

# The Grazing Response Index:

## A Simple and Effective Method to Evaluate Grazing Impacts

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**M**onitoring is the process of gathering information about plants and the rangeland system response to a grazing regime to make informed adjustments. The intent is to maintain or improve the resource and create a sustained output of animal products, clean water, and wildlife habitat. This means that monitoring must provide information that is useful in making the decisions to be made. Filling file cabinets with data was never the intent of monitoring.

The term **over-grazing** is one that is used rampantly but it is rarely defined. Over-grazing is a process of repeated, selective use of the best, most palatable plants in a grazing environment. This graze and regraze process has profound effects on the individual plants which ultimately changes the plant communities. Thus **over-grazing** is a process of loss of productivity and/or death of a select group of plants that are excessively pressured by grazing animals.

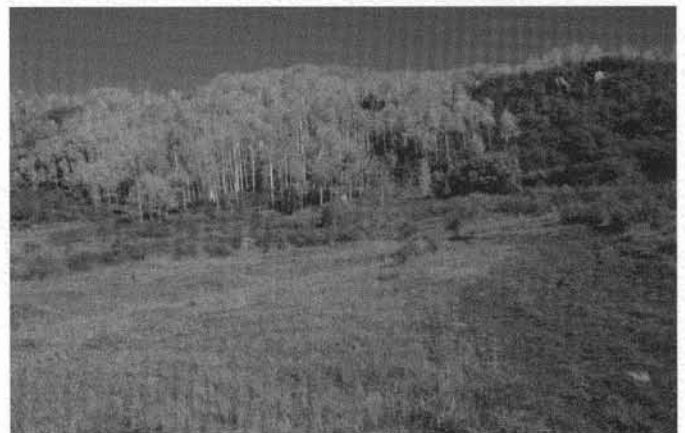
During the 1990's range management began to include length of time and time of year in evaluating the impacts of grazing. Recently the Colorado State University Range Extension Program working hand-in-hand with the Integrated Resource Management Program, developed the Grazing Response Index to help range managers better evaluate the effects of grazing on plants. The Rocky Mountain Region (R2) of the Forest Service has adopted this approach and found it to be effective, simple and easy to communicate.

### General Discussion

The Grazing Response Index (GRI) was developed to assess the effects of grazing during the current year, and aid in planning the grazing for the following year. The GRI is based on general assessment of grazing use that occurs during the current growing season. It is necessary to understand plant physiology and plant responses to grazing to use the GRI. The GRI considers three concepts related to plant health in evaluating the impacts of grazing - frequency of defoliation, intensity of defoliation, and opportunity of the plant to grow or regrow.



*Cunningham Stomp, Terror Creek. Taken by H.P. Gaylor, November 6, 1940. Site now called Round Corral Park.*



*Photo retake of Cunningham Stomp, Terror Creek. Site now called Round Corral Park. Photo taken October 1, 1997 by David Bradford.*

### Frequency

Frequency refers to the number of times forage plants are defoliated during the grazing period. It is dependent on the length of time plants are exposed to grazing animals (grazing period). Seven to 10 days are required for a plant to grow enough to be grazed again during late spring or early summer (Briske, 1986). Therefore, the most selected plants in the grazing area, that are exposed to animal grazing during this growing period are potentially subject to being grazed once for each 7 days of that grazing period. **Remember, overgrazing is the repeated, selective use of the best, most palatable plants.**

This portion of the index is derived from plant clipping research. Plants were clipped at various intensities and frequencies to determine the influence of frequency and intensity of defoliation on plants (Branson, 1956; Mueggler, 1972). Individual tiller defoliation studies (Briske, 1986) indicated that three or more successive defoliations of a plant in one growing season was detrimental to the plant and, if continued, would reduce the plants ability to be productive and/or remain a viable part of the plant community (Ellison, 1960).



West Terror C&H. Photo taken on September 17, 1947 by Carl F. Henderson as part of a range inspection. Henderson described the site "Round Corral Park on West Terror showing active gully erosion and heavy browsing or snowberry. Complete utilization of bluegrass.



West Terror C&H. Photo retaken on October 1, 1997 by David Bradford. Observed changes are: gullies are healed over; old road to cow camp is noticeable but also revegetating; conifers on hillside have increased; snowberry has increased; willows have come in on main draw; all woody species, oak-brush, cottonwood and spruces are older and taller.

To obtain an estimate of how many times plants were, or will be, defoliated during a grazing period, divide the number of days in the planned grazing period by 7, or up to 10 if growth is slower. Using 7 is more conservative, because it will give the highest probable number of times the plants could be grazed. An index value of +1 to -1 is assigned as follows:

Number of Defoliations	Value
1	+1
2	0
3 or more	-1

A value of +1 is a general indicator that the plants grazed will respond quite positively to that influence. More importantly if that grazing regime were to continue the plants would continue to be favored by that frequency of defoliation. A 0 value is indicative of the plant's being neutral to the defoliation event - being neither severely depressed or enhanced. A -1 value is a clear indication that the current frequency of defoliation is excessive and continued grazing at that frequency will have a negative influence on the plant.

Local knowledge of the area is needed to determine how fast plants are growing and whether to use the values of 7-10 days as the divisor in calculating the index.

### Intensity

Intensity is a description of the amount of leaf material removed during the grazing period. This is not an estimate of forage utilization. The primary concern is the amount of photosynthetically active material remaining for the plant to recover from defoliation. Generally defoli-

ation of less than 50% of the leaf material allows enough leaf area to meet the plants needs and will not inhibit subsequent plant growth. Intensity for the purposes of the index is described using three levels of defoliation—light, moderate and heavy. These terms are sufficient to handle the description of levels of defoliation for almost every grazing situation.

