Adaptive Grazing – Module 3

How do we implement adaptive grazing?

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Objective: Students will develop an understanding of how to implement adaptive grazing management.

Adaptive grazing:

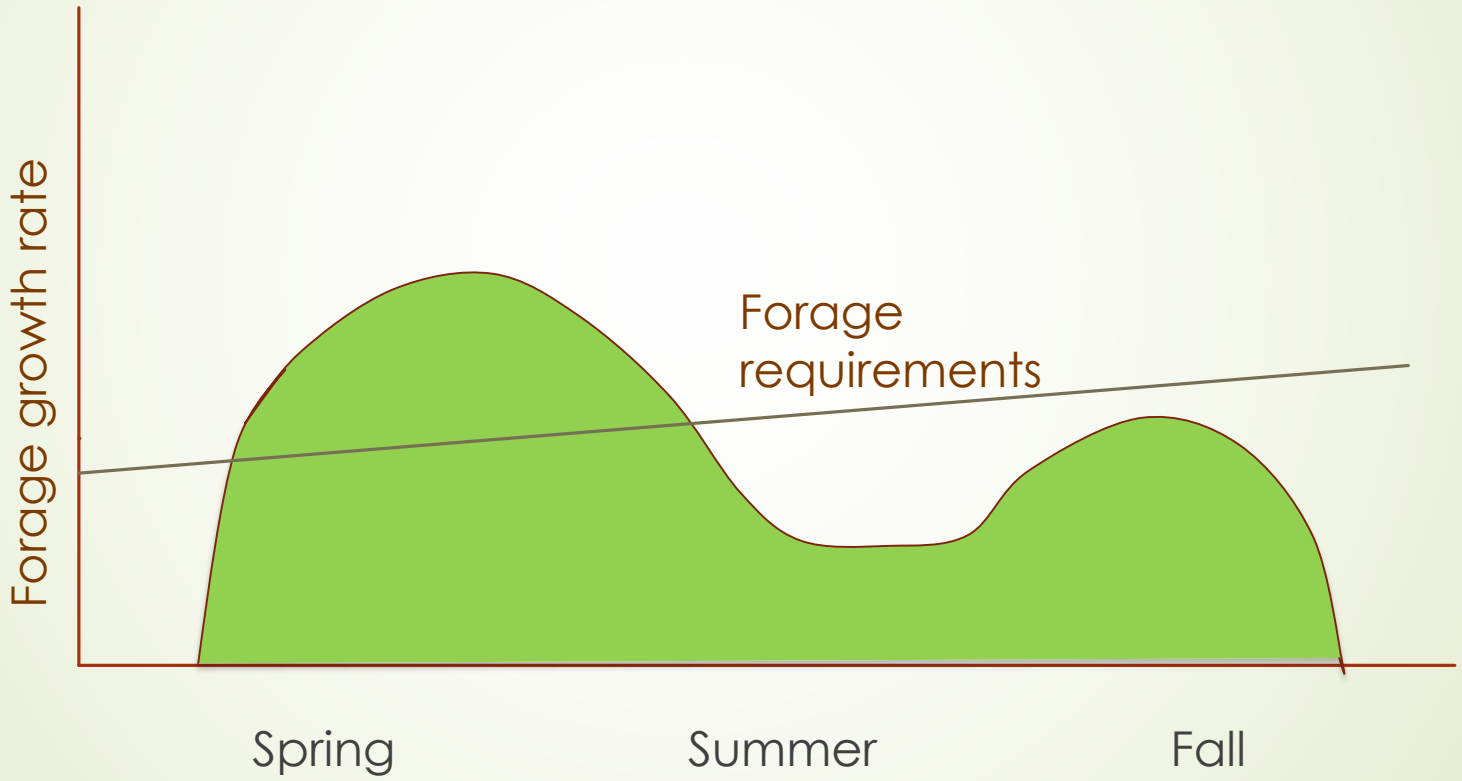
- **Not** a ridged, fixed or routine system (e.g. "rotational grazing")
- There is a plan, but **not** a prescription.
- Adjustments based on manager **observations** to changing conditions
- **Multiple goals** may be addressed at the same time on the same paddock.
- Manager implements based on an understanding of ecological principles, how animals graze and how plants respond.

Simulate Nature

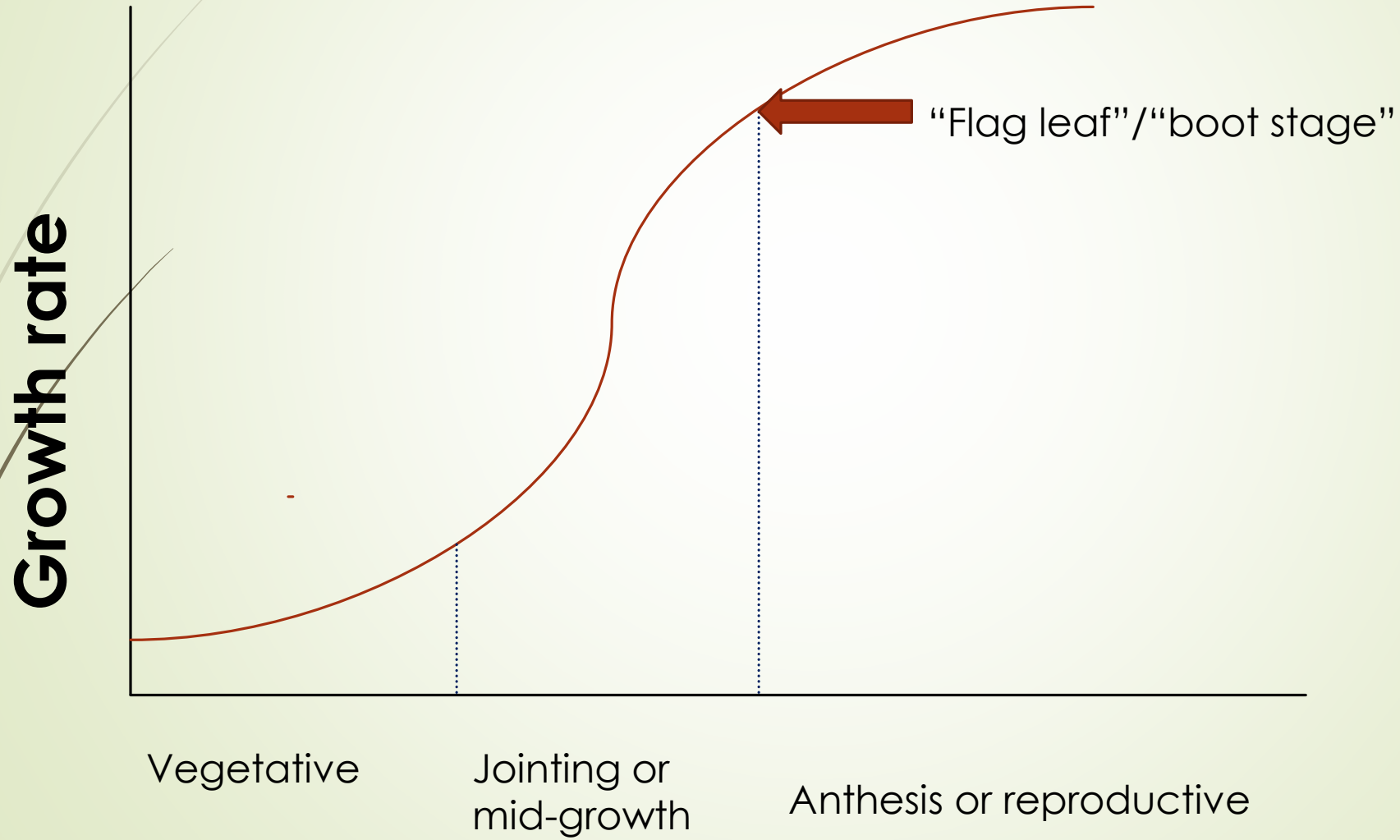
Grazing Management

- We control:
  - **Timing** = When during the year
  - **Frequency** = Rest period length
  - **Duration** = Time on a specific site
  - **Intensity** = Stocking density (#'s/acre)

