Ranchers' Monitoring Guide

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BUREAU OF LAND MANAGEMENT

Nevada Department of AGRICULTURE

Nevada Cattlemen's Association

Nevada Farm Bureau Federation

RANCHERS'

MONITORING

GUIDE

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- ***USDA Forest Service***
- ***Natural Resources Conservation Service***
- ***College of Agriculture, Biotechnology and Natural Resources, University of Nevada, Reno***
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- ***Nevada Agricultural Foundation***
- ***Nevada State Grazing Boards***
- ***Nevada Range Resources Commission***

Some of our valuable partners have had the opportunity to review and support this guide. Many of those individuals and organizations are a significant part of the sustainable management of Nevada's rangelands. Thank you for interest and we hope this guide serves you well.

TABLE OF CONTENTS

Acknowledgements 2

Table of Contents 2

Introduction 3
Monitoring Methods 4
Site Information Form 6
Photo Information Sheet 9
Permanent Photos 10
Landscape Appearance 12
Key Forage Plant Method 15
Grazing Use Map 17
Stubble Height 19
Cover by Life Form Transect 22
Plant Density 23
Streamside Stability 25
Grazing Response Index 27

Glossary 30

Information Sources 33

Forms 34

INTRODUCTION

Rangeland monitoring is the orderly repeated collection, analysis, and interpretation of resource information (data). It can be used to make both short- and long-term management decisions. This guide is designed to provide individuals interested in monitoring rangelands with information and processes useful for simple, quick, and efficient monitoring. Use of any of these methods is voluntary.

> ***When the procedures in this guide are followed, the information gathered is acceptable to federal and state cooperating agencies. Coordinate public lands monitoring with the appropriate public land manager, and jointly collect the information whenever possible. The information collected will be referenced and will contribute to evaluating whether rangelands are meeting standards, goals, and/or objectives.***

GOALS AND OBJECTIVES

Before beginning any monitoring on allotments or pastures, first carefully define the goals and objectives. Goals are broad categories of desired accomplishments. Write them out. This accomplishes two things: first, it provides an opportunity for you to think out just what accomplishments are envisioned for the allotment and range landscapes. Second, it serves as a periodic reminder to you as you contemplate your management efforts from year to year. The best monitoring requires organized recordkeeping. Having information organized through time is helpful to find and use it when needed, and to really evaluate if objectives and goals are being met.

LONG-TERM MONITORING

Long-term monitoring is the measurement of progress toward meeting objectives such as changes in plant community composition, cover, and structure; or soil resource conditions over time. It is critical to detect changes in the rangeland early enough to make necessary adjustments in grazing management strategy or other management practices. Long-term rangeland condition and trend information is necessary to make these adjustments. In this guide book the emphasis is on short-term monitoring. However, while we suggest that the primary responsibility for long-term monitoring lies with the land management agencies, some ranchers may wish to do some of their own long-term monitoring. Among the procedures described in this guidebook, the following may be considered to provide long-term monitoring data; repeat ground photography, cover by life form transects, plant density, and streamside stability in riparian areas. In addition, the producer should be aware of the species frequency method that has been used extensively by the agencies. Species frequency and other methods are described in the *Nevada Rangeland Monitoring Handbook* and may be used by ranchers who wish to supplement or add to data that may or may not be required on their allotments or key areas.

SHORT-TERM MONITORING

In addition to long-term information, it is often critical to record annual management and variables such as calendar dates, weather, grazing use-intensity, pasture rotations, actual livestock use, wildlife use, and recreation impacts. These factors are examples of short-term monitoring.

Short-term monitoring is helpful in explaining changes measured during long-term monitoring. It is difficult to make effective changes in grazing management strategies without a record of annual conditions, events, or management practices

that have an influence on rangeland conditions. Short-term monitoring also helps the producer determine when, where, and how to move livestock.

Both short- and long-term monitoring information are required to effectively manage rangelands. Consider "why, where, and when" to monitor.

WHY MONITOR

Reasons to monitor rangelands include:

- To determine whether management objectives are realistic and achievable.
- To evaluate when management strategy changes are needed to better meet the identified objectives.
- To provide a record of environmental and resource conditions, events, and management practices that may influence rangeland vegetation.
- To determine whether the grazing management strategy meets the objectives established for resource conditions and livestock on the unit.
- To provide information for managing livestock (for example, determining when to move livestock).
- To determine whether the grazing and other management plans are being followed and track how they were modified in practice.

WHERE TO MONITOR

It is not practical or necessary to monitor every rangeland acre. Consequently, it is essential to select monitoring sites (key areas) that represent larger management areas or are themselves special areas of concern. Proper key area selection is critical. One or more key areas should be established in each pasture or unit. It is important to locate key areas away from sites that are not representative of the larger management unit such as near fences, salt locations, stock trails, ridges, or unused areas. For factors that change across a landscape, more than one key area may be needed. Monitoring activities and key area locations should be coordinated with the appropriate agency specialist if monitoring is being conducted on public lands.

WHEN TO MONITOR

Consider both grazing and browsing impacts when scheduling monitoring activities. It may be necessary to conduct short-term monitoring before, during, and after grazing or browsing use occurs. Record actual use numbers on the Site Information Form. At the conclusion of the grazing season, maintain copies of all completed forms and photos, and, if appropriate, submit copies to the appropriate agency specialist for the agency's files.

Each monitoring method presented includes instructions, and an example of a completed form. Make copies of the blank forms (at the end of the guide) for field use.

MONITORING METHODS

The methods in this guide represent only a few of all the monitoring tools available in the data gathering toolbox. A more extensive collection can be found in the *Nevada Rangeland Monitoring Handbook*. Not all methods presented here will be required in all situations. Likewise, a method or methods not presented may be necessary to use for a specific objective. Choose the suite of tools that will allow determination of whether goals, objectives, and standards are being met.

While not a method per se, keeping information on livestock movement and pasture use is very important to a proper monitoring program. This information is invaluable when used with the specific range monitoring techniques outlined in this book. A form is provided for those that aren't keeping these kinds of records in a pocket herd book or some other type of record keeping system. The form is called, "Record for Livestock Operators."

These methods were selected because they are generally easy to use, require a limited amount of time, and tend to produce consistently reliable results. Individuals can easily collect information that may have a significant effect on maintaining or improving rangelands. The methods presented fall into four categories.

Basic Information

Site Information. This information is recorded when virtually all monitoring activities are initiated and updated as necessary.

Site Location Map. Sketch a map displaying where each monitoring site is located and plot all sites on a ranch map

Photos. Include a photo information sheet in every photo to identify when and where the photo was taken.

Short-term Methods

Landscape Appearance; This estimates general forage utilization. There is a separate form for herbaceous and browse species. Either could be used in an upland or a riparian setting.

Key Species Method. Estimates utilization by focusing on key species related to management objectives.

