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THE JOURNEY TO RECOVERY OF THE RANGE AFTER DROUGHT

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INTRODUCTION

A destination is implicit in considering a journey. While travel may be an end in itself, the notion of a journey most often incorporates a substantial change from current location or present conditions. This is particularly true for a "journey to recovery." It is essential to have a clear destination and a carefully planned route in order for the journey to have the desired outcome. Yogi Berra is reported to have captured the importance of knowing one's destination this way: "If you don't know where you are going, you might wind up someplace else."

A realistic understanding of drought is essential to appropriate planning and response when rainfall is short. "Average" rainfall is a misleading index of potential plant growth conditions for our region. The mathematical mean for precipitation is calculated from a few years when rainfall is above "normal" and more years that a below normal. Additionally, exceptionally dry years should not be unexpected. Cyclic drought is characteristic of arid and semi-arid areas of the world. Viewing drought as unusual or as a crisis is not realistic.

The Northern Great Plains are in the midst of a persistent climatic pattern of "below average" precipitation of 3 to 5 years duration. The severity of the current pattern is exacerbated by unusually favorable rainfall during the decade of the 1990s. Current conditions seem that much more serious by contrast. While optimism is always appropriate, the prudent manager prepares for the worst, rather than anticipating the best and suffering the consequences.

DESTINATION

For managers of rangelands, one goal of recovery should be high range condition – including a diversity of desirable plant species and healthy soil conditions. A consensus about the desirability of high range condition might be rapidly achieved among range cow-calf producers, the benefits are worth considering. Research initiated in 1942 at the Cottonwood Research Station in southwest South Dakota (Johnson et al. 1951), demonstrates the interaction of stocking rate and vegetation response (Figure 1).

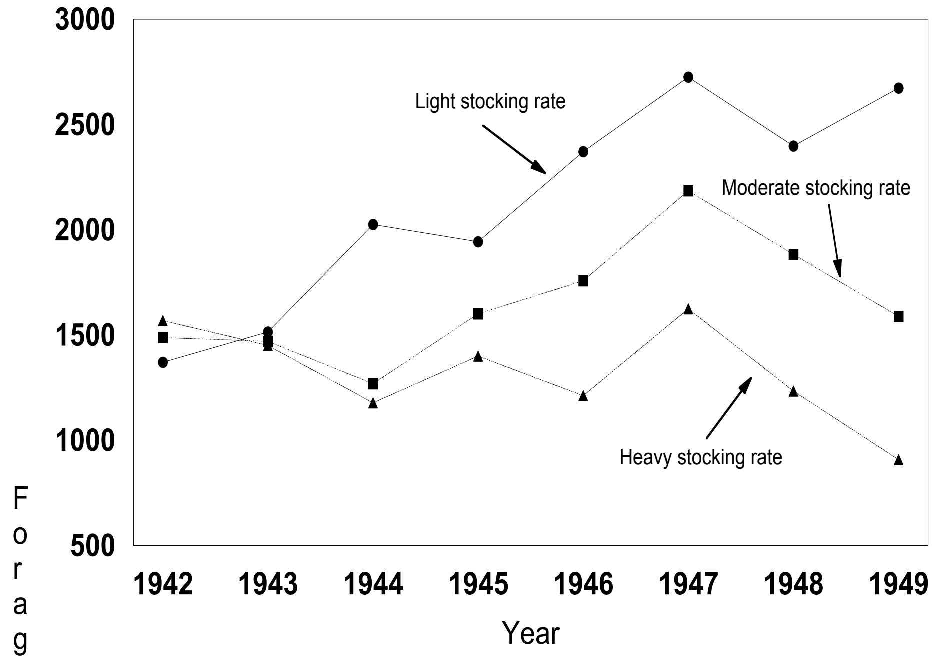

Figure 1. Forage production from pastures grazed at 3 stocking rates during summer at Cottonwood Station, SD from 1942 to 1949 (adapted from Johnson et al. 1951).

