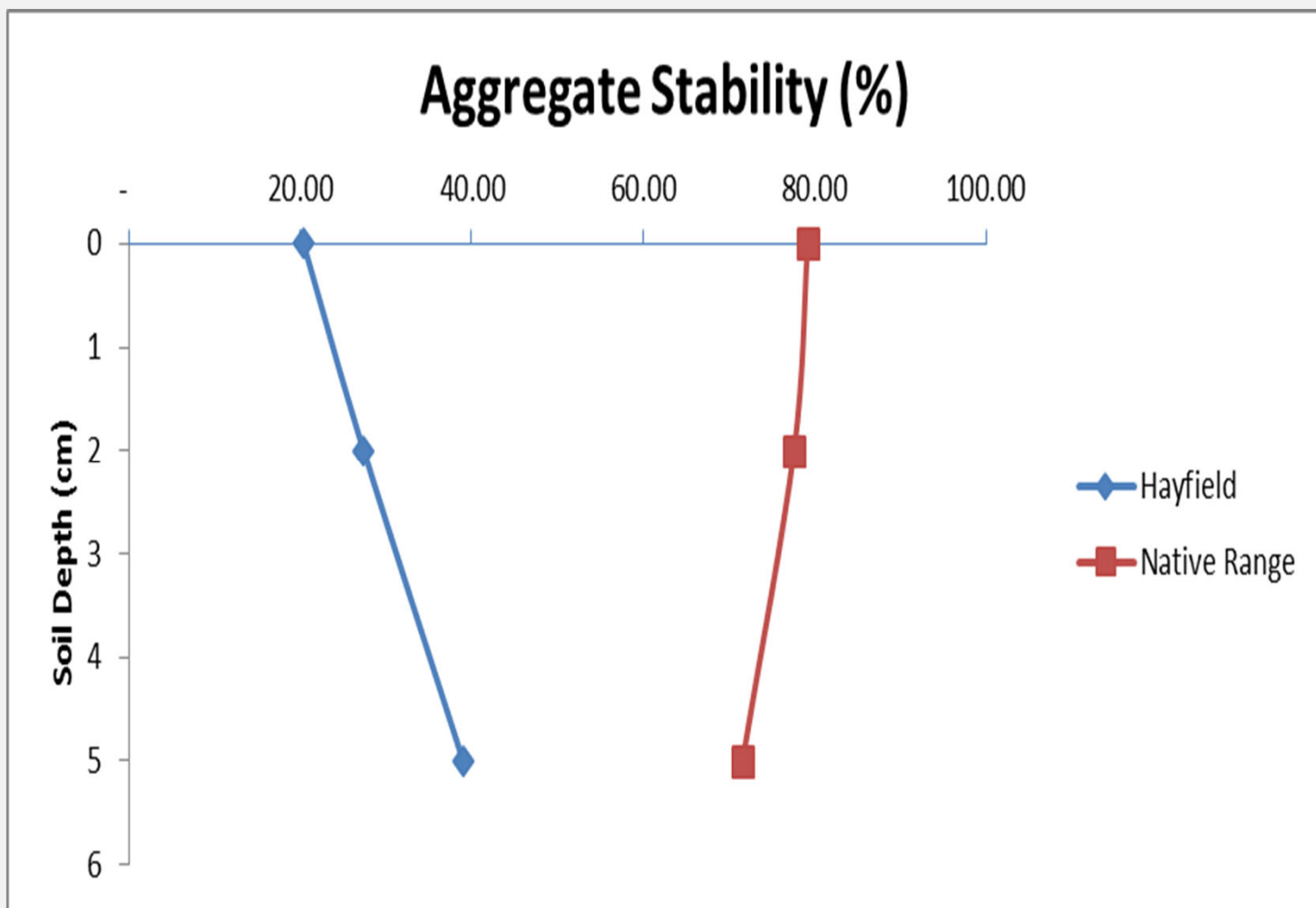
Another disturbance that can result in poor soil health