Grazing Use Map. Create a map depicting pastures or other grazing units, with utilization classes indicated.

Stubble Height. Used to estimate utilization or to monitor residual vegetation.

Long-term Methods

Photo-Point Transect. Establish a permanent photo-point transect for the purpose of monitoring vegetation and overall site condition/appearance.

Photo Plots. Establish a permanent photo plot for observing changing conditions through time by using a portable frame and markers for its relocation

Cover by Life Form Transect. This estimates canopy cover on the monitoring site by life form.

Plant Density. This is a simple count per unit area of key species.

Streamside Stability (Riparian). This monitors the percentage distribution of riparian communities along a greenline.

Data Interpretation Methods

Grazing Response Index. This describes annual grazing use, and its effects inferred from intensity of defoliation, frequency of repetitive defoliation during the growing season, and growth or regrowth before and after grazing.

SITE INFORMATION FORM

The Site Information Form should be completed whenever and wherever any of the methods described in this guide are used. This basic information is used to compare data collected from different sites to prevent inappropriate comparisons and conclusions. The information described is basic and should not require significant scrutiny by the observer.

Unit Name. Record the name of the allotment, management area, or other geographic description of the unit to be monitored.

Pasture Name. Record the name of the pasture or subunit to be monitored.

Study Site. Record the number or name of the specific site where monitoring data or photographs are collected.

Date. Record the date the information is collected.

Observer. Record the name of the individual(s) collecting the monitoring information.

Monitoring Method(s). List the method(s) by which monitoring information is collected.

Date Study Established. Record the date the first information was collected for this site. This facilitates tracking trend information across several years.

Study Location. Record the legal description of where the study site is located and how it is marked. Be as specific as possible (use GPS when possible) so that others can easily relocate the site in later years.

Access. Optional. Describe the easiest way to drive or ride to the study site vicinity.

Ownership. Optional. Record the land ownership (and management responsibility) for where the monitoring site is located.

Site Characteristics

Landform. Optional. Record the best landform description of the general area where the plot is located.

Elevation. Optional. Record the elevation of the study site to the nearest 100 feet.

% Slope. Optional. Record the average percent slope of the general terrain where the study site is located.

Average Annual Precipitation. Optional. Record the approximate annual precipitation to the nearest inch. Do not record the current year's precipitation.

Range Site. Specify whether the study site is representative of upland or riparian conditions.

Current Growing Conditions. Indicate whether this year's conditions are above, near, or below average.

Exposure (aspect). Optional. Indicate the general aspect (direction the slope faces) on which the study site is located.

Soil. Optional. Indicate the general soil characteristics of the study site. Note: More than one soil texture can be checked. For example, if the soil is a sandy loam, then check both sand and loam.

Other Climatic Information. Optional. Record any applicable remarks regarding the climatic conditions, especially those out of the ordinary for this year or recent past years.

Unit/Pasture Use Information

Kind & Class of Animal. Identify the kind and class of livestock grazing the unit and pasture this grazing year.

Season of Use. Record the on and off dates for the pasture.

Number. Record the number of livestock animals grazing the unit this year.
Grazing System. Record the type of grazing system used in the allotment or management area.
Current Year Grazing Management. Describe the pasture rotation for this year, especially which one on and around this particular pasture.
Other Notes. Optional. Record any other pertinent information about the grazing system, range readiness, current plant physiology, or other information worth capturing for future reference.

SITE INFORMATION FORM (sample)

Complete this form when conducting any of the study methods in this booklet to provide an important summary of site information. If no study methods are conducted, completing this form alone will still provide a record of valuable information. All fields are required unless otherwise indicated with an "opt." Complete the blanks to the best of your knowledge.

___X___ Initial _____ Annual

Unit Name Lake Creek Pasture Name Baldy
Study Site (# or name) #-1 Billy Creek Date 20 Jun 2001 Observer R. Jones
Monitoring Method(s) Landscape Appearance Date Study Established 20 Jun 2001
Study Located __N __S __E _X_ W Trail Crossing on Lake creek, 200 feet
NW 1/4 of SW 1/4 of Section 16 Township 14N Range 26E
Access Highway 66 to County Road 241
Ownership (opt) Bob Robertson GPS Coordinates Lat.
Long.

Site Characteristics

Landform Mountain meadow
Elevation 5500 ft % Slope 1 Avg. Annual Precipitation 16"

Range Site	Current Growing Conditions	Exposure (opt.)		Soil (opt)
X Upland (U)	___ Above average (1)	___ N	___ S	_X_ Sand (1)
__ Riparian (R)	___ Average (2)	_X_ NE	___ SW	___ Silt (2)
	_X_ Below average (3)	___ E	___ W	___ Clay (3)
		___ SE	___ NW	_X_ Loam (4)

Other Climatic Information (opt. snow depth/persistence, temperatures, storms/flooding, etc.)

Temperatures during May were cooler than normal

Unit/Pasture Use Information

Kind & Class of Animal Cattle (steers) Season of Use 01 Jun to 01 Jul
Number 175 Grazing System Rest rotation
Current Year Grazing Management Baldy to Iron Creek – rest Willow Creek
Other Notes (opt. for example, growth stage of plants at time of use) Counted 22 head of elk in pasture when cattle went on. Use levels in riparian areas were light to moderate

VEGETATION FORM

Vegetation

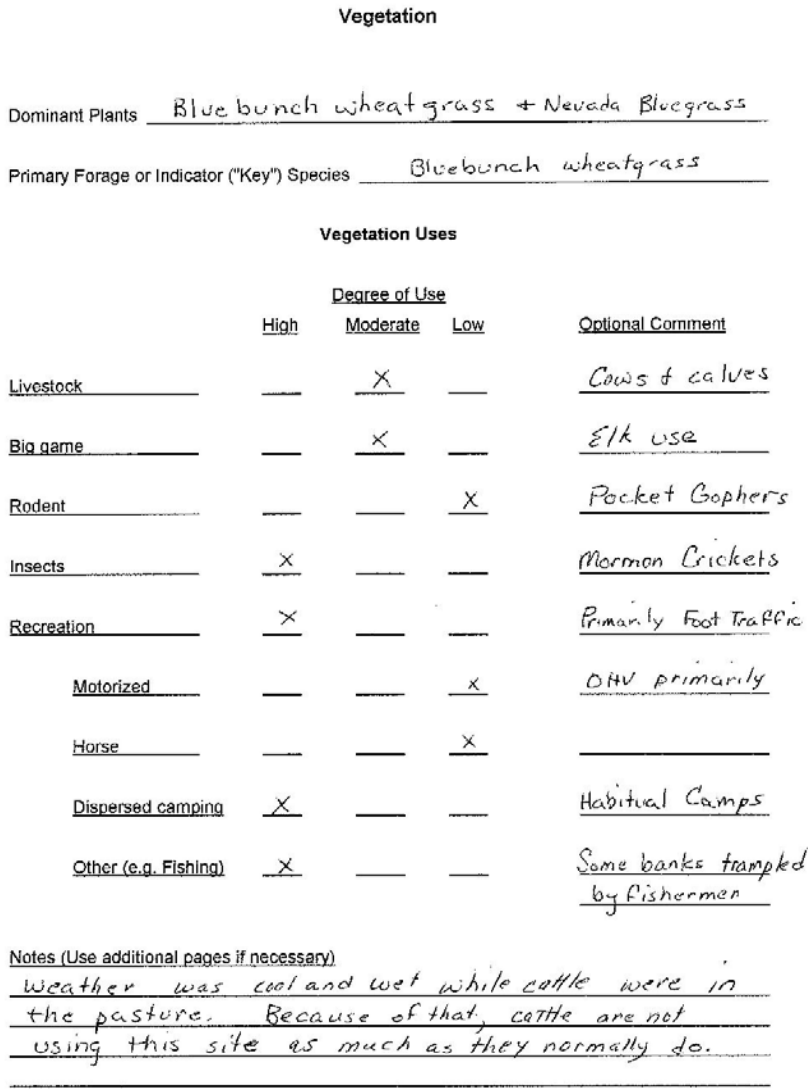
Dominant Plants. Identify the three to five most prolific species present on the study site. Be as specific as possible.