During a seven year period, dramatic changes in forage production resulted from light, moderate and heavy stocking during the summer. In this region, characterized in high range condition by a diversity of warm- and cool-season species, one consequence of overgrazing is a reduction in important cool-season midgrasses, particularly western wheatgrass, and an increase in warm-season short grasses (blue grama and buffalograss).

High condition range is also more resilient. Following dry years in 1962 and particularly after 1966, high condition range at Cottonwood returned to higher levels of production much more rapidly (Figure 2). Both higher forage production and more rapid recovery are desirable attributes of high condition range.

We are likely to first consider the characteristics of the vegetation, the species present and their abundance, associated with high condition range. After all, that is the source of feed for livestock and wildlife. Soil conditions are at least as important in maintaining resource productivity.

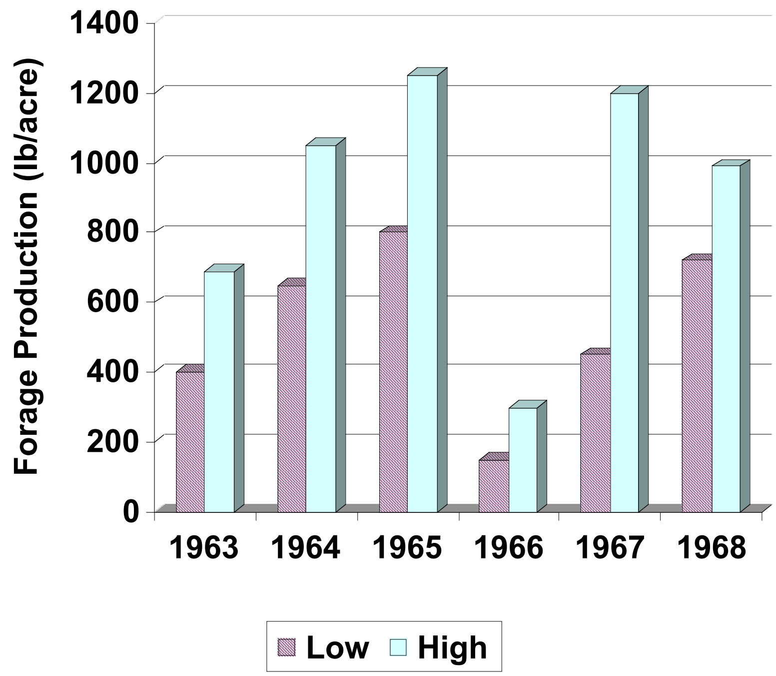

Figure 2. Drought and range condition (Low vs. High) effects on production at Cottonwood, SD (from Hanson et al. 1978)

Drought is perhaps most easily defined in meteorological terms. In fact, the Society of Range Management uses precipitation below 75% of normal for an extended period to define drought (Kothman, 1974). A more complex, but perhaps more functional understanding of drought, is based on soil moisture conditions which cause extreme stress and lead to lower plant production (Carr 1966). Soil moisture is influenced not only by precipitation, but infiltration and transpiration. High range condition promotes more rapid water infiltration, resulting in more complete "harvest" of rainfall (Figure 3). Closely related factors of grazing intensity (Figure 4) and resulting levels of litter (Figure 5) contribute to the infiltration of rainfall, improved soil moisture and enhanced plant growth. The "healthy cycle" perpetuates itself: greater plant growth enhances litter accumulation which benefits water infiltration.

An important destination of the journey of recovery would be **high range condition** and the resulting advantages of greater benefit from rainfall which does occur and high plant productivity.

