PRINCIPLES OF CONTROLLED GRAZING

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David W. Pratt, UCCE Livestock Range Management Advisor (1993)

GRASS FARMING

Ranching is really the business of converting sunlight energy into forage and forage into harvestable livestock products in a sustainable manner. From this perspective we see that those of us in the livestock business are also in the grass business. Allan Nation, editor of the Stockman Grass Farmer would say we are "grass farmers" and our livestock are the four legged combines with which we harvest our crop.

Most of us have considered the livestock business, not the grass business, as our primary occupation. As a result, our focus has been on the animal. We have a relatively poor understanding of how our crop grows and responds to grazing. An understanding of this relationship is fundamental to successful grass farming.

GREEN LEAVES CAPTURE SUNLIGHT

Sustainable production in ranching starts with using plants to capture sunlight energy. When sunlight falls on bare soil, rocks, or anything but growing plants, its energy cannot be harvested.

Principle: ***Maintain 100% green plant cover in pastures for as long as possible.***

THE "S" SHAPED CURVE

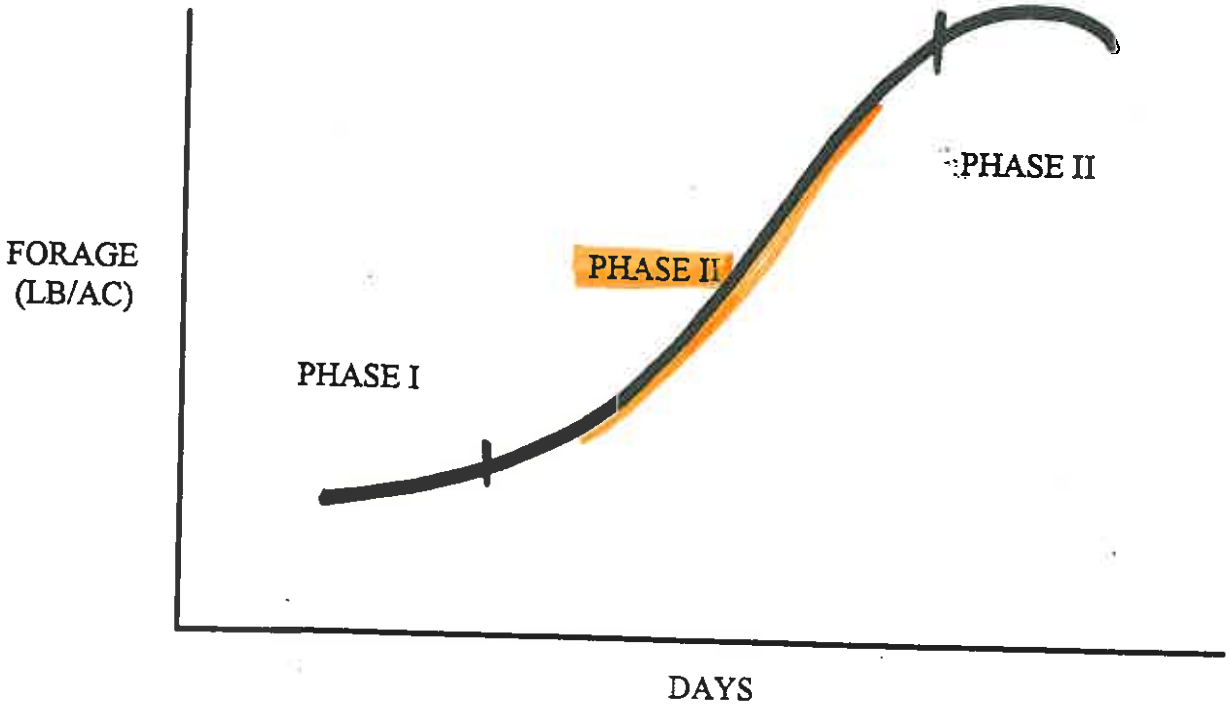
The efficiency with which plants convert the sun's energy into green leaves and the ability of animals to harvest and use energy from those leaves depends on the phase of growth of the plants.