Primary Forage Species. Identify the three to five indicator species. These are most often the species that experience the most use during the time this pasture is grazed. Consult your agency range specialist to determine the agency's primary forage species and key species for this site or allotment. Key plant species may or may not be a primary forage species.

Vegetation Use

Degree of Use. Indicate the general use (high, moderate, or low) for one or more of the categories listed. Other use categories can be identified if they do not appear on this list. Be as specific as possible. Use the comments to capture anything significantly unique about the use on this site. Consult your agency range specialist to determine their definition of high, moderate, or low degree of use. This may vary from agency to agency and between field offices within an agency

Notes. Record any other comments that are pertinent. Most often, the mental observation you made when you saw the site or the first topic you discussed with others in the party are those that merit capture.



Vegetation

Dominant Plants: Blue bunch wheatgrass + Nevada Bluegrass

Primary Forage or Indicator ("Key") Species: Bluebunch wheatgrass

Vegetation Uses

	Degree of Use: High	Moderate	Low	Optional Comment
Livestock		X		Cows & calves
Big game		X		Elk use
Rodent			X	Pocket Gophers
Insects	X			Mormon Crickets
Recreation	X			Primarily Foot Traffic
Motorized			X	OHV primarily
Horse			X	
Dispersed camping	X			Habitual Camps
Other (e.g. Fishing)	X			Some banks trampled by fishermen

Notes (Use additional pages if necessary)

Weather was cool and wet while cattle were in the pasture. Because of that, cattle are not using this site as much as they normally do.

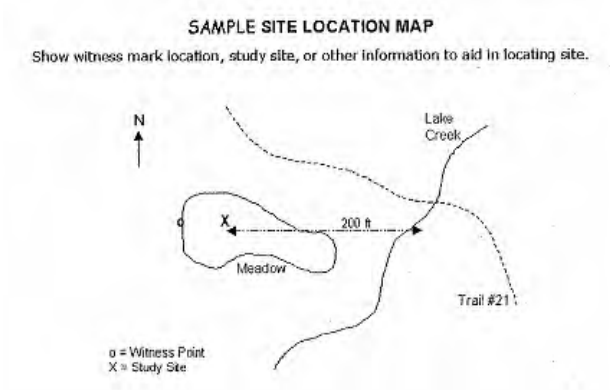


PHOTO INFORMATION SHEET

UNIT NAME: Grass Valley

PATURE NAME: Mountain

STUDY SITE: #1 South Sheep Corral

OBSERVER: J. Wilker

DATE: 01 June 2001

PHOTO INFORMATION SHEET

Display this sheet in every photograph you take. Use a wide-tipped black marker to write on the sheet. Use colored paper (yellow or blue) if possible so that the paper and writing are visible (white is too bright). Then include the sheet in each photo so that a record of when and where the photo was taken is included in the photo.

PERMANENT PHOTOS

REMEMBER: FOR IMPORTANT PLACES OR PASTURES WITHOUT AN EXISTING PHOTO, THE OLDEST PHOTO YOU WILL EVER HAVE IS THE ONE YOU TAKE TODAY! START TAKING PICTURES!!!

Repeated photographs taken at permanent locations are an effective and efficient method for monitoring. When using this method, it is important to:

1. Use consistent techniques.
1. Identify the date and location with the picture.
2. Take the picture during the same stage of plant growth each year.
3. Include the same skyline in the landscape picture.
4. Carefully relocate the photo points each time.
5. Try to take the picture at the same time of day.

It is also important to maintain consistency in camera type (lens size), film, timing, and associated documentation.

Repeat photographs of landscapes can provide basic documentation of range trend. Landscape photos should be taken in the same direction from the same designated point at approximately the same time of year and, when possible, the same time of day. Photographs that include a distinctive landmark in the background or on the horizon are easier to relocate. It is difficult to locate previously established photo points without a portion of the horizon in the photograph. Comparing previous photographs (or photocopies) can also be helpful in "framing" the photos consistently from year to year.

Notes

Photographs from a permanently marked site (for example, from a fencepost or rock of a stream crossing, gully headcut, or other impacted site) can be very effective in demonstrating resource recovery or the need to modify current management.

Finding the location of an old photograph (for example, scenery or a fishing trip with a stream in the background) and relocating it can provide good information on past use and trend of a site.

PHOTO-POINT TRANSECT

Equipment

- Site Information Form, Blank Photo-Point Transect Forms and Photo Information Sheets.
- Two folding 6-foot carpenter rulers; two transect stakes, 100-foot tape.
- Digital camera or 35 mm camera with color print film - exposure index of 100.

Procedure

Establish 100-foot transect and install permanent stake at either end. Complete Site Information Form for the site.

From behind the stake at the start of the transect, take a landscape photograph looking down the transect towards relocatable bearing point.

Using the two carpenter's rulers, create a 3x3 foot square frame and lay it over the tape so it intersects it at the 5-foot and 8-foot marks. Standing over the tape, take a photograph looking down at the framed section with the 5-foot mark in the foreground and 8-foot mark in the background.

Repeat the previous process (using the frame) at the 50-foot to 53-foot marks and the 92-foot to 95-foot marks.

At the 100-foot end of transect, take a photograph looking back down transect to the 0-foot mark.

Use the Photo Information Sheet in all photographs, if possible. A complete transect will include a total of five photos.

