Rest vs. Recovery

It’s Not Enough to Just Move From Pasture to Pasture

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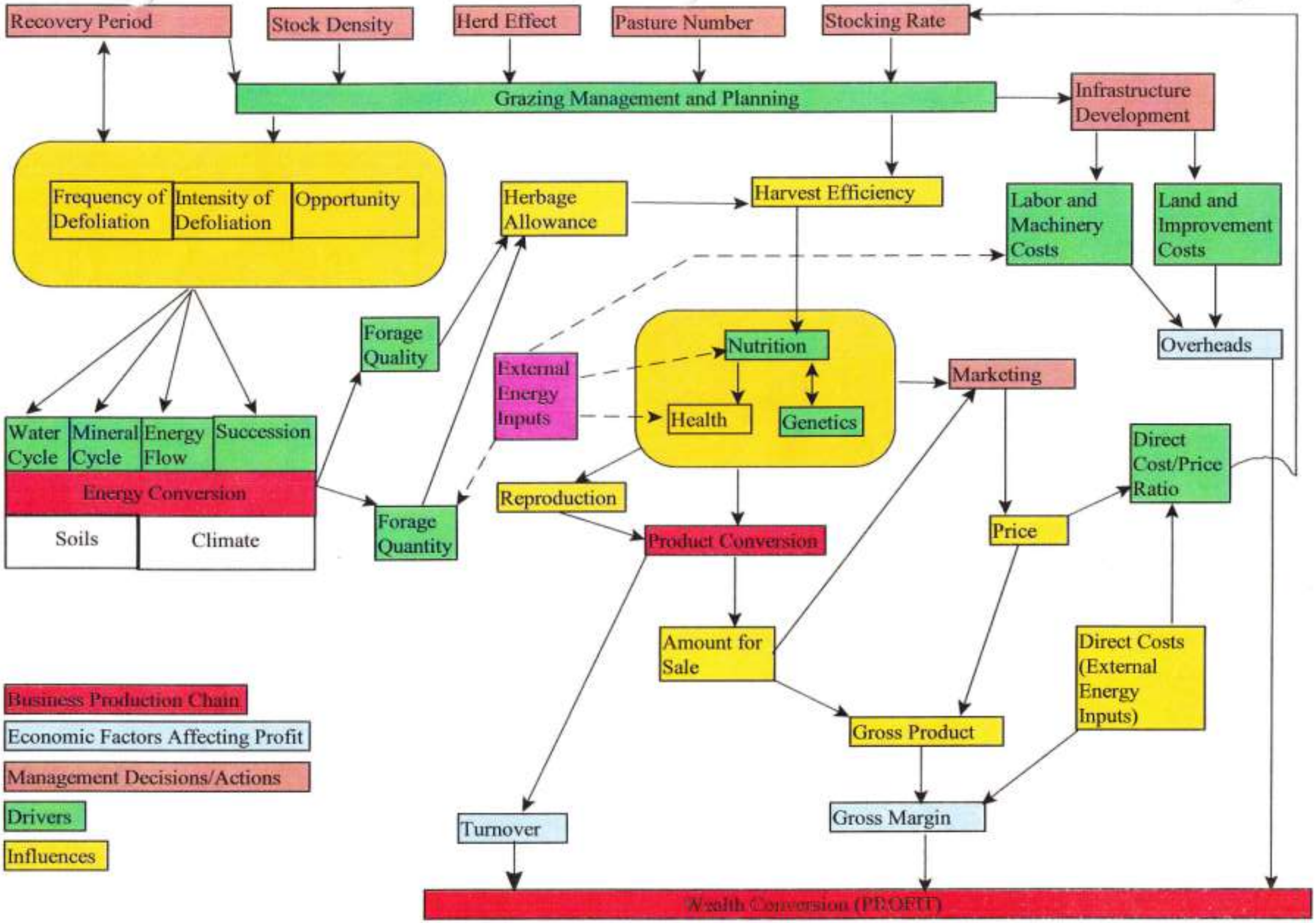
Objectives:

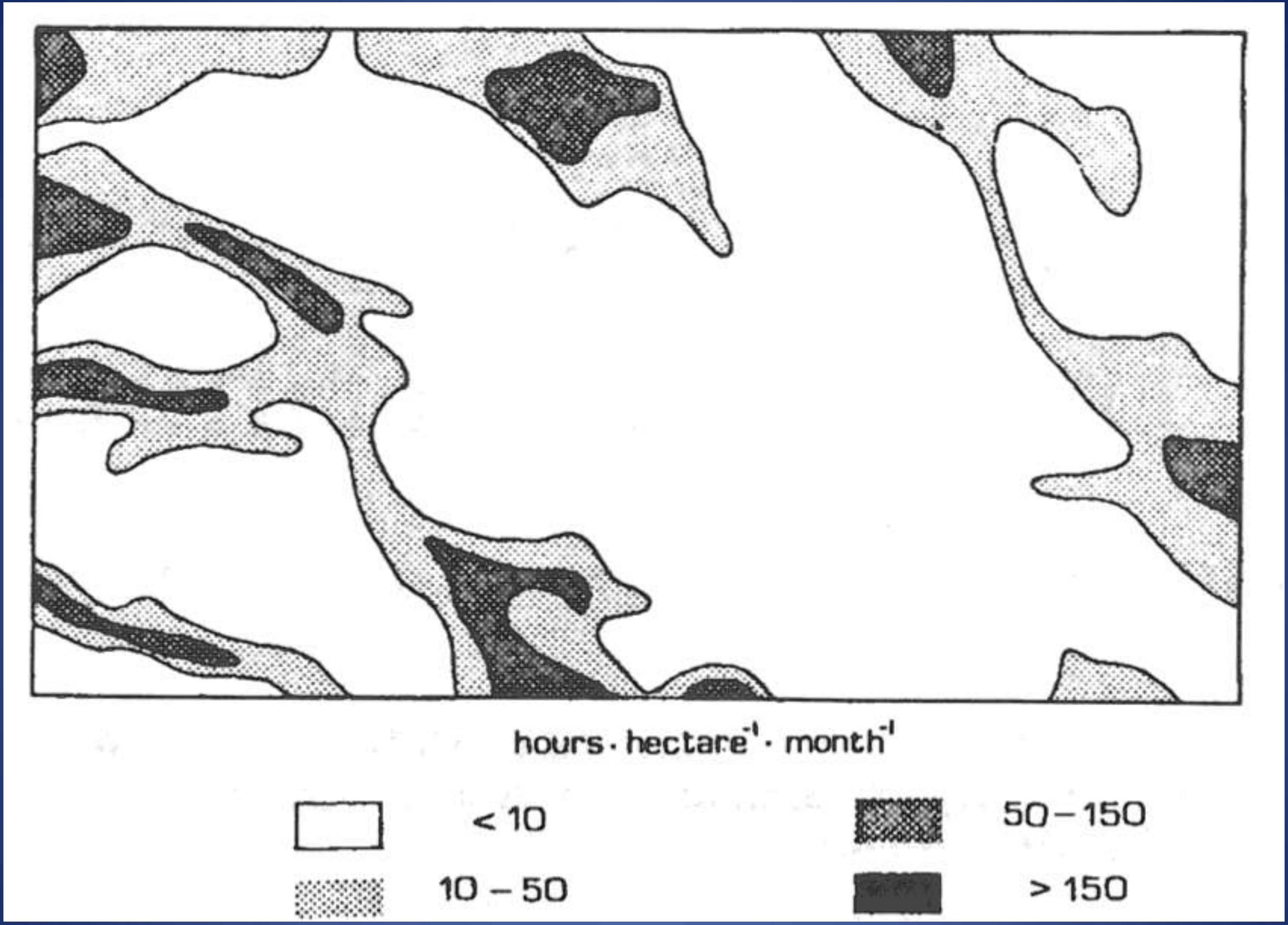
- Explain why deferment is needed in grazed ecosystems.
- Differentiate between adequate *recovery* and days of "rest."
- Explain the "anatomy of recovery."