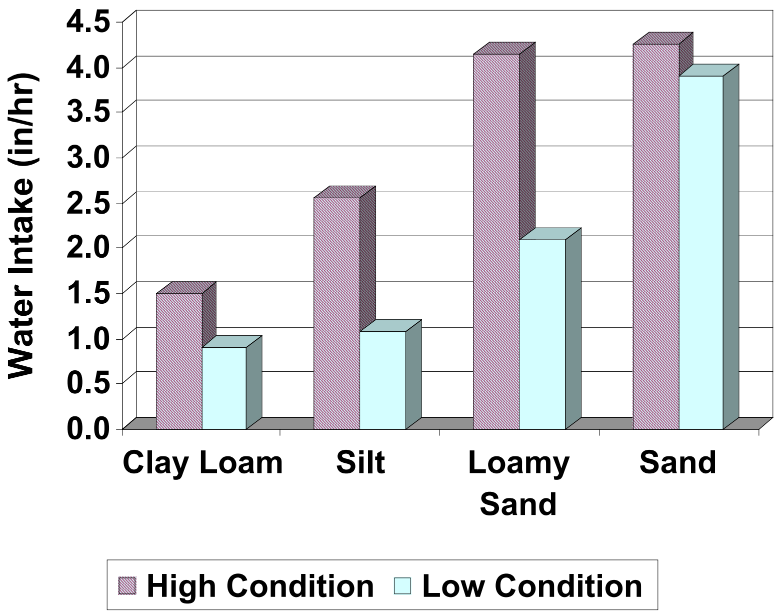

Figure 3. Range condition and soil texture influence on water infiltration. Adapted from Abouguendia, 1998.

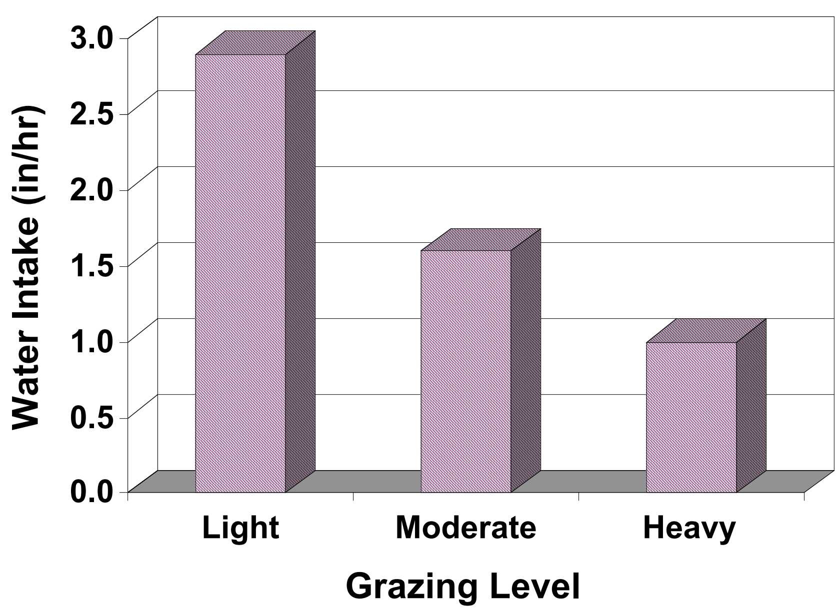

Figure 4. Grazing level modification of water infiltration rate. Adapted from Abouguendia, 1998.