Midwest Machinery Company

# Effect of Haying on Aggregate Stability

## Mellette County, SD



Rotational  
Grazing

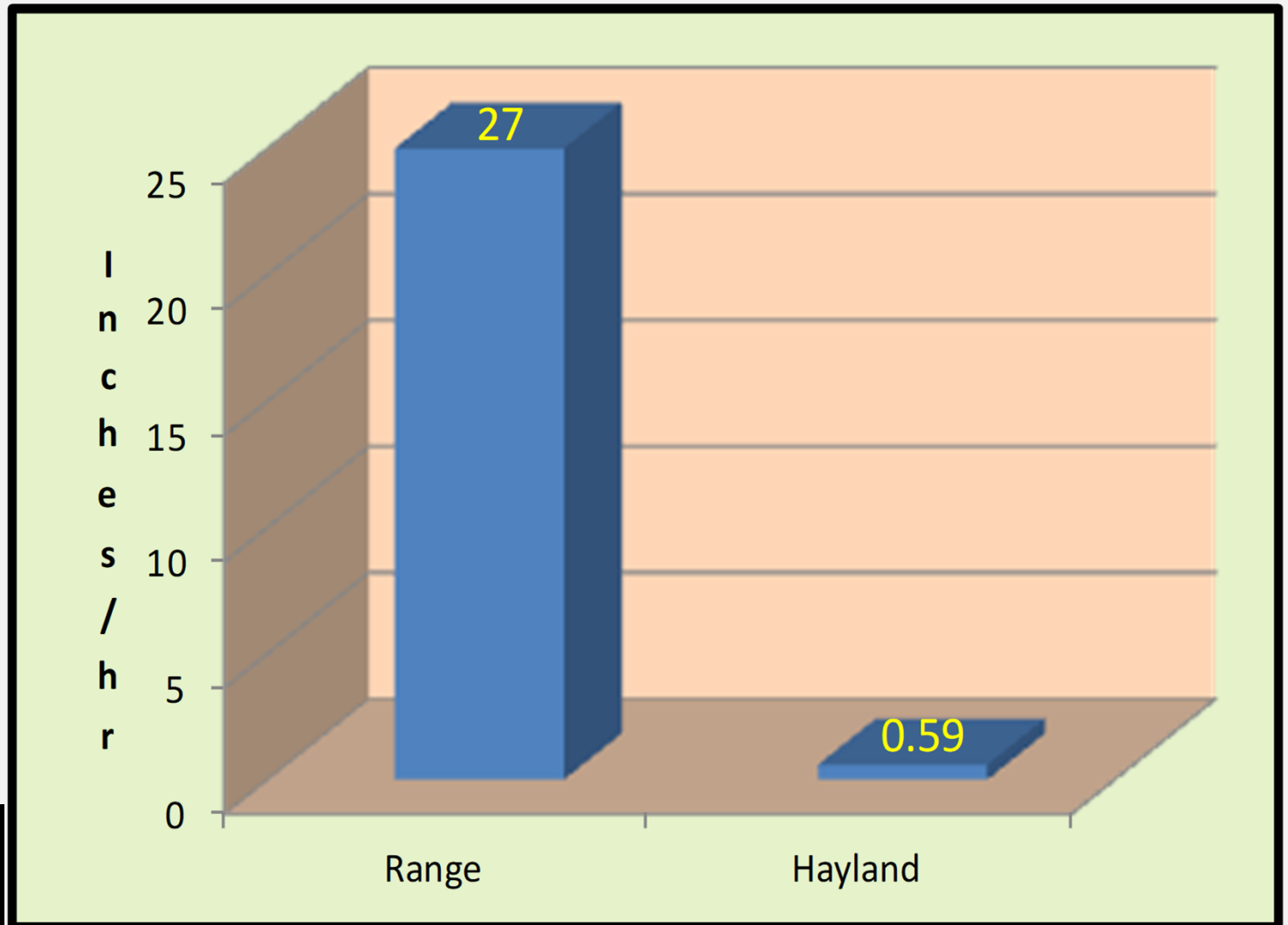
Hayland



# Effect of Continuous Haying on Water Infiltration Rate Mellette County, SD



Rotational Grazing Hayland





# Other Soil Health Improvement Strategies

## Bale Grazing



Saskatchewan Agriculture



Saskatchewan Agriculture

# Grazing Management Strategies for Soil Health

- Sufficient quantity and quality of forage
- Plan and control grazing timing, frequency and intensity, and duration:
  - Reduce selectivity – decrease impact on desirable plants, ensure proper forage use levels
  - Adequate recovery period for plant health
  - Change season of use from year to year
- It takes leaves to make leaves

# More to Ruminant On

How does continuous haying affect soil health?



- Reduction in aggregate stability
- Reduction in soil carbon

Midwest Machinery Company