Recovery Period
Stock Density
Herd Effect
Pasture Number
Stocking Rate
Grazing Management and Planning
Infrastructure Development
Frequency of Defoliation
Intensity of Defoliation
Opportunity
Herbage Allowance
Harvest Efficiency
Labor and Machinery Costs
Land and Improvement Costs
Forage Quality
External Energy Inputs
Nutrition
Health
Genetics
Overheads
Marketing
Water Cycle
Mineral Cycle
Energy Flow
Succession
Energy Conversion
Soils
Climate
Forage Quantity
Reproduction
Product Conversion
Direct Cost/Price Ratio
Price
Amount for Sale
Direct Costs (External Energy Inputs)
Gross Product
Business Production Chain
Economic Factors Affecting Profit
Management Decisions/Actions
Drivers
Influences
Turnover
Gross Margin
Wealth Conversion (PROFIT)


Following July 1

Goal-oriented, adaptive grazing management *strategies* that provide planned, regular, *adequate recovery* of desired plants after defoliation have predictable, positive effects on plant communities.



"Utilization was heavily concentrated in Buda-Agsm-carex communities *in the low-lying areas of the pasture."* Senft et al (1985)

Relative Growing Season Preference

Buda-Agsm-Carex	Bogr-Eref	Agsm-Dist	Buda-Bogr	Bogr-Eref-Oppo	Bogr-Oppo
1.68	1.39	1.11	1.10	.72	.60

Watering area	Draws/ lowlands	Fencelines	Southern exposures	Northern exposures	Ridgetops
1.95	1.39	1.05	.93	.86	.43

Relative preference = ratio of percent grazing time to percent pasture area

38% of the area received 54% of the use – nearly 2X demand of other areas.
"Intermittent drainage channels and adjacent communities were heavily grazed during the growing season." Data and quote from Senft et al. (1985)

“How can grazing be regulated so as to prevent close use of these plants? The answer is: It can’t.”

- *August Hormay, 1956*

Even when plants are defoliated heavily, preferred species respond favorably when adequate recovery follows grazing (e.g. Mullahey et al, 1990,1991; Reece et al, 1996; Jacobo et al, 2006; Teague et al, 2004, 2011).

- Torell et al (2011) found >4X growth on days with soil moisture over 30% compared to days with soil moisture between 20 and 30%. Days with soil moisture <20% had almost no growth.

- Favorable conditions for recruitment of desired species are sporadic and unpredictable (Pechanec, 1964; Gardiner 1986; Call and Roundy , 1991) , and defoliation following germination may affect survival (Woodmansee and Potter, 1971; Limb et al 2011).

- **Recruitment and survival were responsive to moisture and grazing, varied among years as much as 60 fold, and could be as high as 6-700 plants/ha gain or loss for perennial species. (Gardiner 1986 a,b).**