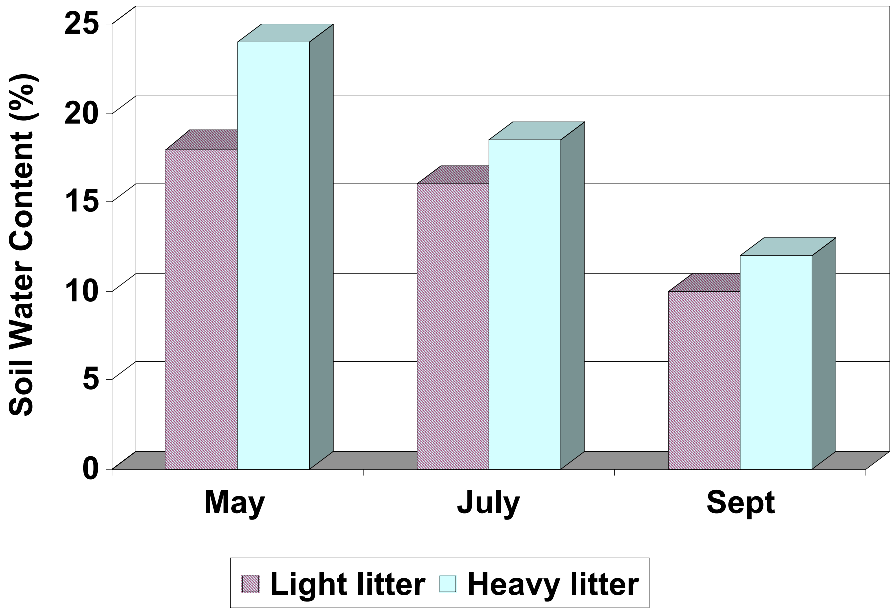

Figure 5. Litter effects on soil water. Adapted from Abouguendia, 1998.

BEARINGS

Reaching any destination depends first on knowing the starting point. Mariners would be foolish to set a course without first knowing their bearings. An inventory of current conditions is essential in making meaningful progress toward recovery. Historically well managed ranches, that have used conservative stocking rates and reduced stocking promptly in response to drought, are likely to have large areas in high range condition. A rapid return of plant vigor when moisture conditions improve could be anticipated. Gradual restocking would be appropriate. Anticipating large increases in production would not be realistic.

Where stocking rates have been more aggressive and destocking less rapid, some deterioration of range condition is nearly certain. Careful inventory, pasture by pasture, is the logical starting point for a recovery plan.

ITINERARY

"Plotting the course" to recovery requires careful utilization of a few well established biological principals. A widely repeated guide for rangeland management is "Take half and leave half." This principal is simply stated, but much more than trivial to achieve. It is not difficult to understand the importance of the "taken half." It supplies the nutrients which support livestock production. The value in the "left half" is less obvious and sometimes seems wasteful.

Vital functions of the vegetation residue remaining after grazing include:

1. Soil cover. Standing dead vegetation and litter reduce the impact of raindrops and promote water infiltration. Soil cover reduces crusting and protects against water erosion
2. Wind barrier. Air movement is much more rapid over bare soil, promoting evaporation and increasing the likelihood of soil erosion
3. Nutrient pool. Nutrients necessary for plant growth are available in standing dead and litter, released slowly through microbial activity. These nutrients can be lost through wind and water erosion
4. Snow capture. Snowfall is an important component of annual precipitation. Loss through blowing and drifting can significantly reduce spring soil moisture
5. Feed reserve. Standing carry over forage can be used as emergency feed. Difficulty occurs when use becomes frequent. The long term benefits from high residue levels are lost rapidly.

A realistic (and conservative) feed "budget" may be the single most important component of the recovery plan. A careful and accurate inventory of both range and other feed sources and projected animal inventory allows development of a feed budget which considers not only total feed available but the distribution of when feed is available. Anticipation of feed deficits precludes the costs associated with unplanned feed purchases. Making conservative estimates of rangeland productivity provides the greatest likelihood for recovery of the vegetation and acceptable levels of animal production. Considerable grazing research has demonstrated that moderate grazing intensities (50% use) avoid damage to the rangeland resource (Ganskopp and Bedell, 1981; Nelson, 1934; Weaver and Albertson, 1936; 1939; Paulson and Ares, 1961). Additional studies suggest that conservative stocking (35% use) provides financial returns similar or superior to moderate stocking with less risk (Holechek, 1992; Houston and Woodward, 1966; Martin, 1975; Winder et al., 2000). Conservative stocking has benefited depleted rangeland by increasing grazing capacity (Klipple and Bement, 1961; Paulsen and Ares, 1962).

A substantial obstacle to achieving planned levels of utilization is the difficulty in prediction plant production. While accurate long term prediction of rainfall or drought is difficult or impossible, helpful efforts have been made in anticipating rangeland productivity. Eight years of vegetation data from Miles City, MT indicated that regressions which included October and November precipitation explained 44% of the variation in total standing crop at initiation of the grazing season (Haferkamp et al., 1993). Fourteen years of data from the Saratoga area in south central Wyoming indicated that April precipitation alone was a better (43% correlation) predictor of annual forage production than any other combination of winter and spring precipitation variables (Peterson, 2002; Smith, 2002). Recent evaluation of historical data from Cottonwood, SD suggests that April through June precipitation is a useful index of season-long productivity (Table 1), explaining more than 40% of the variation encountered (Smart et al., unpublished). Early season standing crop is also indicative of animal performance during the grazing season (Heitschmidt et al., 1993).

