

Stocking Rates

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Some say that proper stocking rate is the most important consideration in good range management. But what is “proper” stocking rate? There is not a simple answer because what is “proper” depends on how we measure it. For example, to many range professionals, proper stocking would be that which will maintain or improve the range condition. For most ranchers, it might mean the stocking rate that would return the greatest income. For some wildlife interests, it would be that stocking rate which minimizes conflict with wildlife values. And for some radical anti-grazing interests it means no livestock at all.

To start, let’s make a distinction between stocking rate and carrying capacity, another term widely used and seldom defined. Carrying capacity is the average amount of forage available on a range when it is properly used. Again, this may vary depending on the management objectives, i.e., it could be different if the objective were to maximize income from livestock as opposed to accommodating needs of endangered species. Carrying capacity (commonly expressed as animal unit months, AUMs) can be roughly estimated by using the total annual production of plants, the relative palatability of various species, topography, distance to water, and other factors that influence how much of the plant growth can actually be utilized without damage to the basic resource. Forage available is converted to AUMs by dividing pounds of forage by forage intake per animal unit (an animal unit is a 1,000 pound cow or equivalent and daily forage requirement is usually figured at about 26 pounds dry weight per day). Stocking rate (the number of animal units per acre, acres per animal unit, or animal units per section over the grazing season or yearlong) may average about what the carrying capacity is, or it may be lower or higher, at least for short periods due to weather, grasshoppers, wildfire, or regulations.

It is often stated that “moderate” grazing is better for the range condition than “heavy” grazing, and better for livestock production than either heavy or light grazing. Let’s consider how stocking rate affects livestock production and profitability. There are two factors to consider: production per head and production per acre. Production per head is easy to understand for a steer operation – it is just the average weight gain from the start of the grazing season to the end. For a cow-calf operation it is a bit more complex because it involves calving percentage, calf weaning weights, etc. But the bottom line is still this: “how many pounds of beef do you sell per acre each year for each cow in the herd?”

Production per acre is the pounds of beef sold per acre.

As a rule, production per animal is greatest at low stocking rates (see graph). This is because each animal has more forage available and more ability to select the favored plants and plant parts than at higher stocking rates. The production per animal at low stocking rates depends mainly on the quality of the animals, the quality of the range, the time of year, etc. As stocking rate increases, at some point, the production per animal will start to decrease due to decreased quantity and/or quality of the forage

available. It will continue to decrease until the animals make no growth at all, i.e., they probably starve to death.

Production per acre obviously starts out low with low stocking rates because there aren't enough animals. It increases, at first, at a more or less straight line rate as the number of animals increases, but at the point where animal production per head starts to decline, production per acre increases at a diminishing rate. It peaks out where the addition of one more animal causes the rest of the herd to lose more weight than the additional animal provides (similar to the law of diminishing returns in economics). After that point of maximum production per acre, both measures decline to zero (see graph).

So, what is the "optimum" stocking rate? For simplicity we will assume that the average price received for the beef sold does not change, at least within the range of reasonable stocking rates. We will also assume that effects on the forage supply are solely the short-term quality and quantity of the forage, i.e., that any level of stocking will not cause long-term degradation of the capability of the range to supply the same quality and quantity of forage. (Keep in mind, those assumptions may not be valid.)

Some have stated that where the production per head and production per acre curves cross (see graph) is the optimum stocking rate – but there is no reason to think that. The most profitable stocking rate is determined by the relationship of fixed and variable costs for the operation. Fixed costs are those that do not change with stocking rate, e.g., real estate cost, taxes, living expenses, most working equipment, etc. Variable cost increases as stocking rate increases, e.g., veterinary expense, feed, supplements, hired labor, etc. Total cost is therefore partly fixed and partly variable.

If we assume that production per acre is a measure of gross income from sales of livestock, then the difference between gross income and total costs is what determines the maximum net income. This point will always be somewhat below the stocking rate which produces the most gross income (see graph). At a stocking rate higher than that, the gross income goes down and costs still go up. It can also be seen that the most economic stocking rate is influenced by how much of the total cost is fixed and how much is variable. To take the extreme example, if all costs were fixed it would always be best to stock at the point of highest production per acre, i.e., highest gross income. On the other hand, if a greater percentage of the costs are variable, then more conservative stocking would give more net income. Unfortunately, the high price of land, improvements, equipment, etc. encourages higher stocking rates.

At the outset, we assumed that stocking rate would not affect long term range condition or prices received. Neither of those is true. For example, in the early days, when cattle sold by the head (sometimes for hides and bones) and not by pounds or grade, there was incentive to stock as heavy as possible, since the cattle all brought pretty much the same regardless of condition. Likewise, if the range condition starts to degrade at some stocking level, then consistently stocking beyond that level may produce higher short-term gain but will not be sustained.

The bottom line is this: It isn't how many head of livestock you run that is important, it is the net income from sales – and that usually occurs at less than the maximum stocking rate. In Texas, they used to say you could stuff one pant leg into your boot if you ran 500 head, and both could be stuffed in your boot if you ran 1,000 head. A better measure of success would have been to see how good your boots were.

Stocking Rates Graph