Cool season pasture forage production

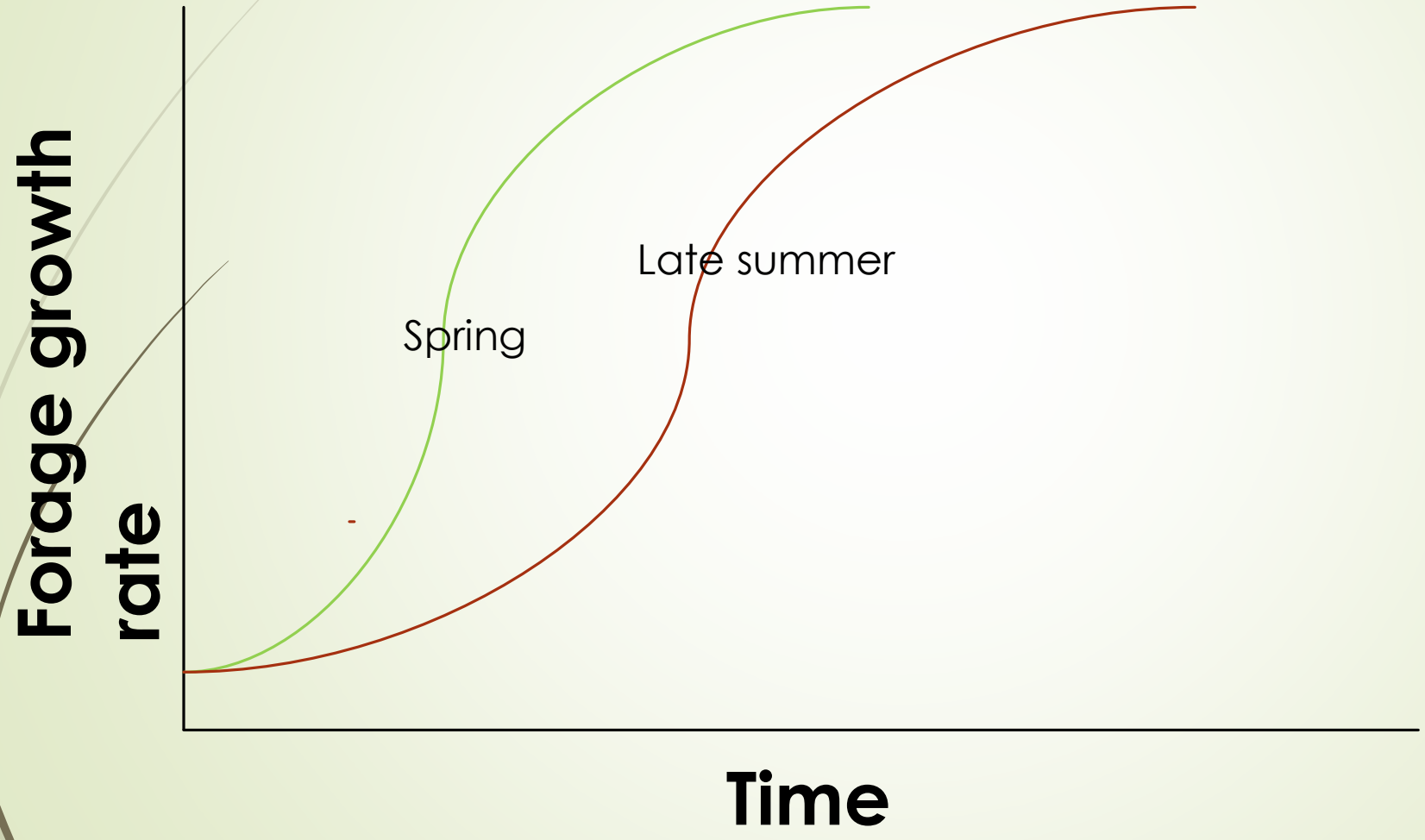


Stages of grass growth



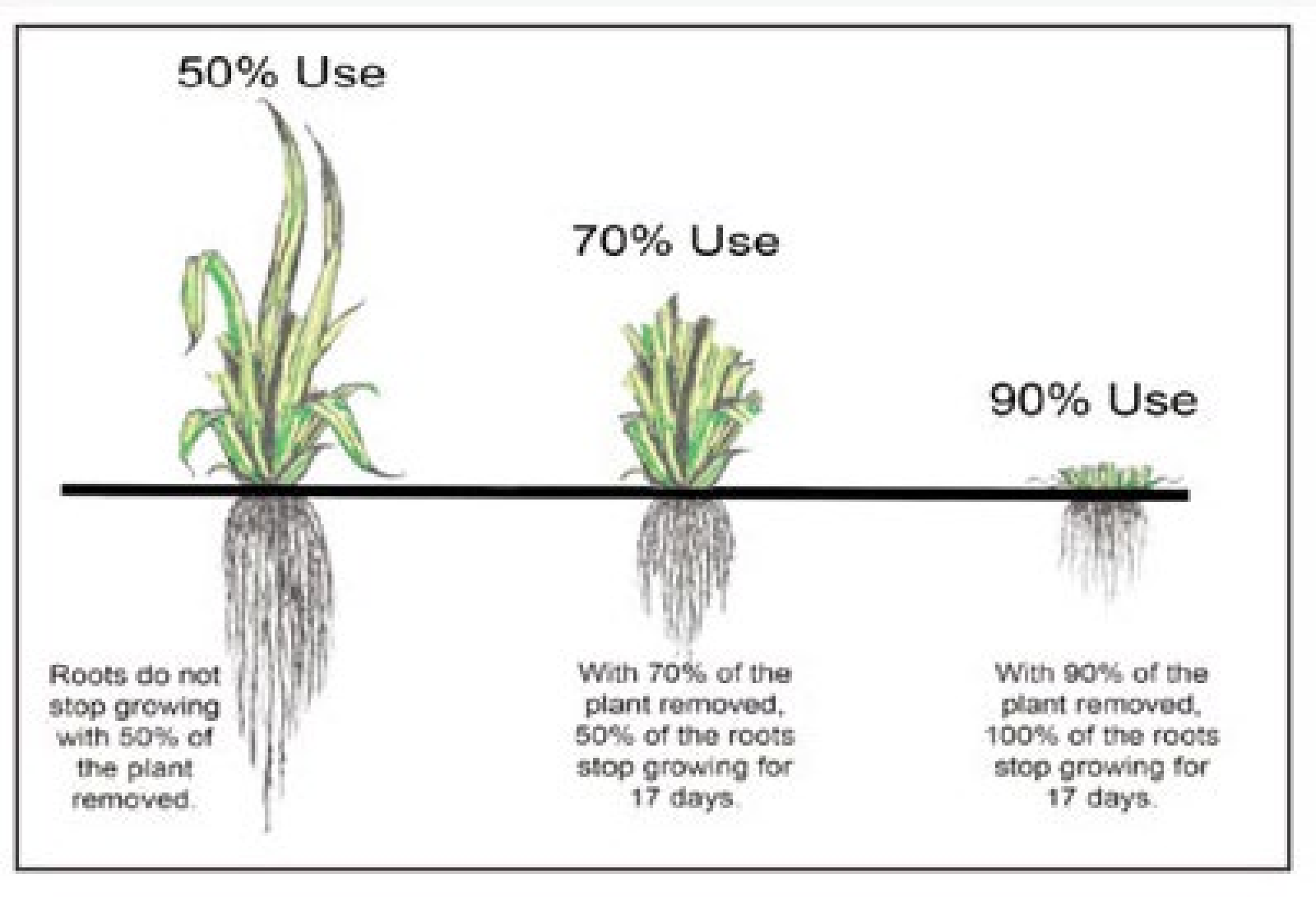
Optimal spring graze window

Cool season grass recovery curves



High stock density to “feed” soil biology

Protect the roots



Courtesy: On Pasture

Soil surface temperatures

Air temperature = 89° F

117° F

75° F

80° F

118° F

Photos: Understanding Ag, L.L.C.

Influence of Soil Temperature

70° F	100% Soil moisture used for plant growth and to support soil microbes.
100° F	85% Soil moisture lost. 15% available for growth.
115° F	Microbes breakdown
140° F	Microbes die

Goal:
Leave leaves!

Leave leaves and provide adequate recovery

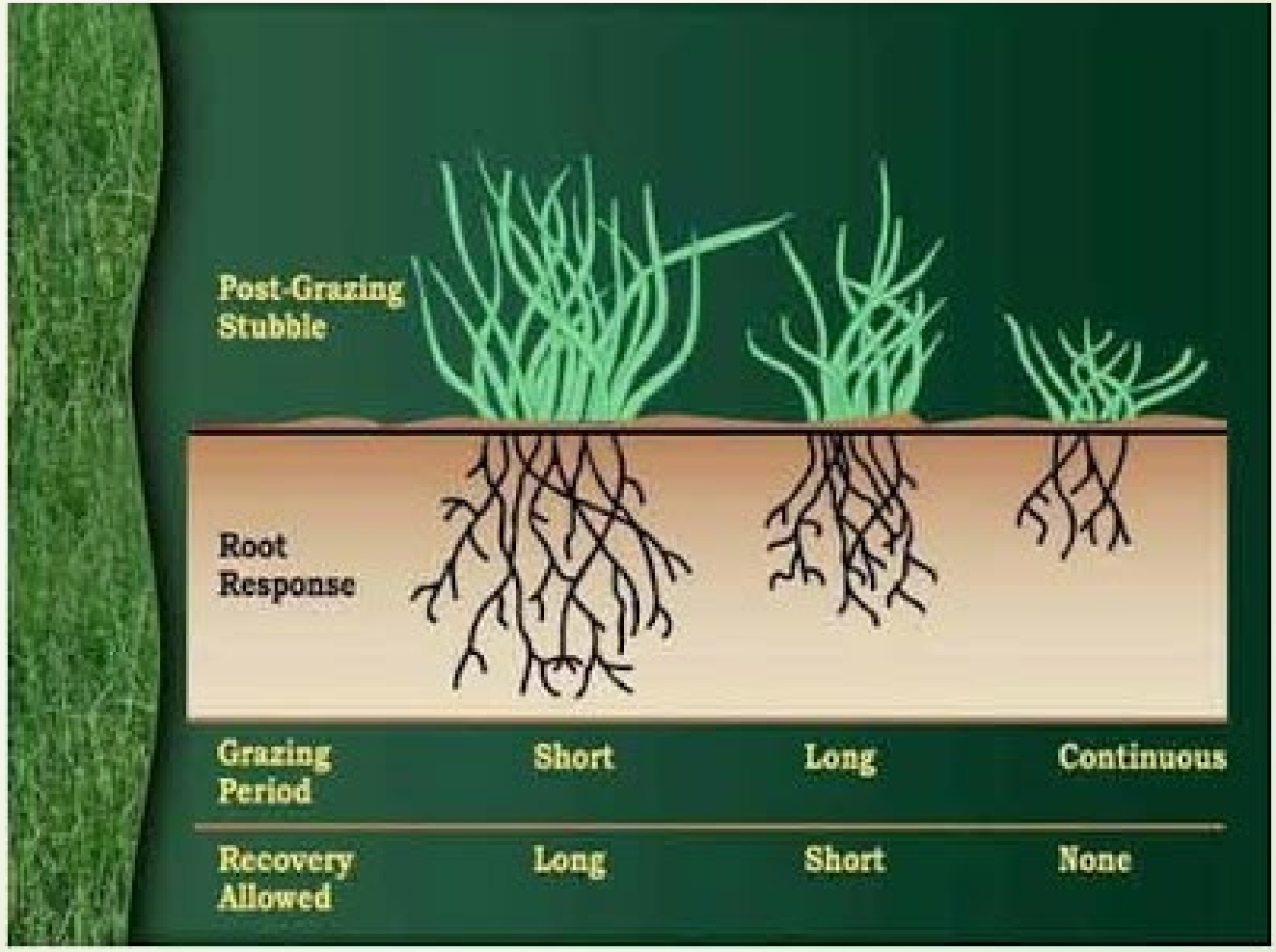