PHOTO PLOTS

Equipment

Digital camera or 35 mm camera with color print film is needed, use an exposure index of 100 (ISO or ASA). A 3x3-foot frame, two carpenter's rulers or PVC pipe (both work well) are also needed.

Things to Remember

- Take photos of the plot and of the general view (at least an acre with a horizon for identification of landmarks).
- If retaking photos, be sure to match the plot frame size used previously.
- Permanently mark at least three corners of the plot frame location with stakes. Paint steel stakes a bright color such as orange.

- If the photo plot is difficult to locate, use a witness post. Make sure the photo plot is at least 20 feet away from the post. For all photo points consistently document the photo plot location with respect to the witness post.
- Include the Photo Information Sheet in the photo. Colored paper works best because white is too bright.
- Take the photo from the north side of the plot to avoid casting a shadow into the photo.
- Include at least three photo plots per pasture to capture range of variation.
- Photos should be repeated at the same stage of plant development, independent of calendar date.
- The photo can be taken at an oblique angle or vertically above the plot. Just be sure to be consistent from one year to the next!

REMEMBER: THE OLDEST PHOTO YOU WILL EVER HAVE IS THE ONE YOU TAKE TODAY! START TAKING PICTURES!!!

LANDSCAPE APPEARANCE (HERBACEOUS AND BROWSE)

This method estimates general forage utilization. It is especially helpful when grazing or browsing use must be estimated for large areas with only a few examiners and for rangelands with many palatable species instead of a few key species. For this method, an ocular estimate of forage utilization is based on the general appearance of the rangeland. Utilization levels are determined by comparing observations with the written utilization class descriptions. The utilization estimates are evaluated against the standards, goals, objectives, triggers, or end-points for the area.

This method is often used only on key areas. However, when the objective is to develop a utilization map, this method should be used throughout the grazing unit and provides the basis for the mapping.

Equipment

- Site Information and Landscape Appearance Forms.
- Camera and Photo Information Sheet.

- Transect reference stake (optional), permanent ends to the transect can also be utilized.

Procedure

Select a key area (or initial area if utilization mapping is required) and complete the Site Information Form. Determine whether to use the herbaceous or browse species descriptions, and use the appropriate form.

Select a beginning point for a paced transect in the key area. Ensure the transect remains within the same vegetation type (e.g., meadow type, aspen type, or open pine type). Take a photograph looking down transect. Include a relocatable, prominent feature in the photo background such as a rocky point, tree, or distinctive horizon.

Observe and record at least 25 samples per transect. Generally, a sample interval of 30 feet works well for this method. *Record the sample interval on the form*.

Determine how many paces or steps will give you the selected sample interval and begin pacing along transect (use either paces or steps - paces are simply two steps). When the predetermined numbers of paces or step are reached, examine the immediate area in front of you and determine which Landscape Appearance class most accurately represents the vegetation use, and record your finding as a dot tally in the appropriate row. It is helpful to visualize a 20-foot half-circle immediately in front of where you are standing. Usually, you will only be able to accurately assess the plants within about 20 feet of where you are standing.

After reaching the end of transect, total the dots in each row and record in the count column. Then multiply the count for each class by the midpoint displayed in the first column and record the product. Calculate the average utilization by dividing the sum of products (B) by the total count (A).

Landscape Appearance Method (Herbaceous)

Unit Name Lake Creek Pasture Name Baldy

Transect ID #1 Billy Creek Date 20Jun01 Observer R. Jones

Animal Kind/Class Cattle Season of use 1 Jun to 1 Jul Sample Interval 30 Ft

Class (Midpoint)	Dot Tally	(#) Count	# x Midpoint	Description of Landscape Appearance
0-5% (2.5%)		3	7.5	The rangeland shows evidence of no grazing, or of negligible use.
6-20% (13.0%)		11	143	The rangeland has the appearance of very light grazing. The herbaceous forage plants may be topped or slightly used. Few current seedstalks and young plants are grazed.
21-40% (30.0%)		18	540	The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60-80% of the number of current seed stalks of herbaceous plants remain intact. Fewer than 50% of the young plants are grazed.
41-60% (50.0%)		9	450	The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15-25% of the number of current seed stalks of herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants have been utilized.
61-80% (70.0%)		2	140	The rangeland has the appearance of complete search. Herbaceous species are almost completely utilized, with less than 10% of the current seed stalks remaining. Shoots of rhizomatous grasses are missing. More than 10% of the number of low-value herbaceous forage plants have been utilized.
81-94% (88.0%)		3	264	The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seedstalks of herbaceous species. Herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.
95-100% (97.5%)		1	97.5	The rangeland appears to have been completely utilized. More than 50% of the low-value herbaceous plants have been utilized.
	Totals	A 47	B 1642	
Average Utilization = B/A			34.9 %	

Landscape Appearance Method (Browse)

Unit Name Lake Creek Pasture Name Baldy

Transect ID #1 Billy Creek Date 20Jun01 Observer R. Jones

Animal Kind/Class Cattle Season of use 1 Jun to 1 Jul Sample Interval 30 Ft

Class (Midpoint)	Dot Tally	(#) Count	# x Midpoint	Description of Landscape Appearance
0-5% (2.5%)		4	10	Browse plants show no evidence of use; or browse plants have the appearance of negligible use.
6-20% (13.0%)		3	39	The available leaders of palatable browse plants have the appearance of very light use.
21-40% (30.0%)		3	90	There is obvious evience of leader use. The available leaders appear cropped or browsed in patches and 60-80% of the available leader growth of the palatable browse plants remains intact.
41-60% (50.0%)		6	300	Browse plants appear rather uniformly utilized and 40-60% of the available leader growth of the palatable browse plants remain intact.
61-80% (70.0%)		8	560	The use of the browse gives the appearance of complete search. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on palatable browse plans. Between 20-40% of the available leader growth of the of the palatable browse plants remain intact.
81-94% (88.0%)		8	704	There are indications of repeated coverage. There is no evidence of terminal buds and usually less than 20% of available leader growth on the palatable browse plants remains intact. Some patches of 2nd and 3rd year's growth may be utilized. Hedging is readily apparent and the browse plants are more frequently broken. Repeated use at this level will produce a definetly hedged or armored growth form.
95-100% (97.5%)				Less than 5% of the available leader growth on browsed plants remain intact. Some, and often much, of the more accessible 2nd and 3rd year's growth of the browse plants has been utilized. All browse plants have major portions broken.
	Totals	A 32	B 1703	
Average Utilization = B/A			53 %	

KEY SPECIES METHOD for FORAGE PLANT UTILIZATION

Key forage plant utilization checks are done in key areas with a limited number of key species after the grazing and growing period, unless monitoring or management plans call for different timing. They are tied to key areas. Utilization studies are used: (1) to supplement use maps for further documentation of the need for a change in livestock use, (2) at trend study sites for documentation of use in order to properly interpret the meaning and causes of change in plant species frequency, ground cover, or species composition.