After grazing, plants go through three phases of growth that form an "S" shaped curve (figure 1). **Phase I** occurs after plants have been severely grazed. After grazing, fewer leaves are left to intercept sunlight and plants require more energy for growth than they are able to produce through photosynthesis. So, to compensate, energy is mobilized from the roots. The roots become smaller and weaker as energy is used to grow new leaves.

Plant growth during phase I is very slow but the leaves are extremely palatable and nutritious.

Remember phase I - high quality but low quantity.

FIGURE 1. PLANT GROWTH AFTER GRAZING (THE 'S' SHAPED CURVE)



When regrowth reaches one fourth to one third of the plant's mature size, enough energy is captured through photosynthesis to support growth and begin replenishing the roots. This is **phase II.** It is the period of most rapid growth. During phase II, leaves contain sufficient protein and energy to meet the nutritional needs of most livestock.

Remember phase II - high quality and high quantity.

As plants continue to grow, leaves become more and more shaded. Lower leaves die and decompose. Leaves use more energy for respiration than they can produce through photosynthesis. This is **phase III.** Phase III material is stemmy and fibrous. Nutrient content, palatability, and digestibility of leaves in phase III material is poor.

Remember phase III - low quality but high quantity.

Principle: ***Adjust grazing and rest periods to keep plants in Phase II, the most rapid period of growth.***

Do not graze plants so short that they enter phase I. Phase I regrowth is very slow and will reduce total productivity. Do not allow plants to enter phase III. In phase III, shading and senescence begin to detract from efficiency of photosynthesis. **The harvest of energy from your pastures will be maximized by keeping plants in phase II.**

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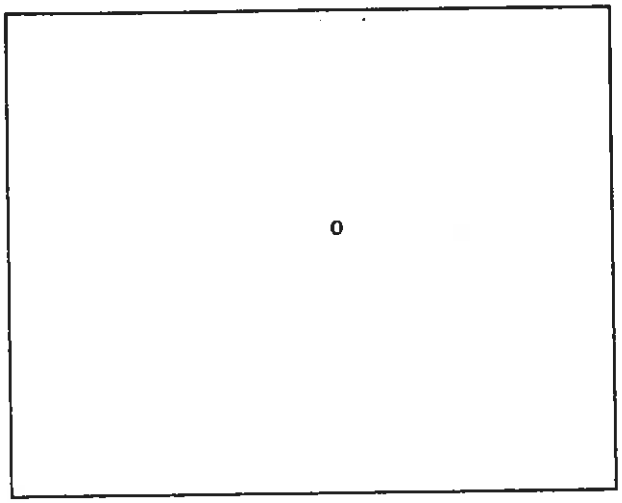
OVERGRAZING IS A FUNCTION OF TIME

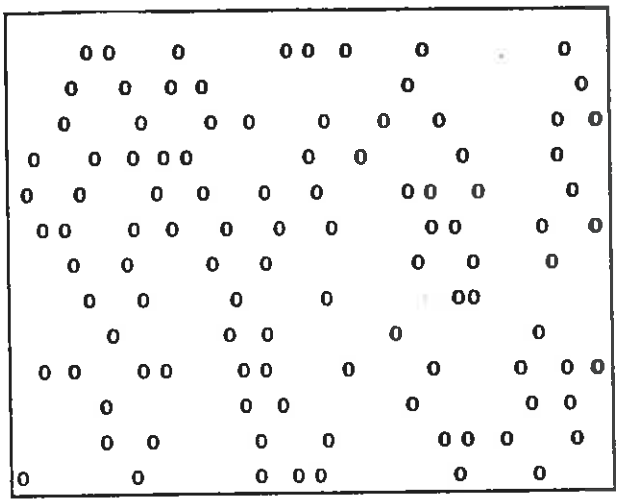
Which would cause more overgrazing: one animal grazing a one acre paddock for 100 days, or 100 animals grazing that same paddock for one day? (figure 2) The stocking rate of both paddocks would be identical: 100 Animal Days per acre. But the effect on the paddocks would be much different.

