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Range Condition:

Key To Sustained Ranch Productivity

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Have you ever heard a rancher say "*Sure I raise livestock, but more importantly, I raise grass*"? Forage serves as the foundation for all range livestock and/or wildlife enterprises. The "state of health" of that forage directly influences both short-term cash flow and sustained ranch productivity. Therefore, ranch operators must understand and utilize techniques that continually monitor the condition of the forage base and how it is affected by past grazing management decisions. This information is your key to sustaining ranch productivity.

What is range condition?

Range condition, often described as rangeland's "state of health," is an ecological measure of the current condition of the range as compared to the potential (often called "climax"). Plant species composition is the criteria used to make this determination.

Range condition is evaluated for each range site on a ranch. Range sites are areas with the potential for producing similar amounts and kinds of vegetation (for example, shallow hillside site, deep upland site, draw site, etc.). Sites are determined by climatic, soil, topographic and vegetation features. A complete listing and description of all range sites on a ranch can be obtained from the Soil Conservation Service (SCS).

Range condition is determined by comparing the present vegetation composition to the potential, as described by the SCS technical guide. For example, the predicted species composition of a desert grassland-loamy range site at its highest ecological potential is 90 percent

Table 1. Species composition from SCS Technical Guide for a Desert Grassland - Loamy Range Site.

Grasses	90%	Woody	5%	Forbs	5%
Sideoats Grama		Hackberry		Orange Zexmenia	
Plains Bristlegrass		Littleleaf Sumac	1	Bush Sunflower	5
Cane Bluestem	20	Tarbush	2	Indianmallow	
Arizona Cottontop		Rosenbush			
Green Sprangletop		4-wing Saltbush	1		
Bush Muhly		Vine Ephedra			
Black Grama	10	Woody Vines	1		
Sand Dropseed	10				
Tobosa	20				
Perennial Threeawns	15				
Vine-Mesquite					
Buffalograss	15				
Burrograss					

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grass, 5 percent woody species and 5 percent forbs (Table 1).

Using the technical guide description, 20 percent of the total vegetation will be a combination of sideoats grama, plains bristlegrass, cane bluestem, Arizona cottontop and green sprangletop. Ten percent will consist of a combination of bush muhly and black grama. Sand dropseed will contribute to 10 percent of the total plant community. The rest of the species contributing to the "climax" plant community are listed in Table 1.

Table 2 summarizes the *actual* range condition of a loamy range site on a hypothetical ranch in West Texas. Sideoats grama, plains bristlegrass and cane bluestem make up 26 percent of the plant community. No Arizona cottontop or green sprangletop exists. Since only 20 percent of this combination (sideoats grama, plains bristlegrass, cane bluestem, Arizona cottontop and green sprangletop) is present in the "climax" community (Table 1), only 20 percent can be counted toward the condition score in the far right column (Table 2).

A total of 10 percent of the "climax" plant community can consist of a combination of bush muhly and black grama (Table 1). Only 3 percent (2 percent + 1 percent, respectively) was present, thus only 3 percent is counted toward the condition score (Table 2).

Creosotebush totaled 6 percent of the plant community. Since creosotebush is not present in the "climax" community, none can be counted toward the condition score, and a zero is entered in the far right column (Table 2).

Range condition of a site is then determined by totaling the condition scores for all species present (Table 2). The number obtained (0 to 100 percent) can be divided into four classes:

Excellent condition = 76 to 100% of the climax community
Good condition = 51 to 75% of the climax community
Fair condition = 26 to 50% of the climax community
Poor condition = 0 to 25% of the climax community

The example presented in Table 2 totaled 52 percent, or low-good range condition.

Table 2. Illustration of information collected to determine range condition (example corresponds to Desert Grassland - Loamy Range Site).

	Number of Observations	Percent Composition	Percent Allowed	Condition Score
Grasses				
Sideoats Grama	14	7%		
Plains Bristle	6	3%		
Cane Bluestem	32	16%		
Sub-total	52	26%	20%	20%
Bush Muhly	4	2%		
Black Grama	2	1%		
Sub-total	6	3%	10%	3%
Sand Dropseed	42	21%	10%	10%
Perennial 3-awns	38	19%	15%	15%
Woody Plants				
Hackberry	6	3%		
Littleleaf Sumac	2	1%		
Sub-total	8	4%	1%	1%
Tarbush	22	11%	2%	2%
Creosotebush	12	6%	0%	0%
Forbs				
Orange Zexmenia	1	.5%		
Indianmallow	1	.5%		
Sub-total	2	1%	5%	1%
Desert Holly	18	9%	0%	0%
Grand Total	200	100%		52%

How does range condition differ from forage condition?