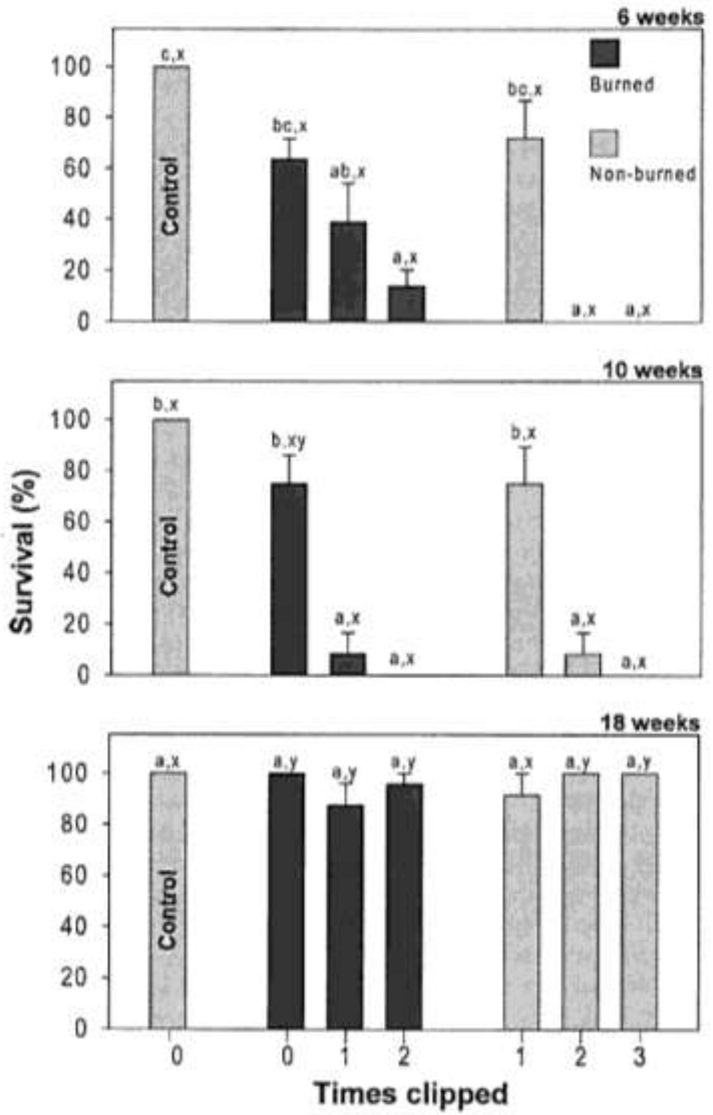


Figure 3. Survival of little bluestem plants (mean ± SE) burned or clipped at 6 wk, 10 wk, or 18 wk postgermination. Treatment bars with different letters differ at $P \leq 0.05$ with the letters a, b, and c identifying differences among treatments within an age group, and the letters x and y identifying differences among age groups within a treatment.

Limb et al (2011)

- Targeted grazing is the application of a particular kind of grazing animal at a specified season, duration, and intensity *to accomplish specific vegetation management goals*. (Launchbaugh and Walker (2006)

- Grazing strategies that consistently use knowledge of ecosystem processes, adapt to changing conditions, and change animal behavior in ways that "condition" plant communities to respond toward a goal under favorable conditions *and to be resilient during unfavorable conditions* can be thought of as consistent targeted grazing.

- Watson et al (1996) said plant communities on a landscape can be “conditioned” through grazing management to respond to sporadic, favorable conditions.

- Westoby et al (1989) – “Under the state and transition model, range management . . . would see itself as engaged in a continuing game, the object of which is to seize opportunities and to evade hazards as much as possible. The emphasis would be on timing and flexibility rather than on establishing a fixed policy.”

So how would such a game be played?

What Will a Player (Manager) Need?

- THE OBJECTIVE OF THE GAME! A *goal-based* strategy, that uses knowledge of ecosystem drivers and a knowledge of their inter- and intra-annual variability.

Only a few find the way, some don't recognize it when they do - some... don't ever want to.
-Cheshire cat

Knowledge about the environment they are dealing with.

SOUTHEASTERN COLORADO HISTORICAL RAINFALL AT A GLANCE

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
Average (in)	.36	.51	.69	1.42	2.36	2.46	2.24	2.43	1.37	.96	.53	.41	15.74
Median* (in)	.27	.32	.43	.99	2.25	2.11	2.11	1.85	1.13	.52	.40	.23	12.61
Range (in)	0.0-1.55	0.0-3.91	0.0-3.47	.02-9.00	0.16-6.77	.25-18.82	0.08-9.64	0.02-7.86	0.0-5.38	0.0-6.05	0.0-3.16	0.0-2.80	7.81-28.79
2011	.38	.00	.00	.21	.26	1.76	.58	.96	.16	.56	.76	.00	5.63
25% of years will have < (in)	.10	.14	.16	.53	1.07	1.18	1.12	1.05	.49	.20	.11	.10	11.31
25% of years will have > (in)	.51	.67	.97	1.84	3.21	3.01	2.94	3.00	1.81	1.15	.75	.62	17.15
% yrs. with < avg	62.5	66	64	69	51.5	59.5	55	63	56	68	63.5	64	N/A
% months getting < average but > worst 25%	37.5	41.5	39.0	46.5	28.5	35.0	31.0	38.0	31.5	44.0	39.0	39.5	N/A
% months getting > average but < best 25%	12.5	8.5	11.0	3.5	21.5	15.0	19.0	12.0	18.5	6.0	11.0	10.5	N/A

What Will a Player (Manager) Need?