Image: Kansas State University

When has the plant recovered?

Late summer recovered pasture

Past management focus

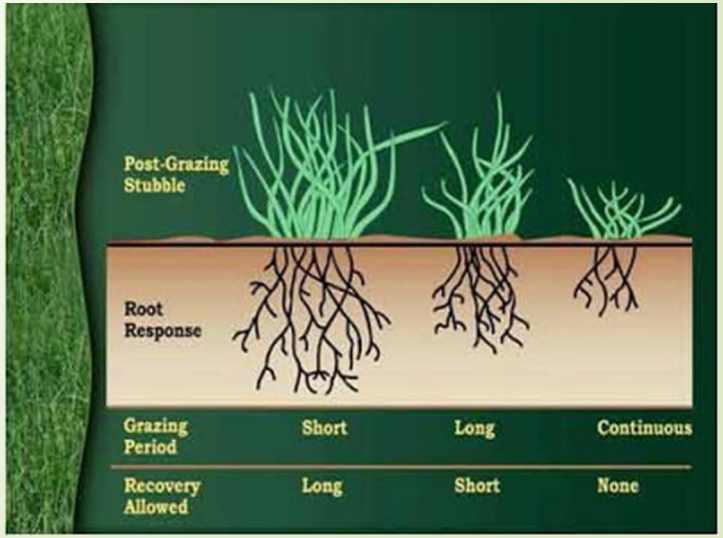
- Past grazing management focused on preventing cool season grasses from going reproductive. In an effort to do this, managers worked hard to keep grasses in the vegetative stage. This often resulted in forages with excessive protein levels. High energy supplements were required to maintain the health of the herd or flock.
- When we have a high degree of plant diversity in our pastures, target grazing dominant grasses at the boot or flag leaf stage, and not forcing animals to take more than 50% of the stand better things happen for our animals, soils, forages, and bottom line.