FIGURE 2. VARYING TIME & NUMBERS WITH CONSTANT STOCKING RATE

1 ANIMAL FOR 100 DAYS



100 ANIMALS FOR 1 DAY



1 ANIMAL X 100 DAYS / 1 ACRE = 100 ANIMAL DAYS PER ACRE

100 ANIMALS X 1 DAY / 1 ACRE = 100 ANIMAL DAYS PER ACRE

In the first case, the animal would keep returning to areas previously grazed because the new growth would be more palatable and nutritious than the older growth of ungrazed plants. In the second case, the animals would probably graze everything in sight but would not have the chance to regraze plants. So, which would cause more overgrazing? To answer we must first know what overgrazing is.

Overgrazing is grazing a plant before it has recovered from the previous grazing.

Overgrazing occurs in two ways: leaving stock in a pasture too long or bringing them back too soon.

It is important to make a distinction between severe grazing and overgrazing. Most people use these terms interchangeably. I define them differently. Severe grazing means removing a lot of the plant, but it does not tell you how long a plant was exposed to grazing. Overgrazing means that a plant was regrazed before it recovered from a previous grazing. By this definition, a severely grazed plant has not necessarily been overgrazed ... but neither extremely severe grazing or overgrazing is good.

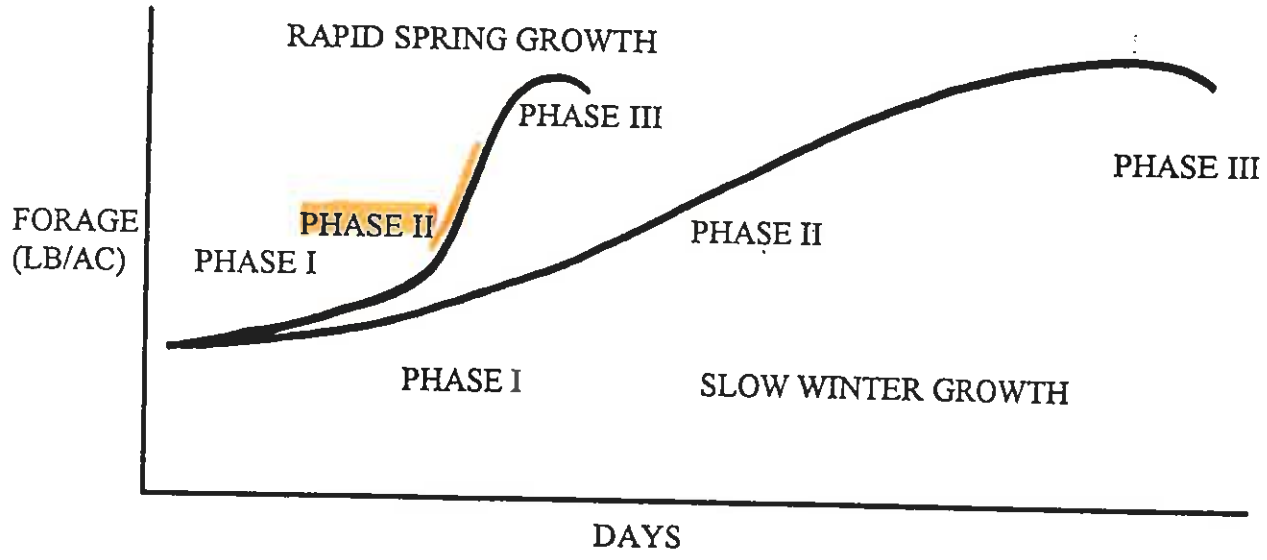
Now, let's relate this back to the two pastures. The first case (one animal for 100 days) resulted in regrazing of plants...overgrazing. There would also be many plants that were completely ungrazed. There would be plants in both phase I and III of the S shaped growth curve. Neither overgrazing or undergrazing is desirable.