The terms range condition and forage condition are often used interchangeably, although their meanings differ greatly. *Range condition* is the current ecological condition (as determined by species composition) of range as compared to its ecological potential. *Forage condition* relates to aspects such as the quantity of forage available and its nutritional qualities (protein, energy, minerals and palatability). *Range condition changes gradually over a period of years.* Forage condition can change in a few days.

Why is range condition important to me?

As range condition improves, the number of different plant species growing on a specific range site usually increases. Greater species diversity improves both the stability of the plant community over time and the diet quantity and quality available to the grazing animal.

Overall plant production and stability of a range site improves as range condition improves because shallow-rooted plants (annuals or sod-forming perennials) are replaced by deeper-rooted, perennial bunch grasses. This species shift creates better overall soil hydrologic conditions. Rainfall infiltration rates increase while evaporation and soil erosion decrease. These factors along with more efficient use of water within the soil profile by deeper-rooted plants results in greater forage production and stability.

Ranchers use the step-transect method to determine range composition.

Improved livestock production depends on higher range condition classes. Livestock are selective grazers. With higher condition classes, grazing animals can select from a greater diversity of plant species, thus maintaining a more optimum plane of nutrition. Diet quality levels will also vary less from season to season and year to year as compared to lower range condition classes.

Photo-points can provide a record of range condition and trend.

How do I determine the species composition of my rangeland?

Species composition can be quickly and easily determined using the step transect method. In this sampling technique, one walks in a predetermined direction from a permanently marked location inside a range site. At every other step, the person records the species of plant closest to or underneath the toe of his or her boot. A minimum of 100 plants are needed, although 500 plants would be optimum to ensure accuracy. Once the desired number of plants are recorded, the percent composition for each species can be calculated (for example, 5 burrograss plants per 100 plants recorded = 5 percent). These percentages should be compared to the SCS technical guide figures for that site to determine range condition.

Sampling should be restricted to specific range sites without crossing range site borders. When time is limited, give range sites receiving the most grazing pressure highest priority. Time requirements using this method are 30 minutes to two hours per site, depending on the number of plants recorded.

Since range condition changes relatively slowly, this method has no specific season

when it must be conducted. However, fall is usually best because plants (especially grasses) are more easily identified at that time. All step transect lines should be reevaluated every two to three years.

What is range trend?

Upward, downward or stable are terms describing range trend. Range trend is determined by comparing range condition at two points in time, at least three to five years apart. Caution should be used when interpreting range trend. Very good or very poor precipitation years can affect species composition. Precipitation records to supplement trend information will aid accurate interpretation.

How do I monitor range trend?

Step transects. The same data collected by step transects to determine range condition also indicate range trend. When range condition is known for two or more points in time (usually three to five years apart), the direction of change can be determined.

Photo-points. A photographic record can provide an effective, objective measure of range trend. The first step to using photo-points is to locate the key range sites within a ranch. Within each range site, areas are selected to represent the site as a whole. The number of areas selected may be few or many, depending on the size of the ranch and number of sites present.

A plot frame (at least 3 feet x 3 feet) is constructed from rebar or PVC pipe. At each selected location, the frame is randomly placed and then permanently marked by driving steel stakes at two opposite corners. Thus marked, the frame can be placed in the exact same location each year. A picture is then taken of the frame and the vegetation inside. Notes describing the vegetation within the frame and a photograph of the general landscape around the frame will be helpful.

One to several photo-points may be located in an area. The total number should not exceed what time the manager can spend evaluating. Photos of each plot frame should be taken on an annual basis, preferably in the fall of the year. Almost any type of camera or film can be used. Most of the time associated with this technique will be involved in traveling to and finding the photo-points.

Comparisons between two or three photographs and their descriptions for the same frame over time provides an objective measurement of range trend. One day devoted to this monitoring method each year, can be one of the most effective management tools for evaluating past grazing management decisions.