Protect early season growth

- Temptation to get animals on pasture as soon as possible in spring.
- Grazing too early can hinder late summer and fall forage production, shortening the grazing season.
- Initiating grazing when the dominant grasses reach the 2-3 leaf stage or are at least 10 -12" tall provides a longer grazing season into the fall baring a serious summer drought.
- If concerned about the development of seed heads, increase stock density on those paddocks as seed heads begin to form to facilitate trample.

Overgrazing

- A function of time, not the number of animals.
- Overgrazing = re-grazing a plant before it has had adequate time to recover from the original grazing event.
- Re-grazing stretches the plants energy reserves, sets the root system back and reduces it's photosynthetic potential stressing and possible killing the plant.
- Short duration grazing events minimize overgrazing.



Day	DMI
1	5 – 6%
2	3 - 4
3	2.5 - 3
4	< 2

Ruminant livestock need between 2.5 – 3.5% of their body weight in dry matter intake (DMI) daily.

The Grazing Plan

- Focus on doing the best job on the best sites first.
  - Helping the best sites do better can have a ripple effect out to other portions of the pasture.
- Begin grazing in a different paddock every year.
  - Many graziers start in the same paddock every year out of convenience.
- Pasture conditions determine when and where to move.
  - Its OK to skip a paddock that has not fully recovered.
- Base plans on averages, but have contingencies.
  - Drought, fire, flood, late or early freeze
- Prioritize other areas for more intensive management.
  - Brushy patch, thistle patch, thin soil/forage on hill top
- Fall is a great time to assess pastures and begin planning for the next season.
  - Walk pastures. Take notes and photos.

Contingency plan options

- Hope is not a plan.
- Adaptive grazing builds operational resiliency.
  - Always building a “stockpile”.
  - Protecting and building soil function.
    - Protect the roots
    - Keep the soil covered to preserve moisture and minimize temperature extremes.
    - Preserve the photosynthetic panels (leaves).

Managing for difficult weather

- Have “reserve” paddocks.
  - Rested for an entire year unless needed as a contingency.
  - Rotate where this is done from year to year.

Managing in difficult conditions

- Part-time grazing
  - Strategically feed supplement on a pre-determined site to build soil fertility and add carbon.
  - Think of hay or other stored feeds (e.g., silage, baleage) as management tools, not simply as “winter feed”.
  - Graze in the afternoon to maximize Brix potential
  - Heavily impacted feeding sites used during wet period may need renovation.
  - Areas targeted with intensive feeding during drought may only need an extended rest period once precipitation returns.

Managing in difficult conditions

- Utilize alternative feed and forage resources
  - Identify alternatives in your area before need arises.
    - Pasture not normally assessable or used as pasture, such as reed canary grass dominated low ground or a hay field harvested earlier.
    - Other feed supplements to stretch pasture and stored forages

Alternative feed sources

- Straw with molasses
- Sugar beet tailings
- Dry edible beet tailings
- Other commodity by-products
- Use with caution. Work with a livestock nutritionist to ensure a balanced ration.

Managing in difficult conditions

- Annual forages ("cover crops")
  - A portion of the farm or ranch seeded to annuals.
  - Works best if a regular part of the operation.
  - Generally 5-20% of the acreage each year.
  - Use diverse blends designed within the context of the field to be planted.
  - Timing of planting and precipitation will determine forage volume.

Managing in difficult conditions

- Depopulation
  - Have a pre-determined threshold based on feed and pasture inventory, and the cost/value of stored feeds. When should you begin to depopulate?
  - Consider opportunity costs. How many animals should you support during feed shortages? How many can you support until pastures recover?
  - If possible, work to retain examples of the best phenotypes to rebuild the herd or flock. How much feed/pasture will you need to do this? How much do you have?
  - In most years, early culling brings the best prices for animals sold.

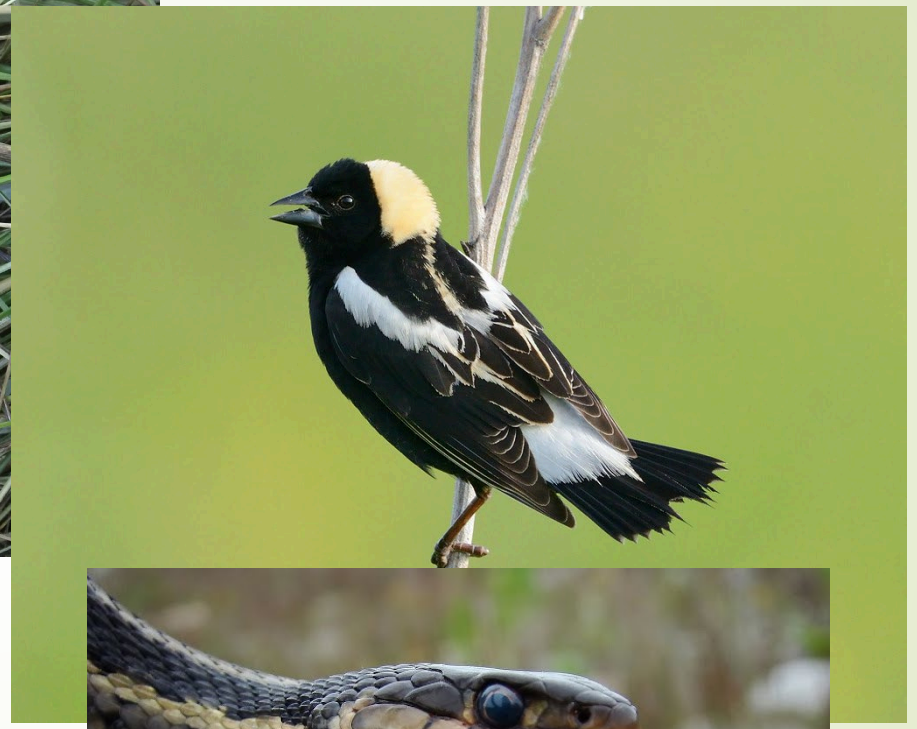
Observe, monitor, adjust

- Always ask:
  - Are we cycling carbon?
  - Are we capturing and storing precipitation?
- Requires the manager to get out of the pickup or off the ATV and look down, as well as around.
  - How much residue did we leave?
  - How much trample? Impact to target areas?
  - Did we meet our goals?
  - How is the forage recovery on previously grazed paddocks?
  - Is there any bare ground in the pasture? Where? How much? Why?

Observe, monitor, adjust

- Use your senses:
  - What do we ***see and hear***?
    - Plant species diversity
    - Insect populations/spider webs
    - Bird species using our pastures, especially grassland obligates such as bobolink, meadowlark, vesper sparrow, prairie grouse, upland sandpiper. Also bobwhite quail or ring-necked pheasants. Number of different species or individuals within species.
    - Reptiles and amphibians
    - Cow manure consistency
    - Dung beetle activity