- Infrastructure to facilitate control and flexibility of distribution and timing of grazing.
  – Recovery periods long enough to allow preferred, severely defoliated plants to recover fully between defoliations.
  – Avoid, as much as possible, repeated severe defoliations of preferred plants in preferred areas.
  – Desired distribution within and among paddocks.

What Will a Player (Manager) Need?

- **Flexible *and timely* adjustment of the strategy in response to changing conditions**
  - **Recovery periods must be based on the vigor and phenology of preferred species**
  - **Stocking rate determines both animal performance and *average* degree of defoliation**
  - **Use a written drouth plan to determine the numbers and classes of animals to remove when conditions warrant**

BUT WHAT IS ADEQUATE RECOVERY!?

- Questions:
  - How long is required to produce a full complement of leaves under good growing conditions?
  - How many days are available in a “normal” year for rapid plant growth?
  - How much does relative palatability of the desired plants change during the grazing season?

BUT WHAT IS ADEQUATE RECOVERY!?

- Questions:
  - Does the goal include increasing frequency or density of palatable species?
  - Will that require seedling recruitment?
  - Will seed production be necessary?
  - How often do years occur with the proper conditions?

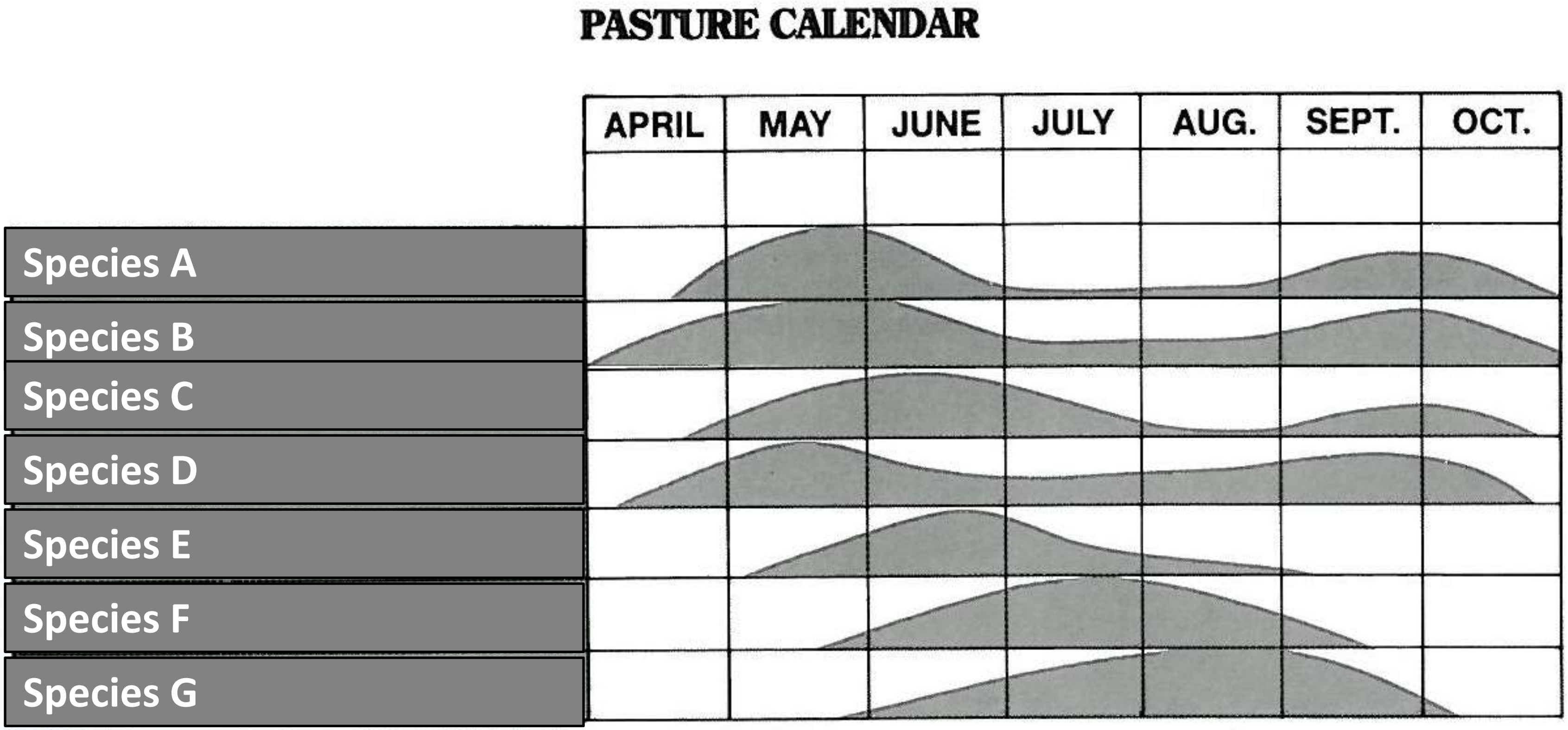


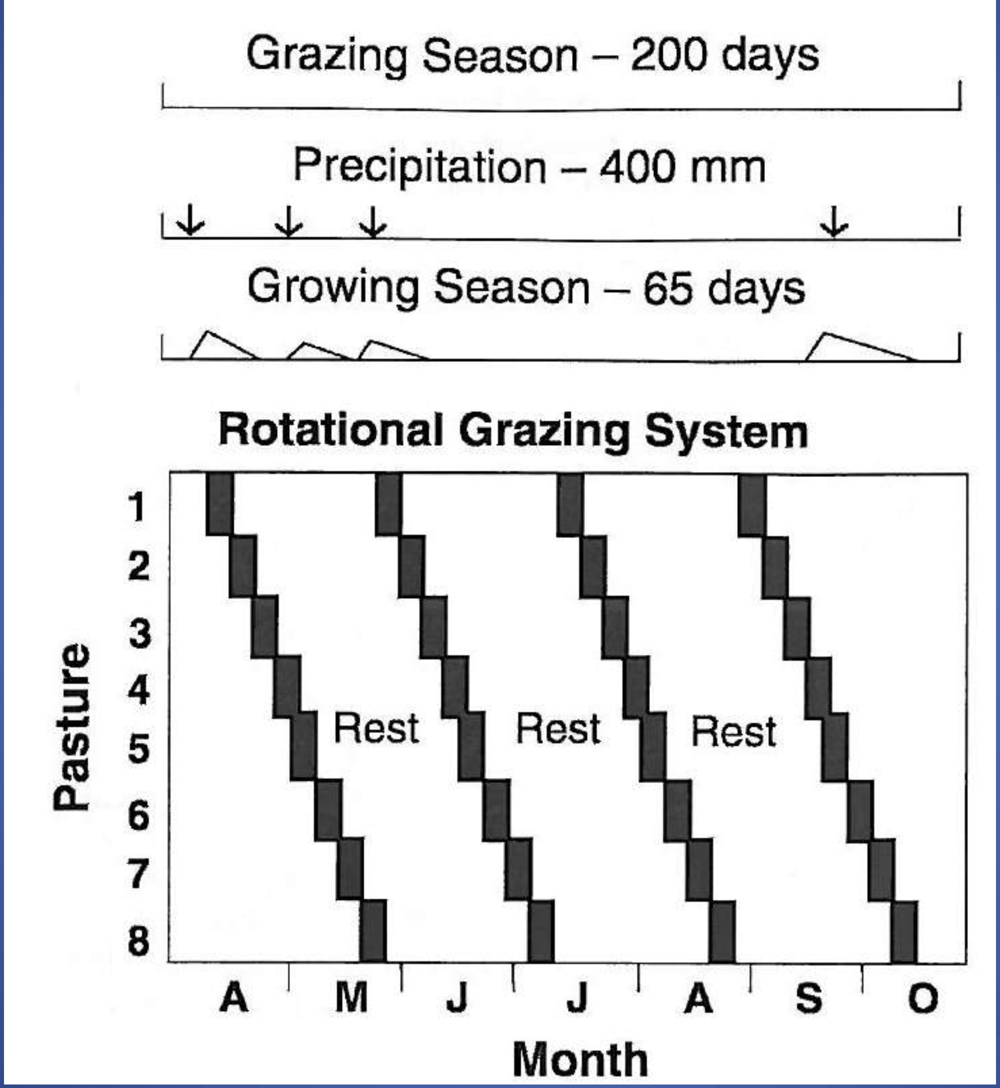
FIG. 2 Seasonal distribution of forage production.