While none of these predictive relationships is infallible, a clear principal emerges. At least in areas with relatively fine-textured soils, largely dependent on growth of coo-season species, spring growing conditions provide reliable indications of quantities of forage for the growing season. A wise manager with heed this "early warning system" and make provision for alternative feeds or a reduction in animal requirements by destocking. Avoiding overgrazing is always important to good rangeland management. It is doubly important following periods of plant stress, such a drought, to provide for recovery.

Destocking is never an attractive prospect. It is made more difficult if drought conditions are not expected and planned for. Maintaining a portion of the herd which is easily liquidated (yearlings, culls, "share" cattle) makes prompt destocking less unpalatable. When moisture conditions improve following a drought, rangeland should be restocked gradually, with a plan for rapid sale of movement of animals if conditions decline. Decisions to destock must be viewed as a short term loss (immediate financial return) which is being exchanged for longer term gain (improved range condition and resulting carrying capacity).

Long term benefits from improved range condition are clearly illustrated in a recent summary of data (Table 1) from Cottonwood, SD (Smart et al., unpublished). High range condition, associated with light stocking rates, always resulted in greater productivity than lower range condition associated with heavier stocking rates. Perhaps most striking is that production from high condition range in drought years was comparable to production from low condition range in the best years. Perhaps equally important, the decrease in production during years of low spring moisture is much greater than the production advantage experienced during wet years.

Table 1. Annual biomass production is related to April through June precipitation and range condition resulting from stocking rate history (Smart et al., unpublished).

	Precipitation			
Stocking Rate	Below 75% of Normal	Normal 7.8 inches	Above 125% of Normal	Average
	------- Forage Production lb/acre -------			
Light	**1420**	1850	1930	1730
Moderate	1030	1420	1630	1360
Heavy	850	1280	**1440**	1190
Average	1100	1520	1660	1430

Data includes years from 1942 through 1960 and 1997 through 2002

Inventory and planning are vital to recovery, but some investment in resource monitoring is equally necessary. Perhaps the least intensive investment results from maintaining current pasture records. Simple written logs of which pasture was grazed during a particular time period by a given number of animals can be a valuable aid to future planning. Additional value can be achieved from estimates of utilization levels achieved at the end of a grazing period. Descriptions about evidence of erosion, increases or decrease in litter accumulation, general plant vigor, increase in undesirable or weedy species and even diversity of wildlife encountered can provide valuable information about the progress of recovery. Without an evaluation of trends (positive or negative) it is difficult or impossible to make “mid course corrections.”

Important components of a recovery plan include:

1. Anticipate below “normal” - have a response plan for severe shortages
2. Destock promptly - maintain a portion of the herd that can be liquidated, be alert to warning signs from spring conditions
3. Be willing to exchange short term losses for long term gains - understand the benefit of improved range condition and associated productivity
4. Avoid the temptation of feed subsidies - Payments reward poor resource management rather than prompt destocking. Short term financial gain will not offset the loss in resource productivity
5. Restock gradually - monitor the response of vegetation and soils.

Jared Diamond (1999) proposes the *Anna Karenina* principle in his recent examination of the role of food production in human history. Leo Tolstoy begins his novel by that name with these words: “Happy families are all alike; every unhappy family is unhappy in its own way.” Diamond applies this holistic principal to, among other things, large mammals and their suitability for domestication. The principle is equally applicable to successful ranches. A large number of positive characteristics are common to successful operations. Among these might be listed: consensus about and commitment to objectives and goals, careful control of capital investment, astute use of purchased feed, excellent animal health, aggressive marketing, etc. Failing operations may succeed at many of the needed attributes, but **all** must be in place to achieve stability and longevity. Careful management of the range resource is only one of the attributes necessary for a successful range cow enterprise, but it is foundational.

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