Simple Concepts for Long-Term Ranch Success

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Introduction

In today’s fast-moving world of information, ranchers frequently suffer from technology overload. There can be enormous temptations to invest excessive amounts of resources on inconsequential activity. Understanding the responsibility of management for long-term success will help ranchers select appropriate technology. Focus on primary objectives will allow ranchers to develop simple and cost effective management strategies. Long-term survival of range livestock enterprises depends on (1) surviving or avoiding environmental extremes, (2) balancing livestock requirements with forage resources, and (3) recovering investments.

Environmental Extremes

Natural

Inability to survive economic losses that occur during blizzards or drought account for a high percentage of ranch failures. Livestock death loss, reduced animal performance and dramatic increases in hay and feeding costs can lead to hundreds of thousands of dollars of unexpected debt in a single year. Surviving blizzards depends on the condition and nutritional requirements of cattle and the availability of shelter, feed and water. Improved weather forecasting and communication should reduce the occurrence of cattle being in high risk locations at the wrong time. Areas where cattle could drift into narrow draws, onto frozen lakes or rivers, or great distances should be avoided during the "historical" blizzard season. Physiological status of cattle and the availability of feed, water, and shelter will continue to be important. Large-scale severe blizzards are uncommon but frequent enough to be described by one generation to the following. For example:

"You can’t blame the weatherman for his cloudy with light snow forecast for January 2. Boiling up from the south was one storm, another came from the northwest. These storms met in mortal combat over western Nebraska, eastern Wyoming and western South Dakota. Wind velocity climbed to 70 mph and snow began to cascade down on January 2, 1949" (Alleman 1991).

The end result of the 1949 blizzard was more than one million head of dead cattle and sheep and the financial end to hard-hit ranches. More recently, a number of "hard winters" occurred in the 1970's. Some livestock losses in the devastating late March blizzard of 1975
exceeded $300,000 for individual ranches in Nebraska.

The unpredictable yet certain reoccurrence of drought is the major factor limiting use of land resources in the Great Plains. Drought will always be a nemesis for ranchers, especially for those who become complacent during wet cycles. In any given year, rangeland vegetation is either in the recovery phase or under the direct influence of drought. The most effective method of drought management is preparation in the years preceding drought through proper stocking rates and periodic growing-season deferment.

The fundamental objectives of drought management are to (1) minimize damage to rangeland resources during and immediately after drought and (2) minimize economic loss. Damage to forage and land resources is reduced and potential profit is increased when ranchers make timely decisions (Reece et al. 1991). Success depends upon viewing drought as a normal part of the range livestock production environment, not as a catastrophic event. High levels of plant vigor and range condition are critical for the endurance of and rapid recovery from drought.

Man-made
Grazing management decisions must be focused on herbage allocation. When and how plants are grazed directly affects all other herbage-dependent functions in a range ecosystem. Forage not consumed by beef cattle will contribute to plant vigor, watershed conditions, site stability and wildlife habitat. Overgrazing reduces the amount of current year and carry-over herbage available for other ecosystem functions. If pastures are overgrazed for several years, forage intake by cattle accounts for an increasingly large percentage of each year’s total supply of herbage.

Critical levels of defoliation for most plants are near 50%. Removing more than 50% of the green foliage results in less plant growth the following growing season for most grass species. Needlendhread (\textit{Stipa comata} Trin) is especially sensitive to heavy defoliation in the late boot stage of growth (Figure 1). Removing about 1/3 of the foliage by weight in mid-May had no effect on herbage production 1 year later compared to unclipped plants (not shown). Moderately defoliated plants and plants not clipped in 1986 capitalized on above average precipitation in 1986 and 1987. These plants produced nearly 3 times as much herbage in 1987 compared to 1986. In contrast, removing about 2/3 of the foliage in 1986 caused a 42% reduction in herbage the following year even with above average precipitation. Heavily defoliated plants on sands range sites were not able to take advantage of abundant soil moisture. Pastures of needleandthread can increase in herbage production dramatically with consecutive years of above average precipitation when properly stocked (Olson et al. 1985). In contrast, shortgrass prairies dominated by blue grama [\textit{Bouteloua gracilis} (H.B.K.) Lag.] and buffalo grass [\textit{Buchloe dactyloides} (Nutt.) Engelm.] are more resistant to heavy grazing. Grazing at a 60% level of consumption for 25 years resulted in a 3% decrease in forage production in wet years and a 12% decrease in dry years in Colorado (Milchunas et al. 1994). Estimated reductions of productivity after 50 years of heavy compared to light grazing were 5% in wet years and 18% in average years of precipitation, respectively. The negative effects of over grazing were greater in dry compared to wet years.
Figure 1. Effects of moderate and heavy defoliation on herbage production of needleandthread 1 year after clipping treatments. Precipitation was above average in 1986 and 1987.