Observation: Predators/bird life



Observation: Insect life

Observation: Manure check

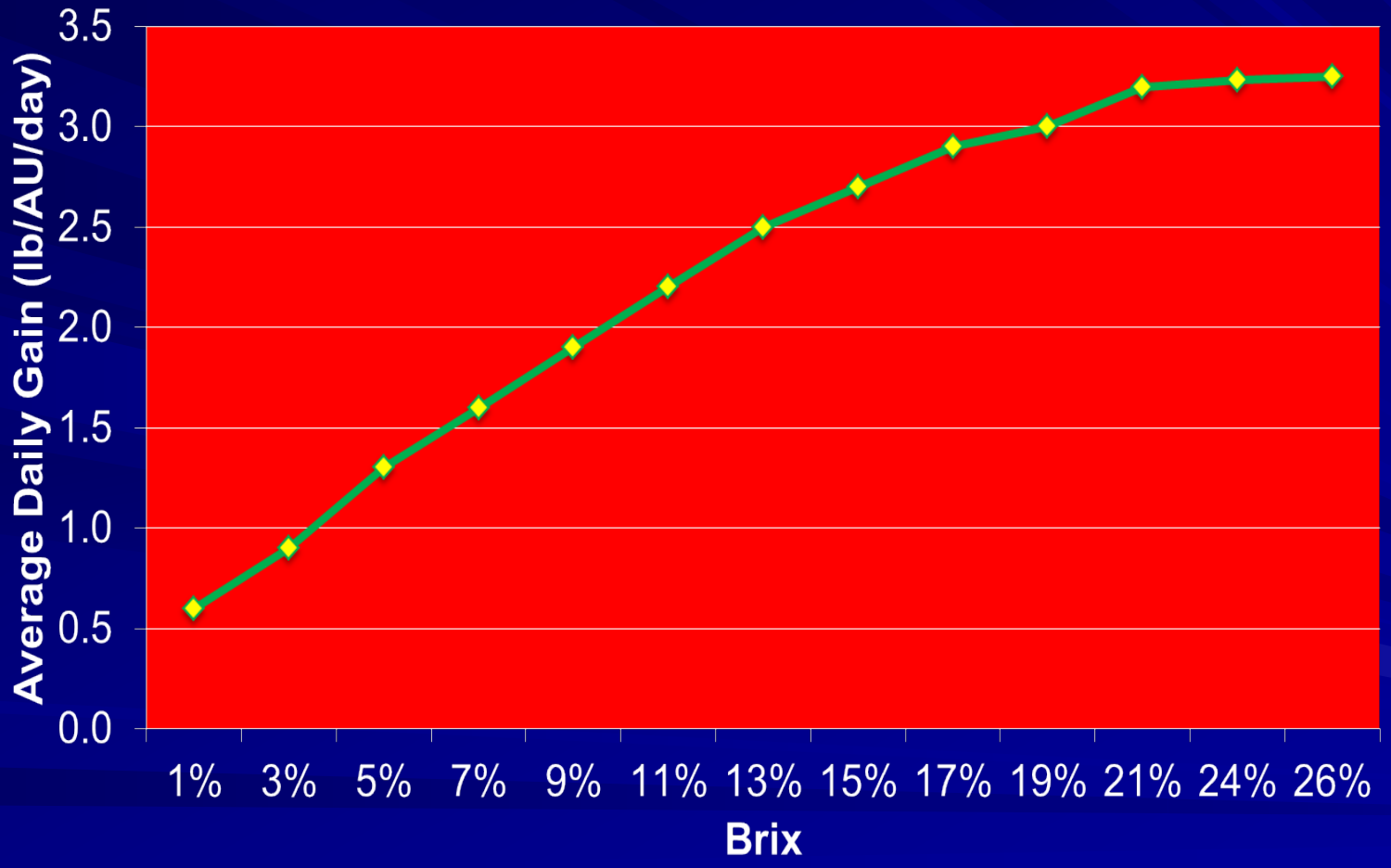
Rumen fill

Livestock contentment

Brix

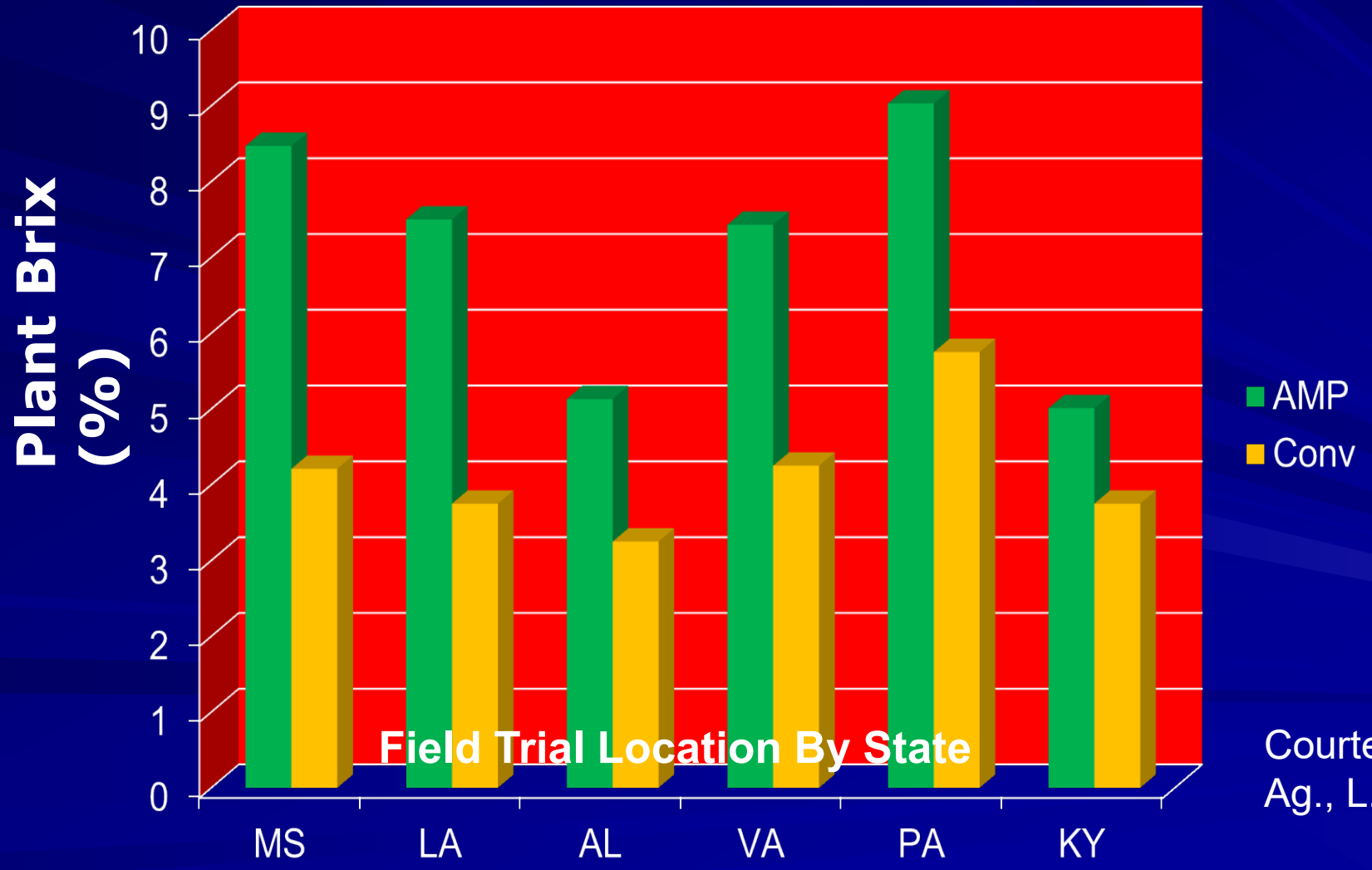
- A measure of soluble minerals in solution.
- Sugars are the dominant component.
- Measured with a refractometer from forage sap.

Impact of Brix on ADG



Courtesy: Understanding Ag L.L.C.

Single Season Forage Brix Impact: Adaptive Grazing Vs. Conventional Grazing



Courtesy: Understanding Ag., L.L.C.