The intensity of defoliation has long been recognized as an influencing force on plant responses. The effects of defoliation are more a factor of leaf material remaining after the defoliation event than a reflection of the amount of material removed (Hyder, 1972). It is clear the plant that has relatively more leaf area surface remaining after defoliation is going to respond better than one that has relatively less.

The GRI uses the following values for describing intensity of grazing:

Level of Defoliation	Percent Utilized	Value
Light	< 40%	+1
Moderate	41-55%	0
Heavy	> 56%	-1

Light use, assigned a +1, would be expected to foster positive plant responses because most of the leaf material is still remaining. Moderate use, assigned a 0 value, would be expected to have a neutral effect on the plant, allowing it to maintain itself and its current status in the community. Heavy use, assigned a -1 value, would inevitably cause the selected plants to decline in vigor; if that level of defoliation were to continue over several years. Use of cages in representative areas is helpful in determining what the level of use was during the grazing



West Terror C&H. Temporary electric fence used to create the east 1/2 low range (right) and west 1/2 low range (left). The right side was grazed June 27–July 16, 1998. Photo by David Bradford.

period. These cages must be moved each year to avoid the effect of long-term deferment and the snow accumulation effect.

### Opportunity

Opportunity is the amount of time plants have to grow prior to grazing or to regrow after grazing has taken place. The opportunity of the plant to grow and recover after the grazing period is critical to maintaining the plant. The plant must be able to fully store energy at some time during the active growth period. The inference to grazing management is that the grazing program must either allow plants full growth of leaves before grazing use or allow for full recovery after grazing

use for the key plants to maintain themselves. If this is done, even the effects of relatively high frequency use or relatively heavy use can be mitigated.

Opportunity is related to both the time of year and amount of time that grazing occurs (time and timing). Of the three factors in the GRI, opportunity is most strongly correlated to long term health and vigor of the vegetation. The opportunity for plants to grow or regrow is dependent on soil moisture, temperature and leaf area. Since this factor is so important in sustaining healthy plants, the relative rankings are doubled in value.

<u>Opportunity to Grow or Regrow</u>	<u>Value</u>
Full Season	+2
Most of Season	+1
Some Chance	0
Little Chance	-1
No Chance	-2

Determining opportunity is a judgment call based on appearance of vegetation at the end of the growing season. If the plants look like they were not grazed or just barely grazed, then a value of +2 is appropriate. If the plants look like they were used, but regrew fairly well, then give a rating of +1. Obviously, if the area has the appearance of being heavily used, with no regrowth, assign a -2 value. If the plants had full opportunity for growth before the grazing period, the index value would be +2 in this situation as well.

Even though opportunity is based upon appearance of the vegetation at the end of the growing season, there are some general guidelines that can help make the determination. For example a pasture or allotment that is used season-long can be expected to rate -2 (no chance for growth or regrowth). An allotment with 2 pastures may provide some chance for growth and/or regrowth resulting in a rating of 0 or -1. An allotment with multiple pastures that are used at different times of the year, or rested, will usually receive the higher ratings of +1 and +2. The most important aspect in evaluating opportunity is that it is based on field observations on whether the plants had full opportunity to grow or regrow.

### Overall Rating - GRI

The values for frequency, intensity and opportunity are additive. The overall rating of the expected response to grazing is the sum of all three values. This result is a numerical value that is either positive, neutral, or negative. As implied a **positive** value indicates the management is **beneficial** to the health, structure and vigor of the plants. Conversely a **negative** value indicates that the management is **harmful**. A **zero** (0) rating is **neutral**. The index is a simple way to incorporate a number of factors into the evaluation of whether a grazing system is providing long-term beneficial, neutral or harmful effects to rangeland plants

The use of the index in making management decisions is the critical link. Without that step this and all other ac-



quisitions of observations are simply data. The power of the GRI is that it is concretely linked with mechanisms that control plant response to grazing. It is also linked with three factors in grazing management that can be managed—the **duration of grazing use, stocking rate and season of use**. *Frequency* is a function of **duration of use**. If the index indicates the plant responses are likely to be negative, changing the duration of the grazing period will alter the plant response. The *intensity* of use is linked with the relative **stocking rate** of the area grazed in the pasture. If the intensity index is high in most pastures on the ranch or the index is consistently high in one or more pastures year after year, the stocking rate is too high. Since *opportunity* is based on plant growth or regrowth, this quite clearly is influenced by **season of the year** and timing more than the other factors. Spring grazed pastures must have enough soil moisture remaining at the end of the grazing period to allow the plants to recover.

## Conclusion

Is this type of evaluation useful? We certainly think so. The GRI provides a more comprehensive method to evaluate the effects of current management. It allows managers to evaluate a number of factors in a simple yet effective manner. It provides feedback to managers quickly. The information from the GRI allows managers to make adjustments to grazing without major investments of money and time. Our grazing permittees, environmentalists and members of the general public all like the approach. They appreciate it because it is easy to communicate and it is based on general observations rather than time-consuming, precise measurements.

The GRI is not intended to be the only method for resolving major rangeland conflicts. It should be used for monitoring when resource issues are considered to be of low to mid-level intensity. For situations with significant resource conflicts, other more intensive monitoring strategies should also be utilized. This approach should be coupled with other longer term monitoring methods including range condition and trend as well as photos to allow interpretation of range plant community responses.

The Grazing Response Index is a simple but useful tool. It is helping us on the Grand Mesa, Uncompahgre and Gunnison National Forests. We like it because it is providing feedback on our management and keeping us focused on real impacts of grazing.

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