Description of Use Classes: The six utilization classes that follow are used with the key species method and refer to the percent used by weight of the key species.

1. *No Use (0-5%)*: The key species shows no evidence of use or negligible use by grazing animals.
2. *Slight (6-20%)*: The key species has the appearance of very light grazing. Plants may be topped or slightly used. Current seed stalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.
3. *Light (21-40%)*: The key species may be topped, skimmed, or grazed in patches. Between 60-80 percent of the current seed stalks remain intact. Most young plants are undamaged. There is obvious evidence of leader use on key browse species. The available leaders appear cropped or browsed in patches, and 21-40 percent of the available leader growth of the key browse plants has been removed. If leaders are only partially removed, some nipping may have occurred on a higher percentage of them.
4. *Moderate (41-60%)*: Approximately half (by weight) of the available forage of key species appears to have been utilized. Fifteen to 25 percent of the number of current seed stalks of key herbaceous species remain intact. Browse plants appear rather uniformly utilized, and 41-60 percent of the available leader growth of key browse plants has been removed. If leaders are only partially removed, some nipping may have occurred on a higher percentage of them.
5. *Heavy (61-80%):* More than half of the available forage on key species appears to have been utilized. Less than 10 percent of the current seed stalks remain. Shoots of rhizomatous grasses are missing. The key browse species are hedged, and some plant clumps may be slightly broken. Nearly all available leaders are used, and few terminal buds remain on key browse plants. Approximately 61-80 percent of the available leader growth of the key browse plants has been removed.
6. *Severe (81-100%):* Key species appear to have been heavily utilized, and there are indications of repeated coverage. There is no evidence of reproduction of current seed stalks of key herbaceous species. Key herbaceous forage species are completely utilized. All available key

browse species leaders are used and some use has been made of previous year's growth. The remaining stubble is grazed to the soil surface. There is no evidence of terminal buds, and 95-100 percent of available leader growth on the key browse plants has been removed. Much use has been made of the second and third previous years' growth on the key browse species. Hedging is readily apparent, and the browse plants are frequently broken.

Field Method for the Key Forage Plant Utilization

Establishing a transect—the starting point is at some known reference marker that is documented on the field form. The witness post for other transect methods can be used as the starting point. The transect direction is set by compass bearing and documented. The direction should be set so that the entire transect will remain within the ecological site selected as a key area. It is important to document the location, starting point, and direction of the utilization transect so that future utilization studies will be conducted in the same area.

Utilization transect observations—start at the beginning of the transect and make utilization observations at predetermined intervals along the transect. Observation intervals should be specified on the field form. A good observation interval is five paces but may vary depending on the type and/or size of the key area. At each observation point, utilization of the nearest plant(s) of each key species within a 180-degree arc, five feet from the toe of the boot is recorded using the six utilization classes. If the key species are not present in the arc, move to the nearest key plant along the transect. The next interval will be measured from this new point. There should be a minimum of 20 hits on every key species along the transect. The actual number of hits obtained will depend upon topography, the variability of the vegetation, and the best judgment of the examiner (often 20-40 points will be observed before there are 20 hits on each key species). It is important to work closely with range professionals to determine which species will be considered for measurement, where transects should be established, how long transects should be, and what the observation intervals should be used for each specific site.

Range Utilization - Key Forage Plant Method

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ Vegetation Type _____

Midpoint	Key Species		Key Species		Description of Use Classes
(x)	Frequency (f)	f * x	Frequency (f)	f * x	
					1. No Use (0%): The rangeland shows no evidence of use by grazing animals.
					2. Slight (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seed stalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.
					3. Light (21-40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed, and 60-80 percent of the number of current seed stalks of key herbaceous plants remain intact. Most young plants of key species are undamaged. The available leaders appear cropped or browsed in patches, and 21-40 percent of the available leader growth of the key browse plants has been removed.
					4. Moderate (41-60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number of current seed stalks of key herbaceous species remain intact. No more than 10 percent of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized, and 41-60 percent of available leader growth of key browse plants has been removed.
					5. Heavy (61-80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with less than 10 percent of the current seed stalks remaining. More than 10 percent of the number of low value herbaceous forage plants has been utilized. Approximately 61-80 percent of the available leader growth of the key browse plants has been removed.
					6. Severe (81-100%): The rangeland has a mown appearance, and there are indications of repeated coverage. There is no evidence of reproduction of current seed stalks of key herbaceous species. There is no evidence of terminal buds, and 81-100 percent of available leader growth on the key browse plants has been removed. Some, and often much, of the second and third previous years' growth on the browse plants has been utilized.
Totals →					Remarks: _____
Σfx/Σf					

Note: f = the frequency or number of observations with in each class interval (f column), x = the class interval midpoint (x column) and Σ = the summation symbol.

GRAZING USE MAP

Livestock utilization maps can be very useful management tools. They may help identify key areas, distribution problems, or management opportunities. They also may be used to modify the grazing management plan. To map utilization, examine the grazing unit and sketch utilization patterns on maps. Landscape appearance observations are often used to develop grazing use maps. Stubble height, key species, and other monitoring methods may also be used.

Equipment

- Site Information Form.
- Topographic or planimetric map of the grazing unit/allotment (or overlay).
- Camera and Photo Information Sheet.

Procedure

Use mapping should be done shortly after the grazing period. Establish a transect wherever a significant change in use patterns or vegetation type occurs.

It is helpful for the examiner to obtain a map showing the boundaries of different plant communities or ecological

sites. When using the landscape appearance method, map utilization using the following classes:

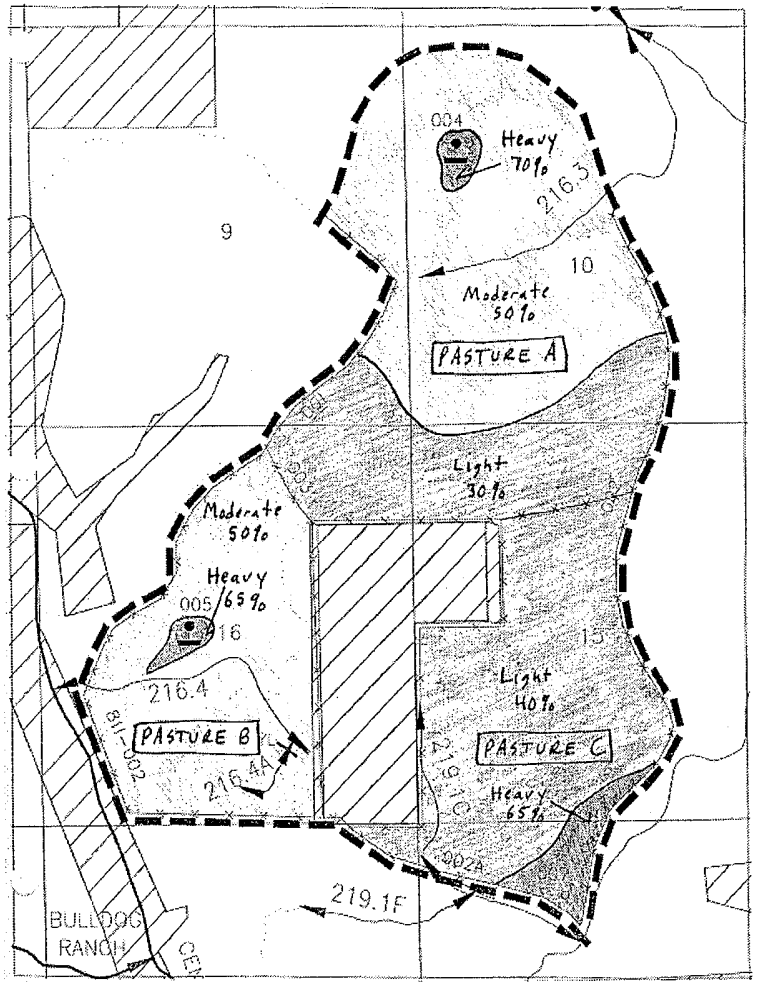
0-5%	61-80%
6-20%	81-94%
21-40%	95-100%
41-60%	

In most cases, do not attempt to map sites that are too small (smaller than a five-acre scale or 1% of the pasture area might be considered examples). However, for smaller patches (such as creeks, springs, or seeps), the degree of utilization on these sites should be noted on the map.

Complete the map with a legend indicating mapping unit, utilization, and/or stubble height. Complete the Site Information Form for each grazing unit (pasture) mapped and take field notes of conditions observed while mapping.

Take photographs showing utilization intensities in representative areas within the grazing unit. Take additional photographs as needed to show unique concerns, opportunities, and comparisons.

SAMPLE GRAZING USE MAP



STUBBLE HEIGHT

Vegetation provides streambank protection, traps sediments, contributes to rebuilding degraded stream channels, and ensures residual forage and habitat. Retaining an adequate amount of standing herbaceous vegetation (stubble) along the streambanks and within the primary floodplain slows overland water flow velocity from winter and spring runoff, and traps and retains sediments necessary to build and maintain streambanks.

Stubble height monitoring typically occurs on predetermined key species in key areas. Depending on the objectives and resource concerns, key areas may be along the streamside or in wet or dry meadow sites within the riparian area or upland areas, depending upon resource objectives. In some instances monitoring is based on species groups, such as sod-forming species with similar growth form and response to grazing.

Stubble height, key species utilization, and landscape appearance monitoring may consist of two closely related but distinct concepts and processes: trigger and endpoint indicator monitoring. These two processes are discussed here because of their importance to stubble height, but can also be effectively used with other monitoring techniques.

Trigger Monitoring

An action is 'triggered" when the stubble height reaches a predetermined point. Frequently, this action is to move livestock from one pasture to the next. Trigger monitoring occurs on one or more key species (or groups of similar species) in a key area. When the actual stubble height approaches the allowable stubble height, livestock are removed from the pasture.

Stubble height guidelines for key areas promote long-term maintenance or recovery of vegetation, stream, or other resources. In addition, meeting "trigger" stubble height guidelines should also facilitate meeting residual stubble height guidelines at the end of the season.

Endpoint Indicator Monitoring

Residual stubble height monitoring is conducted on herbaceous communities along the greenline (streamside), following the end of the grazing or the growing season (whichever occurs later). Retention of a specified height of vegetative plant material along the greenline (streamside monitoring) aids in trapping and retaining sediments by slowing overland water flows associated with winter and spring runoff. As with "trigger" monitoring, the actual remaining

residual stubble height is compared to a defined allowable residual stubble height standard.

Equipment

- Site Information Form and Stubble Height Form.
- Tape measure or folding carpenter ruler.
- Camera and Photo Information Sheet.

Procedure

Measurements need to be made on designated key areas, normally within riparian areas (but possibly on uplands), and on predetermined key species. Alternatively, stubble heights may be determined for a group of similar species such as wet-site, wide-leaved sedges or rushes, or dry-site, narrow-leaved grasses or sedges.

For streams, sampling should be done on both sides of a stream segment along the greenline. For upland or meadow sites, measurements should be taken along a predetermined course or transect, paralleling the greenline.

Once the stream segment or transect site has been selected, take a photograph looking down the stream segment or transect. Include a relocatable, prominent feature in the photo background such as a rocky point, tree, or distinctive horizon. Determine the distance between observation points (the sample interval). This will vary depending on the size and shape of the site selected. Record the sample interval in the Sample Interval blank at the top of the form.

Determine how many paces (two steps) will give the selected sample interval and begin pacing along the greenline or the predetermined transect course. Stop at each sample interval and do the following:

- Locate the individual plant nearest the toe of your boot for each identified key species. The nearest plant may not be immediately at your toe.
- Record the average stubble height (leaf length) for each key species. Where it is difficult to tell where one plant starts and another stops, visualize a 3-inch circle and sample the plants within that circle. Estimate and record the average stubble height within the 3-inch circle.
- A stubble height will be recorded for each key species previously agreed to. There will be a

minimum of 30 stubble height measurements for each species. Additional readings can be taken if the variability on the site warrants.

- After a minimum of 36 samples have been recorded, total the measurements for each column and divide by the number of plants sampled for each species to calculate the average stubble height.

Notes

Both the Landscape Appearance Method (for riparian browse species) and the Streamside Stability Method can be taken along the same stubble height transect.

SAMPLE STUBBLE HEIGHT

Unit Name NE Pine Creek **Pasture Name** Upland

Transect ID _____ **Date** 9/22/04 **Observer** Perryman/Bruce

Animal kind/class cow/calf **Season of Use** 4/1 **to** 7/15 **Sample Interval** 2 paces

Record at least 30 stubble heights for each species or species group. More readings can be taken if desired.

Species/group				Species/group		Species/group	
1	14	26	9	1	26	1	26
2	14	27	13	2	27	2	27
3	10	28	8	3	28	3	28
4	14	29	7	4	29	4	29
5	12	30	6	5	30	5	30
6	8	31	6	6	31	6	31
7	16	32	10	7	32	7	32
8	18	33	8	8	33	8	33
9	10	34	10	9	34	9	34
10	8	35	8	10	35	10	35
11	8	36	16	11	36	11	36
12	6	37	13	12	37	12	37
13	12	38	10	13	38	13	38
14	12	39	8	14	39	14	39
15	12	40	11	15	40	15	40
16	10	41	6	16	41	16	41
17	14	42	6	17	42	17	42
18	5	43	9	18	43	18	43
19	12	44	10	19	44	19	44
20	16	45	9	20	45	20	45
21	13	46	8	21	46	21	46
22	10	47	6	22	47	22	47
23	13	48	3	23	48	23	48
24	10	49		24	49	24	49
25	10	50		25	50	25	50
Sub	282	Sub	200	Sub	Sub	Sub	Sub
		Grand total	482		Grand total		Grand total
Avg. Height (Total/#)			10"	Avg. Height (Total/#)		Avg. Height (Total/#)	

COVER BY LIFE FORM TRANSECT

Cover by life form is simply an estimation of the relative amounts of different life forms on a site.