The second case (100 animals for one day) may have resulted in severe grazing, but plants would not be grazed while they were recovering ... there would be no overgrazing.

PASTURE GROWTH RATES CHANGE

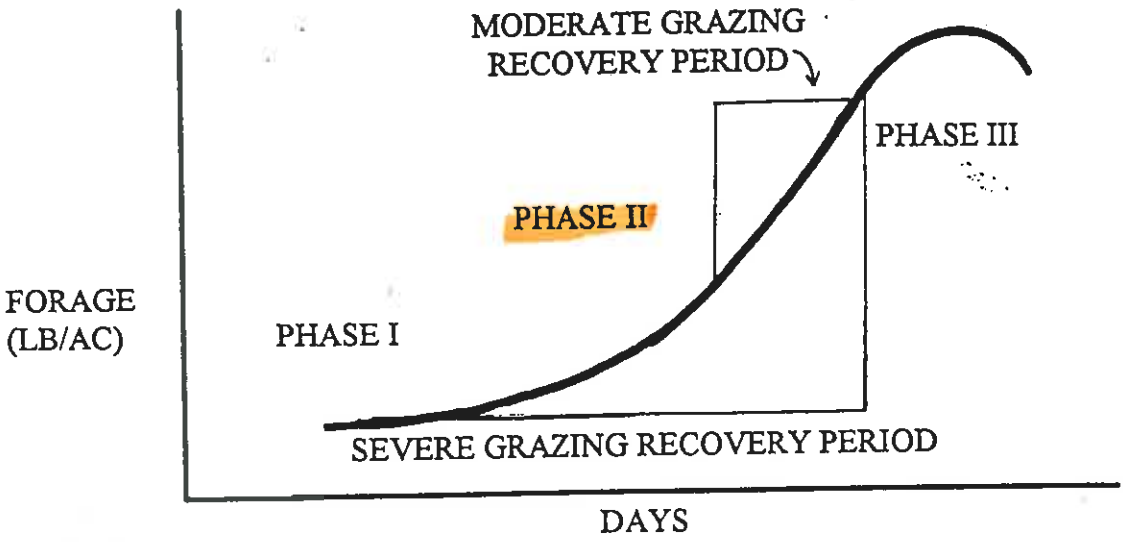
The rate of plant recovery depends on the growing conditions. Plants recover much more slowly during our cool winters than during our warm wet springs (figure 3).

FIGURE 3. PLANT GROWTH AFTER GRAZING DURING RAPID GROWTH & SLOW GROWTH



The growth rate also depends on the severity of grazing (figure 4). When plants are severely grazed their recovery is slow. When grazing is less severe, the recovery is relatively rapid. Increasing grazing severity by 25% may increase recovery time and decrease the productivity of the pasture by 100%!

FIGURE 4. EFFECT OF LIGHT & SEVERE GRAZING ON PLANT RECOVERY



Producers should avoid severe grazing and set rest periods to provide adequate time for plant recovery. During slow growth and dormant periods, rest periods should be long (60 to 120 days). During periods of rapid growth, rest periods should be shortened (30 to 45 days).

Principle: ***Adjust rest periods to reflect rate of plant growth. Slow growth = longer rest. Fast growth = shorter rest.***

COWS ARE GOURMETS

Time is also a critical factor from the animal's standpoint. The forage consumed and the quality of the diet changes during an animal's stay in the pasture.

Cows are gourmets. They graze selectively, eating the best plants and plant parts first, avoiding coarser, less palatable, less nutritious feed. Stock eat most on the first day of grazing (figure 5). As the days pass, the forage gets older and less digestible, and stock spoil more and more grass through trampling and dung and urine contamination, so they eat less.