![Graph showing herbage production](image)

The insidious cycles of overgrazing are diagramed in Figure 2. Excessive defoliation triggers both cycles. The rate of this untoward progression can be visually apparent within 1 year on mid- and tallgrass prairies. Declines in litter and carry-over herbage and visual contrasts between adjacent pastures can be early indicators of problems.

Excessive removal of leaf area reduces the amount of energy captured from the sun and the amount of protective plant material (Figure 2). Loss of residual vegetation and a corresponding increase in bare soil reduces infiltration of rain and snowmelt (Launchbaugh 1957). On the plant side, reduced energy capture reduces the depth and total length of roots and nutrient uptake. Plants with reduced vigor are less able to reach and absorb soil moisture which is less available because more precipitation is lost to runoff. The end result is less herbage production and the cycles start again.
As long as overgrazing continues the situation becomes progressively worse and drought-like conditions occur even with average or above average precipitation (Figure 2). The combination of overgrazing and true drought is disastrous and often leads to significant death loss of desirable plants (Reece et al. 1992). The only way to break these insidious cycles is to reduce stocking rates. More herbage must be allocated for plant vigor and watershed conditions. Grazing systems will not compensate for overgrazing.

Certain amounts of plant residue (ungrazed herbage) must be maintained to protect the soil, ensure rainfall infiltration and sustain forage production. Ungrazed herbage is an investment in future forage production. The minimum residue (current year plus carry-over herbage) levels needed to sustain production are 300 to 500 on shortgrass prairie, 750 to 1,000 on midgrass prairie and 1,200 to 1,500 pounds per acre (oven dry weight) on tallgrass prairie (Bement 1969, Reece et al. 1991, White and McGinty 1992). When forage is reduced below threshold levels, man-made drought often occurs.

**Stocking Rate**

Rangeland is a ranch’s main resource for producing income and other benefits to the ranch and society. Selecting a stocking rate for grazing cattle is a crucial decision which affects the rangeland and, therefore, the success of the ranch. Stocking rate determines animal performance, financial return and the long-term condition of the range. Proper stocking rates will: (1) produce optimum animal performance, (2) make the ranch profitable, and (3) sustain or improve the range resource (White and McGinty 1992).

Stocking rate is defined as the number of standardized animal units which the operator has allotted per unit land area for a specified time period (Glossary Revision Special Committee...
The number of animal units grazed determines the amount of forage that will be consumed each day and over the entire grazing period. Different classes and weights of cattle are standardized by dividing their average weight for the grazing period by 1,000 lb.

The amount of forage consumed in relation to forage supply determines the productivity of both the animals and the forage. This ratio of forage demand (forage intake needed by livestock) to forage supply is called grazing pressure. As grazing pressure increases, there is less forage from which animals can select. Point 1 in Figure 3 represents a threshold of grazing pressure beyond which individual animal performance is reduced. Reduced performance, as measured by decreased weight gain and reproductive capability, translates to lower economic returns per animal. When feed is purchased to offset this higher grazing pressure, the net return per animal is even lower. Proper stocking rates occur between the threshold point for individual animal performance (point 1) and maximum production per unit area (point 2). Long-term ecologically and economically optimum stocking rates are closer to point 1 than point 2 for most range ecosystems around the world.

Figure 3. Livestock production per individual and per unit area as affected by grazing pressure. Proper stocking rate lies between point 1 and point 2 (White, L.D. and A. McGinty 1992, adapted from Briske, D.D. and R.K. Heitschmidt 1991).
High grazing pressure causes nutritional stress and greater health problems in animals, and increases the possibility that they may consume poisonous plants. As the forage supply is depleted, the ability of more desirable plants to survive and reproduce declines, and the diversity of plant species decreases. High grazing pressure continued over several years causes the range to deteriorate and future productivity to be lost. If this situation develops, the enterprise may not be able to survive crises caused by climate and market variability.

Stocking rate is a critical factor in ranch financial success. With high stocking rates production costs generally increase at a faster rate than do gross returns (Figure 4). As profit levels decline, there is a greater chance the ranch will suffer a catastrophic loss. Ranchers must select stocking rates with limited knowledge of future forage and market conditions. But they can use past records, experience and range surveys to make realistic projections of forage and market conditions.