Equipment

- Cover by Life Form Transect and Site Information Forms.
- Camera and Photo Information Sheet.
- 100-Foot Tape Measure.
- Transect Stakes.
- Wire Pointer or Plumb Bob.
- Two Folding Carpenter Rulers.

Procedure

After the transect site is selected, complete the Site Information Form and install two transect stakes 101 feet apart and stretch the tape tight between them and as close to the ground as possible without letting vegetation shift the location from place to place. Keep the tape tight with the 0-foot point directly over the transect stake. Keep the pointer as near to vertical as possible. Always lower the pointer on the same side of the tape. Two people make the process easier and quicker, one to lower the pointer and the other to spot the contact and record what is touched.

Two photographs are taken, one looking down the transect while standing over the 0-foot end of the tape. Included in the photo should be a photo information sheet, a bearing point you can relocate, and enough skyline to assist in finding the transect in the future. The second photograph is taken looking down at the transect centered on the 5-foot mark. The picture should be framed using a 3x3-foot frame (carpenter rulers) laid over the tape (centered).

Beginning at the 1-foot point on the tape measure, lower a wire pointer until initial contact is made with vegetation or the ground surface. Record the data (by dot tally) in the appropriate column and row. Repeat this at each foot-mark along the tape measure until 100 points have been sampled.

The life form categories are: grasses (and grass-likes such as sedges), forbs, shrubs, litter, moss and lichen, rock (greater than 3/4" in diameter), and bare ground.

When 100 readings are taken, the total number of tallies in each column converts directly to the percent coverage for each life form.

Notes: Repeating this data collection over time (for example, three years, five years, etc.) provides an indication of trend on the site.

COVER BY LIFEFORM TRANSECT

Unit Name Moonshine Pasture Name Riparian

Transect ID _____ Date 20Sep04 Observer Conley

Litter includes everything but soil, moss and lichen, or live plants.

You may record dot counts optionally for separate species (e.g., perennial vs. annual species, desireable vs. undesireable species, or noxious weeds vs. native forbs) if doing so will help meet objectives. "Other" categories below may be used for specific species or groupings of interest.

	Grasses	Forbs	Shrubs	Litter	Moss/ Lichen	Rock	Bare Ground
Perennial							
Annual							
Noxious							
Other:	4%						
Other:							
Other:							
Total (=100)	51%	35%	8%			2%	

DENSITY OF KEY SPECIES

Plant density is commonly defined as the number of individual specimens of a given species per unit area. The unit area is less important than making a good count that can be repeated at intervals providing a rapid method of determining long-term trend. Long standing research has shown that counting plants has particular value in assessing changes in plant succession or changes caused by treatments such as grazing level. This long-term monitoring method is useful on many Nevada desert rangelands where the plants are sparse and there is need to determine changes over time.

One or more Key Species can be used in this simple, direct and practical method. Counting is perhaps the easiest analytical concept to grasp. However, one difficulty is the recognition of individuals. This is not a problem for many bunchgrasses that may be important on an allotment but shrubs may present a problem. Another question has to do with the transect edges. A decision must be made as whether or not to count or not count the individual plant. If half or more of the base of the plant is in the transect or quadrat, it should be counted.

At each site stretch out a 100-foot tape to designate the transect. Mark the location of the transect by placing the

post with a white PVC pipe placed on the post (see photo transect). Both ends of the tape should be permanently marked. This can be accomplished by placing a ground stake at each end of the tape at the 0- and 100-foot marks. As with other methods, the user should provide a map to the location and, if possible, further locate the location using GPS technology, if feasible.

Use a belt transect to count important perennial plants. This can be three feet by 100 feet (a 3-foot piece of PVC or a yardstick or folding carpenters rule placed on a 100 foot tape perpendicular can be used). The count can conveniently be expressed as the number of individual forage specimens per acre. For example, if there were 200 plants in a 100- by 3-foot transect or 300 square foot, the number per acre would be 29,040. This is based on the fact that there are 43,560 square feet in an acre. This is a somewhat unwieldy number. In this case it might be easier to just indicate that the count yielded 200 plants in the transect. If the data were expressed as the number of plants per square foot, a very small number would result, in this case 0.66 plants per square foot.

Also, it may be desirable to count other important species including weeds and less desirable species. This can be done rather rapidly. For very abundant species it may be necessary to sub sample, e.g., by counting only every other five-foot or two-foot segment along the transect. For 5- foot intervals, the number of quadrats along a 100-foot tape would be 20 and every other would be half of that or 10, 5-foot by 3-foot quadrats along the tape. In the case of 2-foot intervals, the number would be 25, 2-foot by 3-foot quadrats along the tape. Each transect should be 100 feet in length and a minimum of three should be counted at each Key Area Site on your allotment. The total number per unit area should be recorded for each of the three transects and summarized. The numbers should be carefully recorded on the form and placed in a file for future reference. An excellent way to do this is to place the notes in a computer file that can be placed on a CD for permanently saving the data.

Plant Density

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ Vegetation Type _____

Area counted: 3- by 100-foot; 10, 3- by 5-foot; or 25, 2- by 5-foot quadrats

KEY SPECIES	TRANSECT 1 Numbers	TRANSECT 2 Numbers	TRANSECT 3 Numbers	average
Total				
Total				
Total				
Total				

Note - circle the quadrat sample size; use a dot-count procedure to record the plant numbers.

STREAMSIDE STABILITY

The greenline is the first line of perennial vegetation on or near the water's edge. Often this forms between high and low flows. This is the line that we normally follow for this method. However, where there is no vegetation in this zone, the area between the high and low flows is where the streamside stability is rated.

Equipment

- Site Information Form and Streamside Stability Form.
- Tape measure or folding carpenters ruler.
- Camera and Photo Information Sheet.

Procedure

Locate the streamside monitoring transect along a stream reach representative of the area and of streams being sampled or a particular reach of interest. These areas are

normally deeper, fine-textured soils on low gradients. Do not apply this method on bedrock or large boulder stream types.

The selected stream reach should be all within the same stream type. That is, the gradient, soil conditions, and stream shape are fairly consistent.

