



## APPENDIX F GRAZING RESPONSE INDEX

*(Excerpt from USFS Rocky Mountain Region Rangeland Analysis and Management Guide)*

### Exhibit GRI: Grazing Response Index R2 2200 GRI

#### General Discussion

The Grazing Response Index (GRI) is used to assess the effects of annual grazing pressures, and the effects of repetitive defoliation during the growing season. Understanding plant physiology and plant response to grazing is essential in the development of allotment management plans. Consequently, there is a need for a monitoring tool which adequately estimates rangeland use due to grazing. The tool must not only assess how much of the plant was grazed, but also when the plant was grazed and how many times it was defoliated during the growing season. GRI can be an effective tool to assess grazing systems or complications associated with situations such as early season big game use followed by livestock use.

The Grazing Response Index was developed to assess effects of use during the current year, and to aid in planning the grazing pattern for the following year. Consequently, GRI is based on general determinations of annual grazing use. GRI is not intended to be the only method for resolving major conflicts. *It should be used for situations where resource issues are considered low to mid level intensity.*

GRI considers three key concepts related to plant health: frequency, intensity, and opportunity.

#### Frequency

Frequency is the number of times forage plants are defoliated during the (actual or planned) grazing period.

It is dependent on the length of time plants are exposed to the grazing animals. Approximately 7-10 days [are] required for a plant to grow enough to be grazed again during late spring or early summer when plants are experiencing rapid growth. Local knowledge of the area is needed to determine how fast the plants are growing.

To obtain an estimate of how many times plants were (or will be) defoliated during a grazing period, divide the number of planned grazing days 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 to as follows:

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

#### Intensity

Intensity of defoliation is the amount of leaf material removed during the grazing period. The primary concern is *the amount of photosynthetically active leaf material remaining for the plant to recover from grazing.* This is not an estimate of percent utilization; generally, less than 40 percent defoliation will not inhibit plant growth. It is related to stocking rate. Intensity is described using three general levels of use.

Amount of Use	Percent	Value
Light	< 40 percent	+1
Moderate	40-55 percent	0
Heavy	> 55 percent	-1



## Opportunity

Opportunity is the amount of time plants have to grow prior to grazing or regrow after grazing. This factor is related to time of use. Opportunity is the one factor most highly related to long term health and vigor of the vegetation. It [is] dependent on soil moisture, temperature, and leaf area. This factor is very important for sustaining healthy plants, thus the relative rankings for this attribute are doubled.

The index values for opportunity to grow or regrow forage are as follows:

Opportunity to Grow or Regrow	Value
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 used, then a value of +2 is appropriate. If the plants look like they were used, but regrew fairly well, then use +1. Obviously, if the area has the appearance of being heavily used with no regrowth, assign a -2 value.

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 you make the determination. For example a pasture or allotment that is used season long can be expected to rate -2 (no chance). An allotment with 2 pastures will likely be in the 0 (some chance) or -1 (no chance) range. Allotments with multiple pastures that are used or rested at different times each year will usually receive the higher ratings of +2 or +1. These guidelines can help you get started, but the final rating should be based upon the appearance of the vegetation.

## Overall Rating

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. The index is a simple method to evaluate whether the grazing system has long term beneficial, neutral, or harmful effects to the rangeland forage. GRI gives a more comprehensive basis to plan future use that will maintain or improve plant health, structure, and vigor.

*This index is based on grazing use that occurs during the growing season. This only marginally applies to grazing use when plants are dormant. Dormant season usually occurs after plants have had full opportunity to grow prior to use, hence an opportunity value of +2. Also, intensity is not as critical a parameter during the dormant season, because we are not concerned with producing regrowth.*

## Training

The GRI method does not require intensive training. Examiners can develop their eye for estimating light, moderate, or heavy use. This coupled with practical observations of timing and time of use will provide the information needed.

## Personnel and Equipment

With a small amount of training, an individual can assess the amount of use and correlate that use to both time and timing of the grazing period. Form R2-2200-GRI is used to record data for each area of interest.

## Sampling Procedure

Areas important to observe are: representative, special (critical or key areas), or treatment areas. The examiner should be familiar with the presence of these areas in the allotment or pasture to be rated. Also, it is important to have an idea of whether only one primary plant species, a group of species, or all forage plants in the area are to be monitored. The examiner should spend enough time to become familiar with grazing use patterns and levels of use across the area being rated. Rate the characteristics, record their ranking on the GRI form, and sum the rankings to obtain the GRI Index.



### Grazing Response Index (R2-2200-GRI)

<b>Forest</b> Bighorn NF	<b>District</b> Buffalo Rd	<b>Spatial ID</b> FS 02 12 10 373010830 0045 94
<b>Allotment Name and Number</b> Table Mountain	<b>Pasture</b> Pat Park	
<b>Kind/Class &amp; Number of Animals</b> 825 C/C	<b>Period of Use</b> 6/1 - 7/15	<b>Actual Use</b> 1238 Animal Months
<b>Date</b> 07/21/94	<b>Examiner(s)</b> J. Dawkins	

# of Defoliations	Value
1	+1
2	0
3	-1

Amount of Use	Percent	Value
Light	<40 percent	+1
Moderate	40-55 percent	0
Heavy	>55 percent	-1

Opportunity to Grow or Regrow	Value
Full season	+2
Most of season	+1
Some chance	0
Little chance	-1
No chance	-2

Pasture	Frequency	Intensity	Opportunity	Total GRI
1	+1	-1	+1	+1
2	0	0	-1	-1
3	0	0	+1	+1
4	-1	-1	-2	-4
5	+1	0	+2	+3
6	0	0	+1	+1
7	+1	+1	-1	+1
8	-1	0	-1	-2
9	0	+1	0	+1
10	0	-1	+1	0

#### References:

Caldwell, M.M. 1984. Plant requirements for prudent grazing. From: Developing strategies for rangeland management. Westview Press, Boulder CO. pp 117-152.

Richards, J.H.; Caldwell, M.M. 1985. Soluble carbohydrates, concurrent photosynthesis and deficiencies in regrowth following defoliation: a field study with Agropyron species. Journal of Applied Ecology 22:907-920.

Pond, F.W. 1960. Vigor of Idaho fescue in relation to different grazing intensities. Journal of Range Management 13:28-30.

Mueggler, W.F. 1972. Influence of competition on the response of bluebunch wheatgrass to clipping. Journal of Range Management 25:88-92.



### Grazing Response Index

Use this method to evaluate each pasture, or several sites within a pasture. Each row represents one GRI rating. **To determine the GRI, add all three values (frequency, intensity, and opportunity)** and record the sum in the Total column. Several sites within a pasture can be averaged to obtain an overall rating for the entire pasture. Complete the Site Information Form for each site or pasture.

Unit Name \_\_\_\_\_ Pasture Name \_\_\_\_\_

Transect ID \_\_\_\_\_ Date \_\_\_\_\_ Observer \_\_\_\_\_

Grazing System \_\_\_\_\_ Season of Use \_\_\_\_\_ to \_\_\_\_\_

# of Defoliations	Value
1	+1
2	0
3	-1

Amount of Use	Percent	Value
Light	<40 percent	+1
Moderate	40-55 percent	0
Heavy	>55 percent	-1

Opportunity to Grow or Regrow	Value
Full season	+2
Most of season	+1
Some chance	0
Little chance	-1
No chance	-2

[illegible]