![Figure 4](image.png)

Figure 4. Proper stocking rates are actually a window of opportunity that shifts from year to year. Managing the stocking rate to remain within the window of profit requires monitoring of forage supply and flexibility in adjusting animal numbers (White and McGinney 1992, adapted from Kothmann, 1992, personal communications.)
A rancher must balance forage demand with forage supply and ensure economic survival. Both the number of animals grazed and the financial needs of the enterprise must be realistic in relation to potential forage production. By analyzing previous rainfall, animal performance, stocking rates and financial records, a rancher can better evaluate both potential forage production and risk.

The stocking rates selected must enable the ranch to survive financially (meet current obligations and provide for future needs), give satisfactory animal performance and allow for the vigorous growth of forage plants. Excessive financial obligations often "force" a rancher into selecting a stocking rate too high for the forage supply available. The financial needs of the ranch must not be allowed to dictate an unrealistic stocking rate. The most common cause of rangeland degradation is that ranchers expect animal productivity from their rangelands to be much higher than is realistic (Pressland and Graham 1989). High overhead and high family expenses, coupled with excessive stocking rates, will jeopardize the ranch and all its resources (White and McGinty 1992).

Recovery of Investments

Money will be invested to maintain and replace existing facilities such as fence and livestock water systems every year as a cost of doing business. However, many ranches have considered capital investments for additional facilities to improve grazing management. The present value of money must be considered when determining the wisdom of any investment. Present value analysis can be done very easily with any business pocket calculator that is designed for annuity calculations. Figure 5 demonstrates the effects of interest or opportunity costs (potential return from another investment) and time. Because of compounding interest over time, a net return of $2.00 will be required to pay for each $1.00 of the unpaid balance 6, 9, and 18 years after the initial investment at 12, 8, and 4% interest, respectively. At 12% interest, $5.00 of net return will be required to pay each $1.00 of unpaid balance after 14 years. Consequently, investments must provide rapid and consistent returns for full recovery, especially at high interest rates.

The likelihood of fully recovering an investment becomes increasingly small when a future dollar is worth 50 cents or less (Figure 5). The amount of marketable product that can be produced on rangeland has an ecological upper limit while the present value of money continues to decline over time at a greater rate than changes in market value of grass or rangeland. Investments that are dependent on forage production are also sensitive to intermittent and unpredictable years of below average production caused by natural events such as drought, hail, fire, and/or grasshoppers. Given a cost of money of 8% or higher, using a target recovery period of 5 years is justifiable. Unpaid balances of investments not recovered in the first 5 years may be recovered during the next 5 years. However, based on present value analysis, very little of the unpaid balance for grazing management investments will be recovered after 10 years regardless of the life expectancy of the infrastructure or the Internal Revenue Service’s time scale of depreciation.
Determining upper dollar limits of prudent fence and water development will depend on (1) the extent to which current resources are properly used and (2) the potential upper limit of forage production for the pasture(s). Overstocked and deteriorating rangeland will not sustain increased stocking rates or provide for optimal animal performance. It may be necessary to reduce stocking rates or provide complete growing season deferment to pastures that have been set back by overgrazing, drought, hail and/or fire. If overgrazing has been short-term or intermittent over years, forage production could increase progressively if plant vigor, watershed conditions and/or range condition improve. In these cases, return on investment from increased stocking rates will be small initially and increase in following years. Unfortunately, the present value of net return in the distant future is proportionately small compared to the first several years of the investment (Figure 5). If drought, hail or fire preclude stocking rate increases, it may not be possible to fully recover the investment.

![Figure 5. Present value of $1.00 of net profit in return 1 to 20 years after initial investment at 4, 8 and 12% interest.](image)

All rangeland has an ecological limit for forage production. Potential forage production and thus sustainable stocking rates can differ among range sites dramatically (Stubbendieck and Reece 1992). Recovery of fence and water investments is very sensitive to production per acre. A mile of fence will cost about the same amount per linear foot on the same kind of landscape regardless of the productivity of the land. Consequently, the rate at which investments are recovered tends to increase as the total acres affected and productivity of each acre increase.

The greatest opportunities for rapid recovery of fence and water investments are associated with resources where (1) stocking rates can be increased rapidly and measurably within ecological limits or (2) where complementary forages can be used to replace high cost feed or forage requirements. Separation of highly productive lowland or meadow sites from
upland may solve serious grazing distribution problems. Better control of grazing may allow range condition to improve on the upland and immediate increases in stocking rates on the highly productive site. Separation of old stands of wheatgrass from native rangeland or fence and water development for Conservation Reserve Program (CRP) acres may be rapidly recoverable investments if feeding costs are reduced or animal performance (reproductive success, average daily gain) is increased.