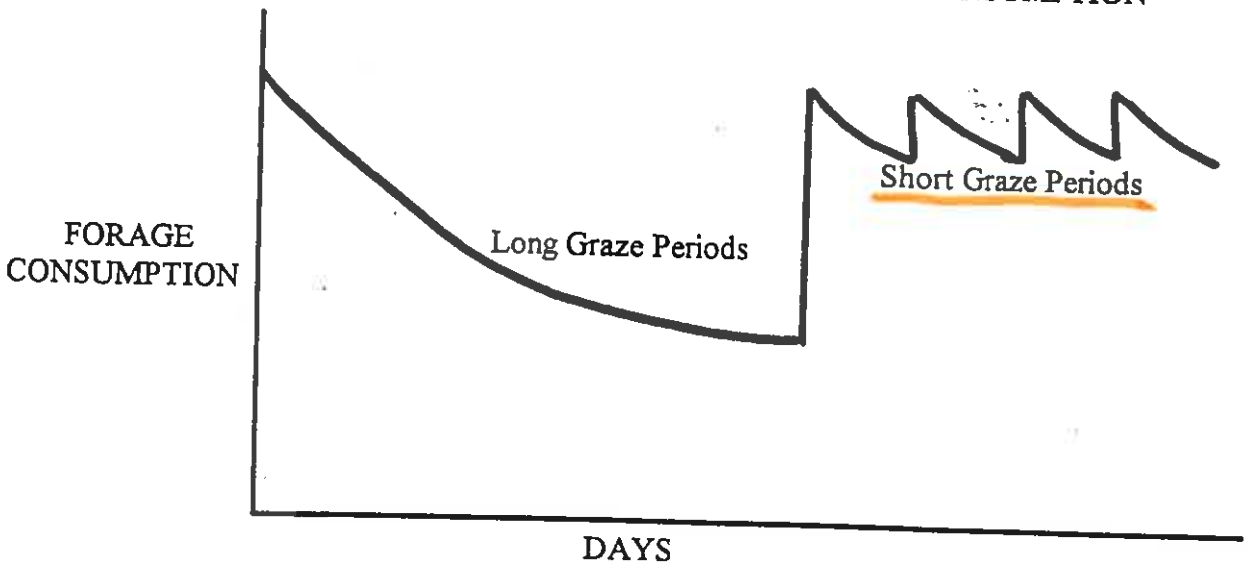
In heavily stocked continuously grazed pastures, regrowth will be grazed as soon as it's available. The phase 1 regrowth is highly nutritious, but there is generally not enough of it to support high levels of animal production.

Lightly stocked continuously grazed pastures consist of plants in phase I and phase III. If animals are forced to eat phase III material, which passes through their gut very slowly, their daily intake will drop because they simply can't fit any more feed in their rumen. The result is poor animal performance.

In contrast, imagine a situation where animals are frequently moved to fresh feed. Forage consumption would remain high. The quality of the diet would also remain high.

Principle: ***Make graze periods as short as possible while maintaining adequate rest periods.***

FIGURE 5. EFFECT OF GRAZE PERIOD LENGTH ON FORAGE CONSUMPTION



SUMMER ROTATION ON ANNUAL RANGES

During the dry season annual plants will not be damaged by continuous grazing, after all, they are already dead. But, there are still benefits of controlling the length of the graze and rest periods. They include more total pasture production, more uniform utilization, less forage waste, improved and more uniform nutrition for livestock and better control of the amount of residue left to maintain healthy water and nutrient cycles.

Consider this: we've observed a dramatic increase in the number and vigor of desirable perennial grasses under this type of management. Do you think we'd be seeing the perennials if we grazed continuously through the summer? Perennials can only become established if the land is managed as though they are already present.