# Cover Crop Selection

- Mixtures typically provide considerably higher production and quality versus single species plantings
- Grass dominated mixes are usually more desirable for grazing purposes
- Warm-season mixes: somewhat lower in protein, but higher yielding
- Cool-season mixes: higher in protein and lower yielding



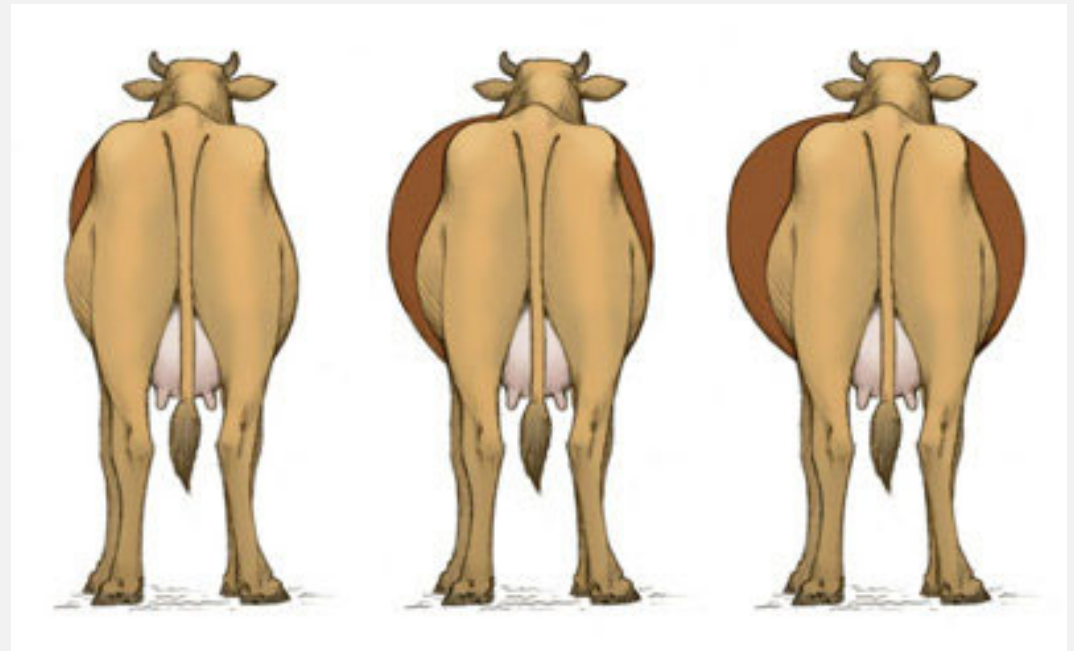
Cisco Farm Seed

# Herbicide Residual Considerations

# Follow the label

# Methods to Avoid issues with High Quality Forage

- Do not introduce hungry animals into a field
- Introduce animals slowly or restrict access over 7 – 10 day period
- Provide dry matter (hay, millet hulls, dry pasture, or crop stalks) when grazing high quality cover crops



Tractor Supply Co.




# Grazing in the 21<sup>st</sup> century will require us to.....

- Optimize disturbance
- Optimize soil cover
- Maximize biodiversity
- Maximize living roots



Carolyn Wong, USDA-NRCS





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