From Waller et al. (1985)

Some Attempts at an Answer

- Grazing Response Index (Reed et al, 1999)
  - Frequency of Defoliation (length of graze period): -1 to +1
  - Intensity of defoliation: -1 to +1
  - Opportunity for growth/regrowth: -2 to +2
  - Values are additive with positive aggregate responses expected to provide positive effects on the plant community

What Would the Grazing Response Index Score Be Here?



From Briske et al 2008

Some Attempts at an Answer

- Sandhills Defoliation Response Index System (SanDRIS) Reece et al (2007)
  - Season of Defoliation: -3 to +4
  - Precipitation Regime: -2 to +2
  - End of season residual: -2 to +2
  - Again, values are additive with positive aggregate responses expected to provide positive effects on the plant community

Management Significance

- Grazing "systems" that do not provide adequate recovery are unlikely to benefit plant communities, long-term.
- Improved MANAGEMENT responses to changing conditions, particularly adequate recovery for severely defoliated plants and adequate residual, increase probability of favorable plant community responses.
- Favorable plant community changes may be unpredictable, sporadic, and depend on favorable events, but grazing decisions that reduce risk and condition the plant community to respond favorably may change thresholds and improve resilience.

How can science provide information that helps land managers improve grazing management strategies and make better operational decisions?

“. . . we recommend that the rangeland profession shift its attention from debating the effectiveness of any particular grazing management *system* to a broader examination and discussion of the *processes* that contribute to adaptive grazing management.”

- Briske et al 2011 (emphasis mine)

Important Research Objectives

- **Identify limiting ecosystem process(es) that drive plant community change in a given climate/ management environment.**

- **Identify the environmental threshold ranges and how they can be manipulated to facilitate desired changes or increase resilience.**

Important Research Objectives

- Determine appropriate response variables that indicate whether the system is being "conditioned" to respond favorably.

- Determine pertinent temporal and spatial scales and sampling intensities to detect change.

Important Research Objectives

- Identify temporal and spatial scales and sensory cues that affect animal behavior.
- Identify methods to manipulate these interactions that address limiting processes for desired goals.

Summary

- Animals will often graze preferred plants in preferred areas severely when encountered.

- Repeated severe defoliations without recovery that allows the plants to re-establish a full array of leaves weakens those plants.

Summary

- Unless animals can be controlled so that this recovery is reliably provided in most years, plant communities in preferred areas of the landscape will deteriorate and become focal points for further deterioration.
- In semi-arid environments, because of the sporadic nature of growth, adequate recovery will require the majority of the growing season in most years.

Summary

- When moisture is below normal or recruitment of new plants is necessary to achieve plant community goals, recovery periods will need to be longer.

- Grazing strategies must be focused on desired plant species or functional groups to have a high likelihood of success.

Summary

- Changes in plant composition are likely to be sporadic and dependent on weather events. Management and monitoring efforts should be centered on creating conditions that will allow the community to respond positively to favorable events and remain resilient in unfavorable periods.

- Management following a recruitment event that provides enough time for new plants to establish without being defoliated will enhance the likelihood of long-term desired responses.