The soil

- How does the ground feel when we walk on it?
  - Soft or hard? Why?
- What does the soil look like?
- What does the soil smell like?
  - Healthy soil will have a sweet earthy aroma.
  - Poor soil will have a sour, metallic or off order.
- Do we see insects active on the soil surface?
- Do we see earthworm castings on the soil surface?
- How many earthworms do we see in a shovel full of soil?

Watch the videos

- https://www.youtube.com/watch?v=2JZJB4zM3Y4
- https://www.youtube.com/watch?v=81Wxz36SnMc

Ring infiltrometer.

- Use once or twice each year to assess management.
- Compare fields/pastures under different management.

NRCS Pasture Condition Scoring Tool

- https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/pasture/?cid=STELPRDB1045215

Soil sampling

- Soil sampling is another monitoring tool.
- Standard soil tests measure inorganic plant available nutrients, pH and soil organic matter.
- A Total Nutrient Digestion (TND) measures the total amount of nutrients that exist in the soil sample.
- The Haney test, coupled with a Phospholipid Fatty Acid (PLFA) analysis provides a window into the biological component of the soil.
  - Soil biology is what makes nutrients plant available.

Dairy assessment tools

- Daily bulk tank reading
- Milk components
  - Butter fat
  - Protein
  - Milk Urea Nitrogen (M.U.N.) level

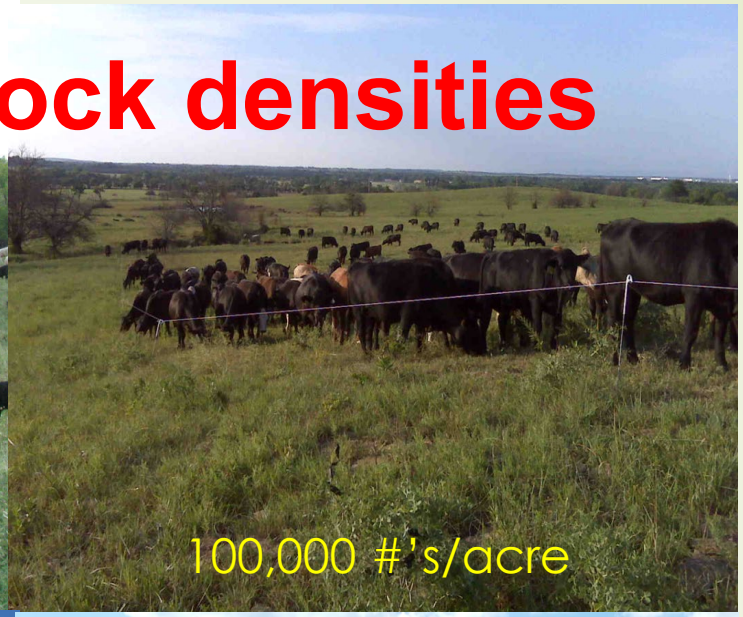
Other observations: Beef

- Average daily gain (ADG)
  - Some grass finishers will weigh animals every few weeks throughout the season.
  - Cow/calf producers will have calf weights and weaned weights coupled with number of days on pasture which ADG can be determined and compared from year to year.
- Visual assessment of degree of finish.
  - Visual cues off grass finishing animals, such as brisket fill and fat deposition at the base of the tail. Note that cattle phenotype and genetics also play a role in the rate and degree of finish.

Record keeping

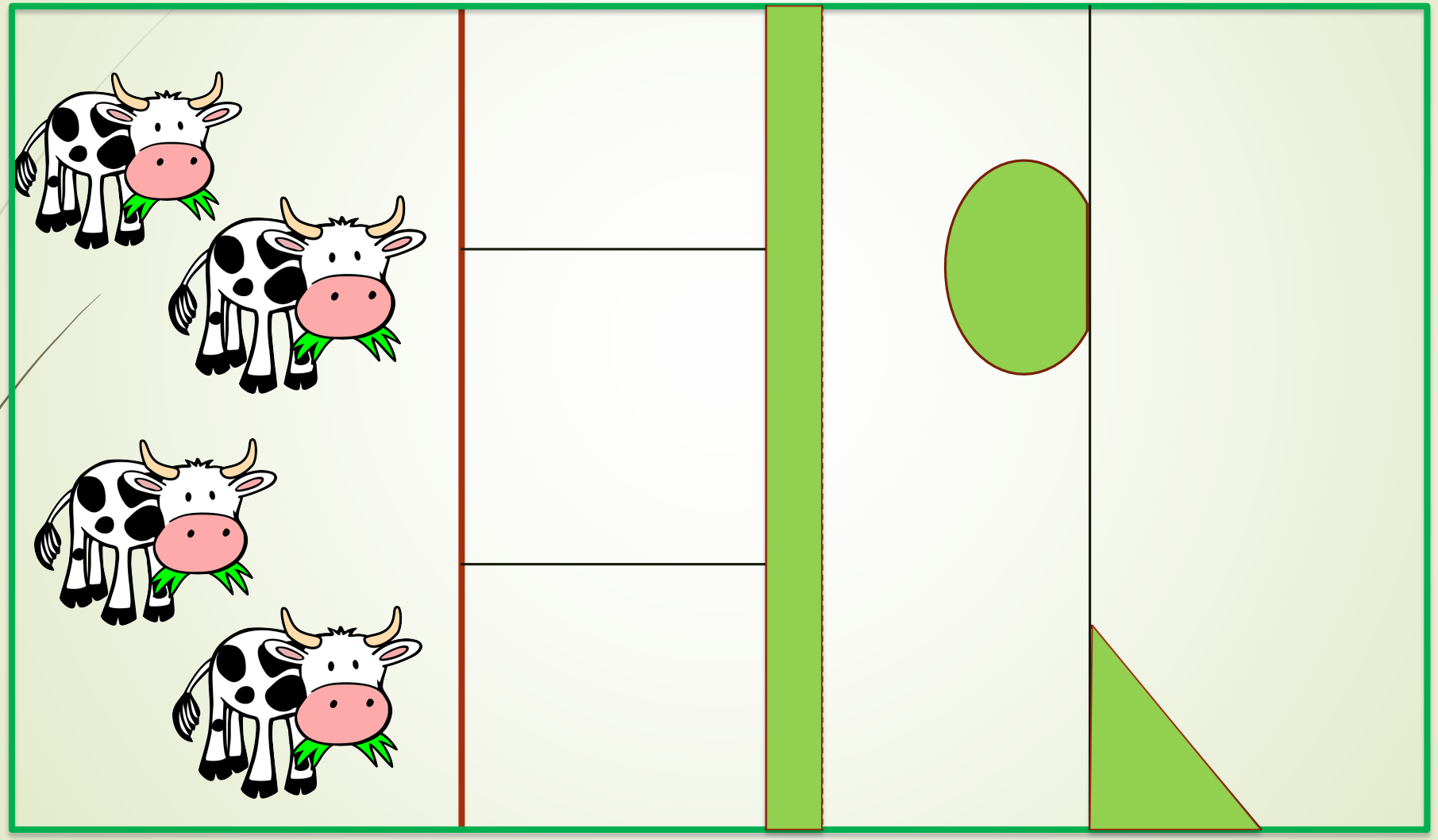
- Maps, notebooks, charts
- Date in, date out
- Stock densities in individual paddocks
- Class of animal in paddock
- Residual height post graze
- Photo points
- Apps such as Pasture Maps and Maia Grazing.