Exclosures. The use of exclosures to evaluate range trend involves excluding livestock and/or wildlife from grazing in specific areas. The differences between protected and grazed areas can then be used to make decisions concerning stocking rate and long-term range trend.

As with photo-points, the first step is to identify key range sites within the ranch. At least one exclosure should be located within each of these key sites. Exclosures can be constructed from simple materials. A few steel fence posts and wire can be used to fence off permanent areas, or mobile cages can be constructed using concrete reinforcement wire. Size of the exclosures can vary from a few square feet to thousands of square feet.

Periodic examination of the differences between the exclosures and grazed areas will give gross estimates of range utilization and trend. It may be helpful to take occasional photographs of the protected and grazed areas. Combined with detailed notes, these photos will document change over time.

Exclosures enable ranchers to monitor the amount of production compared to the grazed pasture

How do I improve range condition?

The single most important factor affecting range improvement is livestock stocking rate. Animal numbers must be balanced with forage supplies for range condition to be maintained or improved. All grazing systems and range improvement practices should follow this

principle. To obtain range condition improvement, any increases in forage production must precede increases in stocking rate, not vice versa.

Periodic rest from grazing is necessary if range condition is to improve. This rest should be staggered at different times of the year to allow all forage species some relief from grazing pressure. A grazing system should be used to provide needed rest. Many grazing systems are available ranging from low-intensity, two pasture-one herd switchbacks to high-intensity, multiple pasture-one herd short duration grazing systems. Some grazing systems favor range improvement over individual animal performance. Others favor the opposite. In many instances, the grazing system used to obtain range improvement is not the system used to maintain the achieved level of range condition.

The species of livestock grazed (cattle, sheep or goats) also impact range improvement. Different livestock species select different types of plants (grass, forbs or browse). To ensure optimum utilization of the total forage base, multiple species of livestock can be grazed together. The selective grazing behavior of livestock can also be used to manipulate vegetation. For example, goat numbers can be increased in relation to other species of livestock if a ranch manager wishes to favor the herbaceous component of a pasture over the woody.

Instances may occur when further improvement in range condition through grazing management (proper stocking rate, species of animal grazed and pasture rest) is too slow or not possible because of undesirable woody plants. In these cases, it may be necessary to apply control methods to accelerate range improvement. Control methods may be herbicides, fire, mechanical, biological (i.e. goating) or any combination of methods. Such methods, while capable of accelerating range improvement, often require substantial financial investment.

How fast does range condition change?

Two factors greatly influence the rate at which range condition changes. The first is the *average annual rainfall* received. In the more humid areas of the state (30 to 40 inches/year), range condition may improve from fair to good condition in two to three years with proper grazing management. In arid west Texas, with an average annual rainfall of 10 inches, that same increase may take five to 10 years.

The rate of change is also influenced by the *present stage* of range condition. Range in extremely poor condition generally exhibits slow improvement because of woody plant invasion, a lack of seed source of desirable plants, poor soil hydrologic conditions or soil loss.

As range condition moves from poor to fair and then good condition the rate of improve-