STOCK DENSITY

Stock density is the number of animals in a particular area at any moment in time. It is usually expressed in terms of number of head per acre:

$$\text{STOCK DENSITY} = \frac{\text{HEAD}}{\text{ACRE}}$$

For example if 50 steers are grazing a 10 acre paddock the stock density is 5 head/acre:

$$\text{STOCK DENSITY} = \frac{\text{50 HEAD}}{\text{10 ACRES}}$$

In his book Holistic Resource Management, Allan Savory says, "Low density, not overgrazing or overstocking, should bear the blame for many serious range and production problems, including trailing, successional shifts toward brush and weeds, pest outbreaks, poor animal performance, and high supplemental feed costs...". To understand why, let's take another look at the two one acre paddocks described earlier (Figure 2).

The two paddocks had identical stocking rates (100 animal days per acre), but they were grazed for different periods of time and the stock densities were drastically different.

In the first paddock, with one animal grazing for 100 days (stock density 1 animal/acre), utilization was uneven, with some plants overgrazed and others undergrazed. In the other paddock, where one hundred animals grazed for one day (stock density 100 animals/acre), utilization was more uniform and there was no overgrazing. Shortening the graze period reduced overgrazing, but it was the increase in stock density that resulted in more even utilization.

Overgrazing is a function of time.
Uniformity of utilization is a function of stock density.

Pastures with low stock density usually appear "patchy" with some patches grazed very short and other patches consisting of rank, "wolfy," phase III vegetation. Some ranchers mow pastures to keep vegetation uniform and palatable. Others use fire to remove old, stemmy, ungrazed material. What they usually really need is higher stock density.

High stock density increases the uniformity of utilization and maintains forage in a more palatable, nutritious, digestible condition.

Stock density increases as the number of animals in a paddock increase or as paddock size decreases.

Principle: ***Use the highest stock density possible.***

Twenty head per acre is the minimum stock density needed to uniformly graze irrigated pasture. Higher is better. Stock densities of over 50 cattle per acre are not uncommon on well managed irrigated pastures. Two head per acre is a reasonable target on more remote ranges. Again, higher is better.

HERD EFFECT

If you haven't already seen the movie *Dances With Wolves*, get out the popcorn and rent it tonight. When it gets to the scene where they are tracking the buffalo, stop the tape and reread this section.

After the buffalo stampeded through, the range literally looked plowed. This is a natural phenomena called herd effect. When animals are spread out and calm, their hooves tend to compact the soil. When they are concentrated and excited, they tend to knock down old standing vegetation and break up the soil.

In addition, would it be easier to achieve herd effect with a group of 2 cows on 20 acres or 200 cows on 2000 acres? You cannot achieve herd effect with small groups.

Principle: ***Use the largest herd consistent with good animal husbandry practices.***

Herds of up to 800 cows or 2500 stockers can be run without behavior problems. Added benefits of combining herds will be to increase the number of paddocks in the rotation and increase stock density.

PADDOCKS

Adequate time control and stock density can be achieved on many ranches with 16 paddocks. However, the "right" number of paddocks will vary and depends on the length of the required rest and desired graze periods and the stock density needed to achieve uniform utilization.

Most ranchers can begin implementing these basic principles without building new fences. By combining herds and closing some gates, there may already be enough fencing to control graze and rest periods and increase herd size and stock density. When fencing is required, consider minimal electric fence designs. Material costs for effective high tensile electric fences usually vary between $500-$1000 on rangelands.

IS CONTROLLED GRAZING RIGHT FOR YOU?

Controlled grazing will help you maximize the sustainable production of high quality forage and animal products from the land. It can be practiced on irrigated pasture or dry rangelands.

But controlled grazing isn't right for everyone. If none of your cows got bred because your bulls were all infertile, you'd better spend your money on new, fertile bulls before you spend it on new fences. But if the "weak link" in your operation is converting sunlight energy into forage, or converting the forage you already have into animal products, then controlled grazing can improve profitability.

It would be nice if I could give you a recipe for controlled grazing that showed the number of paddocks you should have, the number of animals you should graze and the length of rest and graze periods. But there is no controlled grazing cookbook. What works on one ranch may not be suited to another. If you would like to discuss the application of these principles to your operation, please call. There are several local ranchers starting to implement controlled grazing programs. Working together we can all be more successful.