Alternate stock densities



Courtesy: Understanding Ag. L.L.C.

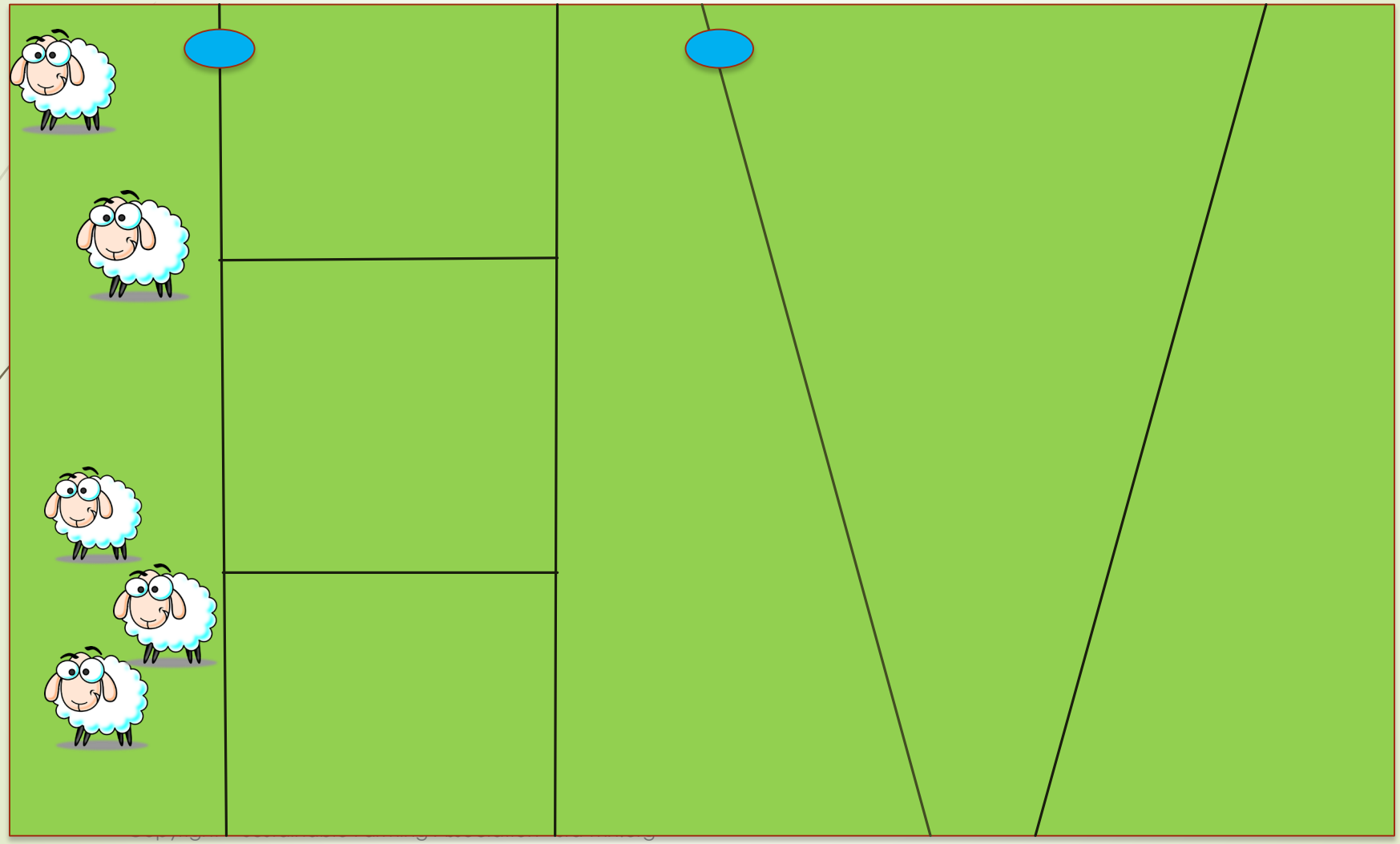
Increasing stock density: paddock within a paddock



High stock density to “feed” soil biology

Herd effect

Change grazing pattern



Paddock shape

- Square paddock = forage utilization
- Long rectangle = increased trample

When should I move cattle?

- 1X – noon to 5PM
  - Why? - BRIX = Gain
  - Heat mitigation
- 2X – noon to 6PM
- Fescue – hi tannin forage AM

  Fescue at hi-BRIX (PM)
- Woody management/silvopasture – 10 -11AM
  - Move out to hi BRIX forages 3-5PM
  - ¾ - Full day's feed for afternoon move

Value of plant diversity

- Based on research by Fred Provenza as summarized in his 2018 book "Nourishment".
- Ruminants will select from 20 – 70 different plant species per day **IF** the manager provides the opportunity.
- Bulk of diet will be from 3 – 4 plant species.
- Other species will be selected based on nutritional needs of the animal and their "knowledge" of the other plants available.
- This will vary from day to day.
- Selection based on plant phytochemical composition and maturity.
  - Woody plant high in tannins. Tannins have anti-parasitic properties.
  - Aspen high in salicylic acid. Salicylic acid is the basis of aspirin.

Three steps to estimate paddock size:

1. Estimate herd dry matter (D.M.) needs.

25 Cows x 1250#'s = 31,250#'s

25 Calves x 300#'s = 7500#'s

38,750#'s

38,750 x 0.035 = 1356.25#'s/day DM

Three steps to estimate paddock size

2. Estimate D.M.

Forage height = 20”

DM/Acre inch = 150#’s

20 x 150 = 3000#’s/acre

3000 x 0.5 = 1500#’s/acre available (Max.)

Three steps to estimate paddock size

3. Determine paddock size for 1 day

Estimated daily DM needs/Estimated DM forage = Paddock size

$$\frac{\text{1360 \#'s/day}}{\text{1500 \#'s/acre}} = \text{0.91 acres/day}$$

Photo: D. Voss

Estimating paddock size

43,560 ft. sq. x 0.91 = 39,640 ft. sq.

√ 39,640 = 199’ x 199’ **or** 300’ x 132’

What is our stock density?

- 38,750 #'s cattle/0.91 acres = 42,582 #'s/acre
- 2X/day = 85,164 #'s/acre
- 3X/day = 127,746 #'s/acre

Grazing considerations - **annuals**

- Soil type
- Crop rotation
- **Herbicide history**
- **ID resource concerns**
- Time of year planting will occur.
- Time of year grazing planned to occur.
- Equipment and labor resources
- Develop multi-species cover crop mix
  - SmartMix calculator https://smartmix.greencoverseed.com/
  - Midwest Cover Crop Council Row Crop Decision Tool
    - https://mccc.msu.edu/selector-tool/
- Infrastructure needs
  - Fence, water