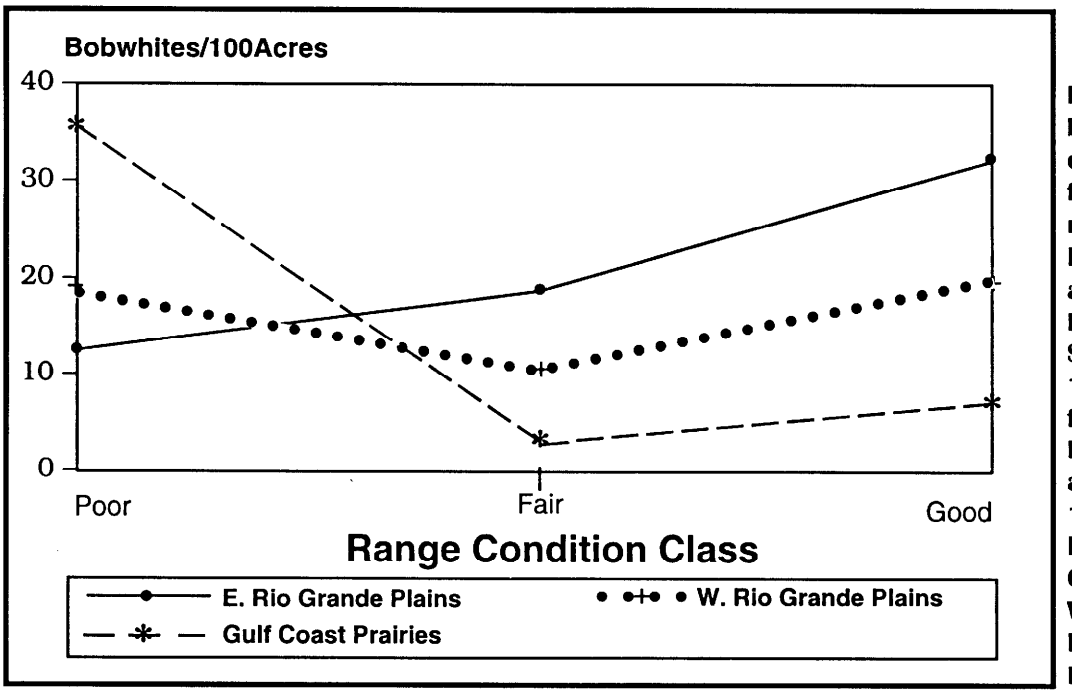

Figure 1. Mean bobwhite density on sites in poor, fair and good range condition, Rio Grande Plains and Gulf Coast Prairies of Texas, September-October 1989. (Adapted from Spears, Rice, Demaso, Zaiglin and Guthrey. 1990. Annual Report 1989-1990. Ceasar Kleberg Wildlife Research Institute, Kingsville, TX.)

ment increases. Improved soil hydrologic condition and a greater seed source and vigor of desirable plants are causative factors.

As rangeland approaches excellent condition, the rate of improvement usually decreases. Often excellent condition range (especially mid- to high-excellent condition) may be difficult to maintain with grazing animals. In fact, if rangeland has suffered soil loss due to previous overuse, it may be impossible to ever reach excellent condition.

Conversely, range condition declines at a greater rate when poor management is applied to higher range condition classes. But as range condition approaches poor condition, the grazing animal has less and less impact on the vegetation base because of toxicity and unpalatability of existing plants.

What range condition class is best for me?

In general, higher levels of range condition help ensure sustained ranch productivity by reducing soil erosion, slowing the invasion of undesirable plants into pastures, maximizing water-use efficiency and providing a productive and stable plant base. However, for some ranchers, management to obtain excellent condition rangeland may not be a practical goal.

Range condition is an ecological measurement of potential range productivity without regard to grazing influences. The optimum range condition for profitable and sustainable livestock or wildlife grazing may differ significantly from the ecological definition of excellent condition rangeland. The optimum range condition may also differ depending on the type of livestock or wildlife enterprises used.

For example, sustained cattle productivity is generally best achieved with good to excellent range condition. Sheep and goat production usually reaches optimum levels at a lower range condition class than cattle (high-fair to good). White-tailed deer production is generally best on range in fair to good condition, while the optimum range condition for bobwhite quail varies from poor to good condition, (Figure 1). The optimum range condition for each range site on a ranch is determined by balancing ecological with enterprise/ranch economic needs.

The best range condition is also the one that is achievable. Factors such as past grazing affect the rate and level of range condition improvement possible. If a pasture or ranch has been seriously overgrazed for a long time, soil loss may restrict the maximum obtainable range condition to significantly less than excellent condition.

It is common for undesirable woody plants to invade rangeland. Woody plants often limit the level and rate of range improvement. Expensive inputs such as herbicides or mechanical control may be required to achieve excellent range condition. Livestock and/or wildlife grazing may not financially support these inputs.

Finally, the determination of what exact vegetation mix constitutes excellent condition rangeland for a specific site is not without error. The climax plant community for a range site is usually determined by evaluating relict areas (areas with long-term protection from disturbance). How accurately these areas depict the potential for a particular site can be highly variable.

In summary, if excellent condition rangeland is not achieved a rancher should not be unduly concerned. Concern should arise if he or she is unable to move above poor to fair condition rangeland or if range trend shows a steady decline in range condition. Low or declining range condition equates to a loss of future sustainable production.

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