The cost of additional animals can have a major effect on the economic assessment of new or modified facilities. At the very least, purchase of additional livestock will have an immediate effect on cash flow. Adding more animals may reduce average cost per animal unit if current equipment and personnel and other resources are not yet fully utilized. However, if additional animals lead to heavy stocking rates overall for the operation, ranch success will be jeopardized. Animal performance and net profit per animal unit is less variable over years at moderate compared to heavy stocking rates regardless of grazing system (Gillen 1995). If additional animals would not exceed proper stocking rates, it may be desirable to take cattle in on share or lease contracts until investment costs are recovered and/or until the market is favorable for livestock purchases.

The economic feasibility of fence and livestock investments can be estimated on the bases of how many acres are required to recover an amount of money in a specified number of years at a selected interest rate. Tables designed for recovery of $1,000 will allow for rapid estimation of any amount of investment. Table 1 includes a range of initial stocking rates and projected immediate and annually consistent percent increases in stocking rate. The market value of 1.0 animal unit month (AUM, forage required for 1,000 lb of beef for 1 month) can be set at a lease value or at annual mortgage principle and interest plus total land tax payments per AUM for forage. In Table 1 the annual end of year payment per $1,000 at 8% interest over 5 years is about $250.46. A 10% increase in a stocking rate of .20 AUM/ac would be an additional 0.02 AUM/ac (.10 x .20) or $.24/acre (0.02 AUM x $12.00/AUM) annual value. About 1040 acres of affected rangeland would be required to recover $1,000 under the specified conditions.

The number of acres required to recover an investment declines (1) as land productivity increases, (2) as percentage change in stocking rate increases, and (3) as the value of each AUM increases. This method of estimation is useless if stocking rates exceed ecological limits. When based on reasonable expectations of forage production and livestock forage requirements, this approach can be used to estimate the smallest size for "economically" reasonable pastures. Remember to total all new costs associated with facilities, including energy and maintenance costs.
Table 1. Approximate number of acres needed to recover $1,000 in 5 years at 8% interest with different initial stocking rates and projected increases in stocking rate.

<table>
<thead>
<tr>
<th>Increase in Stocking Rate (%)</th>
<th>Initial Stocking Rate (AUM/ac)</th>
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1Table values are A/(IxRxV) where:
A = Annual annuity per $1,000, in this example $250.46 with 5 years and 8% interest.
I = Ecologically and economically realistic increases in stocking rate.
R = Initial stocking rate, AUM/ac.
V = Value of forage, $/AUM, in this example $12.00/AUM (1.0 AUM = forage required for 1000 lb of beef for 30 days).

If adequate water was available, total new costs for a cross fence might be $3,000. If the initial stocking rate is .40 AUM/ac and a 10% increase in stocking rate is projected, about 1560 acres (520 ac x 3) of rangeland must be affected in order to recover the investment in 5 years. In this example the minimum pasture size resulting from a single cross fence would be about 780 acres, average area on each side of the fence. In another example a 25% increase in stocking rate may be possible within ecological limits for land initially stocked at .40 AUM/ac. It might be possible to increase the stocking rate from .40 to .50 AUM/ac if a grazing distribution problem could be solved with cross fence, livestock water, riders and/or improved access for cattle. In this situation, the "economical" limit would be about $2,000 for 400 ac, $4,000 for 800 ac, and $8,000 for 1600 ac of affected rangeland for total material, labor, operating and maintenance costs.

NOTE: Additional pastures may also have value for separation of livestock groups, wildlife habitat management, etc. However, if grazing distribution, livestock separation and/or range condition are not a problem, investments for fence and livestock water development may not be "economically" or "ecologically" justifiable.

Technology Overload

The risk of being overwhelmed with information has been and will continue to be a hazard in ranching. Seeking information on the basis of management objectives will provide focus. Additionally, concentration on cause and effect processes and dedication to keeping it simple will help overcome the glitter of unnecessary or unreliable information. Always be cautious of testimonials.
When education is needed to enhance the success of the ranch, consider the potential retention of different educational methods. Discrimination between good and bad information will be valuable at all levels of the learning pyramid (Figure 6). Most people will retain more education as the number of human senses and level of personal involvement increase. When you have clearly identified a subject, select educational opportunities in the lower part of the learning pyramid to improve your rate of understanding and application skills.

The ability to use or develop and explain decision making processes will become increasingly important in the long-term success of ranches. Clear explanation of how management, production, marketing and investment decisions are made to others will (1) improve peer communication and (2) enhance interest and success of other participants in the operation. A growing number of decision making models have been developed by land-grant universities, state and federal agencies and professional organizations for many areas of ranch management. These aids may be as simple as 1-page flow charts to interactive computer software in which "what-if" scenarios can be assessed. Most of these decision making guides could make ranches more efficient and enhance long-term success.

![Learning Pyramid](image)

**Figure 6.** The average retention of information presented or learned with different educational methods.
Literature Cited