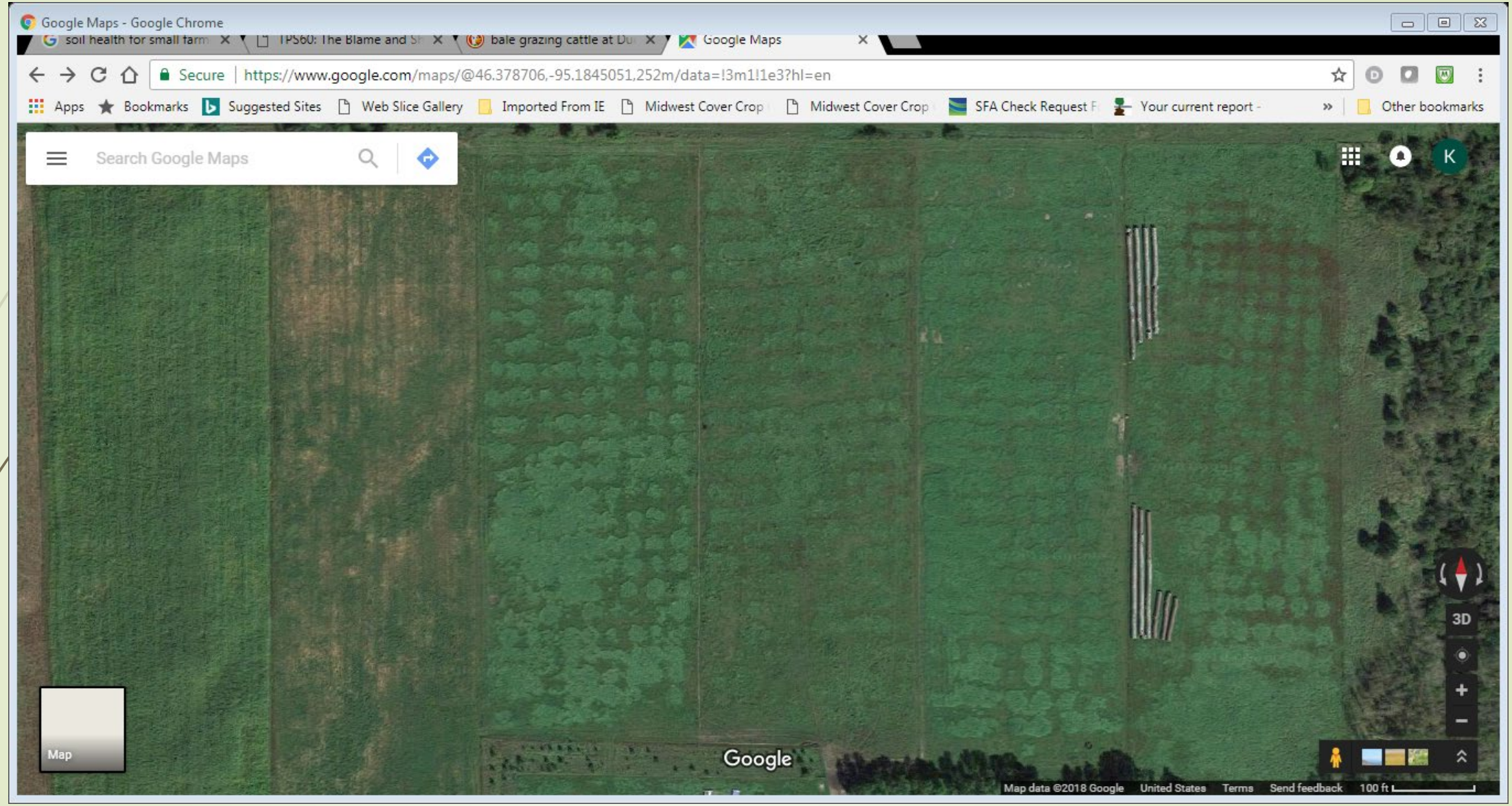
Grazing “sensitive” areas

- Dictated by context
- Animals not forced on the site, but limited managed access may be possible.
- Is there potential to do more good than harm?
- It’s the how, not the cow.
- Many of these sites were grazed by native ruminants pre-European settlement.
- Is the site safe for the animals?
- Is there even a viable feed resource?
- Limit access to short duration with long recovery.

Out-wintering

Out-wintering

- Feed and spread manure in one chore!
- Over 25 years of producers doing this across the Midwest and Canada.
- Wide spectrum of options.
- Context will determine how out-wintering can be adopted.
- Delineate area for management with semi-permanent and portable energized fencing.
- Hay may be systematically unrolled across the targeted area.
- TMR may be systematically fed across the targeted area.
- Offer a windbreak, either natural or constructed. Portable provides greater flexibility.
- Have a contingency plan for extreme weather.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Other bookmarks
Search Google Maps
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Send feedback
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Bale grazing in action:

- https://www.youtube.com/watch?v=6QQp-dV4ca8

Adaptive Management Summary

- Observation based decisions
- Have a plan, but not a rigid prescription
- Prioritize targeted areas for more intensive management. What management options fit that context the best?
- Alternate stock densities
- Change location of mineral and/or water if possible
- Do NOT move through rotation in the same pattern
- Alternate height when plants are grazed
- Alternate residual heights
- Alternate length of rest period
- Alternate time of year grazed
  - Begin in a different paddock every year.
- Have contingency plans

For the instructor: Field/lab exercises

- Walk into a pasture, hay field or idle grassland area. Other than directing them to where you are going, provide no other instruction. Once gathered at a meeting point have the students discuss what they have observed going on at that site. Encourage them to use their senses of sight, sound, feel and smell. Pull leaves from several growing plants (if applicable) and have them smell if there are differences. These are the phytochemicals. Many can be valuable to livestock and human health.
- Use the NRCS Pasture Condition Scoring Guide to evaluate the site. If you have more than 5-6 students in the group, break out into smaller groups to assess the site. Come together after a set time to compare evaluations.
- Do a shovel test on at least 2 sites with different management histories (E.g., fence row and tilled field, or fence row and mown lawn). How many earth worms are observed? What is the soil structure like? What color is the soil? What does the soil smell like? How easy or hard was it to get the shovel in the soil? What is the root structure like? Compare and contrast these sites.
- Measure soil temperature on several sites on a warm, sunny afternoon. Compare readings and discuss the implications to soil microbes and plant available soil moisture. What value would there be moving livestock into a paddock with tall forage on a warm afternoon?
- Use a refractometer to measure Brix. Discuss the value of Brix to livestock performance. What value would there be in moving livestock to a new paddock when Brix levels are high?

For the instructor: Field/lab exercises.

- Measure forage height and density using a yard stick, falling plate meter or grazing stick. Estimate available forage per acre. Using a hypothetical flock or herd, estimate their daily dry matter requirements. Calculate how large of an area would be necessary based on the available forage in the site measured for the hypothetical herd or flock.
- Provide identification of key grassland obligate bird species in your region. Discuss why birds can be a useful indicator of pasture health.
- Identify key forage and pasture plants in your region. Are they warm or cool season species? Why is plant diversity valuable for livestock and pasture management?
- Demonstrate on-line apps such as Pasture Maps or Maia Graze.
- Demonstrate the SmartMix Calculator and Midwest Cover Crop Council Decision Tool. Provide students a hypothetical cover cropping situation including time of year the cover will be planted and harvested, what is next in the crop rotation, what was there previously, soil type, local, and resource concerns or goals to be addressed. Have students design a complex mix and compare their results.
- Visit a pasture and evaluate cow manure pats. Determine dung beetle presence or absence (they may not be active after a hard freeze).

Questions?

About the author

- This curriculum was developed by Kent Solberg. Kent has been involved in managed and adaptive grazing since 1986. He has owned and managed his own grazing operation for 23 years and has been a consultant for the past 13 years. His consulting work has taken him to Michigan, Ohio, North Dakota, Iowa, Wisconsin and across Minnesota working with a variety of crop and livestock farms. He has also taught courses in community and technical college on grazing management and soil health. Kent and his wife live on their farm in north central Minnesota. He can be reached with questions about this curriculum at sevenpinesandfence@gmail.com.