Permanently mark the transect beginning. The transect begins on the right-hand side of the stream (looking downstream). Take a photograph looking down the transect. Include a relocatable, prominent feature in the photo background such as a rocky point, tree, or distinctive horizon. Take additional photos of communities along the transect, as needed.

Sample for 363 feet along the greenline, recording the community encountered at each step or pace on the form. At the end of the downstream transect (right-side), cross the stream and sample another 363 feet along the upstream greenline (left-side).

STREAMSIDE STABILITY

Unit Name Moonshine Creek Pasture Name _____

Transect ID _____ Date 20SEP04 Observer Perryman

Existing Community Type	Value	Dot Tally	Count	Rating
Anchored rock/logs	10	⊠ ˙	11	110
Trees (coniferous & deciduous)	7			
Willows	8			
Other Shrubs (sagebrush, cinquefoil, etc.)	5	˙ ˙	2	10
Wet sedges & rushes	9	⊠ ⁝	15	135
Other sedges	4			
Wet grasses (for example, hairgrass, canarygrass, reedgrass, cordgrass)	8			
Other grasses (for example, bluegrass, redtop, bentgrass, barley, muhly)	3	⊠ ⊠ ⊠ ⊠ ⊠ ⊠ ⊠ ⊠ ˙	81	243
Sandbars, loose rock, bare soil (unvegetated areas)	1	⊠ ⊠ ⁝	24	24
		Total	133	522
		Numerical Rating		3.9

Multiply the **value** for each community type by the number of tally points **(count)** to get the **rating**. Sum all the **ratings** and divide by the **total count** (number of paces) to get the **numerical rating**. Use the table below to determine the overall **stability rating** for the riparian/stream reach sampled.

Numerical Rating	Stability Rating
9-10	Excellent (very high)
7-8	Good (high)
5-6	Moderate
3-4	Poor (low)
0-2	Very Poor (very low)

GRAZING RESPONSE INDEX

General Discussion

The Grazing Response Index (GRI) is used to describe annual grazing use, and the effects of repetitive defoliation during the growing season. Understanding plant physiology and plant response to grazing is essential in the development of unit management plans. Consequently, there is a need for a tool to interpret monitoring data about rangeland 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 describe annual grazing use, interpret annual grazing effects, and aid in planning the grazing management 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. GRI considers three key concepts related to plant health, defoliation frequency, grazing intensity, and opportunity to grow and/or regrow.

Defoliation Frequency

Defoliation frequency is the number of times plants are defoliated during the grazing period. It is dependent on the length of time plants are exposed to 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 area knowledge is needed to determine how fast the plants are growing.

To obtain an estimate of how many times plants were (or may be) defoliated during a grazing period, divide the number of planned grazing days by seven (or up to 10 if growth is slower). Using seven 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:

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

Grazing Intensity

Grazing intensity 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 an estimate of percent utilization at a specific point in time; it is not an estimate of percent utilization of the entire year's growth. Generally, less than 40 percent defoliation will not inhibit plant growth. An index value of +1 to -1 is assigned:

Amount of use	Percent	Value
Light	<40%	+1
Moderate	40-55%	0
Heavy	>55%	-1

Opportunity for Growth and/or Regrowth

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 depends 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. Index values for opportunity to grow or regrow forage are:

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 rangeland that is used season-long can be expected to rate -2 (no chance). A unit with two

pastures will likely be in the 0 (some chance) or -1 (no chance) range. Units 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 vegetation appearance.

Overall Rating

The values for defoliation frequency, grazing intensity, and opportunity for growth and/or regrowth 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 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 method 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. Intensity is not as critical a parameter during the dormant season, because we are not as concerned with producing regrowth.***

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: Robbers Roost — Pasture Name: Butch Cassidy

Transect ID — Date: 15 Aug 04 — Observer: Ernest Tubb

Grazing System: Rest Rotation — Season of Use: 1 MAY to 1 July

Frequency		Intensity			Opportunity	
# of Defoliations	Value	Amount of Use	Percent	Value	Opportunity to Grow or Regrow	Value
1	+1	Light	<40%	+1	Full Season	+2
2	0	Moderate	40-55%	0	Most of Season	+1
3 or more	-1	Heavy	>55%	-1	Some chance	0
					Little chance	-1
					No chance	-2

Pasture Name	Site ID	Frequency	Intensity	Opportunity	GRI (Total)
Butch Cassidy	1	+1	-1	+1	+1
"	2	0	0	-1	-1
"	3	0	0	+1	+1
"	4	-1	-1	-2	-4
"	5	+1	0	-2	-1
"	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
"	11	-1	0	+1	0
					-0.3

GLOSSARY

BARE GROUND. All land surface not covered by vegetation, rock, or litter. See Ground Cover.

COVER, CANOPY. The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of plant foliage. Small openings within the canopy are included. Total canopy cover may exceed 100 percent. Synonymous with Crown Cover.

COVER, GROUND. The percentage of material, other than bare ground, covering the soil surface. It may include organic material, such as vegetation basal cover (live and standing dead), mosses and lichens, litter; and inorganic material, such as cobble, gravel, stones, and bedrock. Ground cover plus bare ground will total 100 percent.

COVER TYPE. A taxonomic unit of vegetation classification referencing existing vegetation. Cover type is a broad taxon based on existing plant species that dominate, usually within the tallest layer.

DENSITY. Number of individuals or stems per unit area. Density **DOES NOT** equate to any kind of cover measurement.

DESIRED PLANT COMMUNITY. Of the several plant communities that may occupy a site, the one identified through a management plan that best meets the objectives for the site. It must protect the site as a minimum. The desired plant community must be consistent within the capability of the area to produce vegetation through management, land treatment, or a combination of the two.

EROSION PAVEMENT. A concentration of gravel or coarser fragments (1/8 – 3/4 inch) that remain on the soil surface after finer particles have been removed by running water or wind.

FORAGE (n). Browse and herbage that is available and may provide food for grazing or browsing animals or be harvested for feeding.

FORB. Any herbaceous plant other than those in the grass (Poaceae), sedge (Cyperaceae), and rush (Juncaceae) families.

FREQUENCY. The ratio between the number of sample units

of a given size that contain a species and the total number of sample units.

FREQUENCY OF DEFOLIATION. The number of times forage plants are defoliated during the (actual or planned) grazing period. It depends on the plant growth rate and the length of time over which plants experience grazing within a growing season.

KEY AREA. A portion of rangeland selected because of its location, grazing or browsing value, or use. It serves as a monitoring and evaluation point for range condition, trend, or degree of grazing use. Properly selected key areas reflect the overall acceptability of current grazing management over the rangeland. A key area guides the general management of the entire area of which it is a part.

KEY SPECIES.
1. Forage species whose use serves as an indicator to the degree of use of associated species. In many cases, key species include indicator species and species traditionally referenced as increasers, decreasers, desirables, or intermediates.
2. Those species that must, because of their importance, be considered in the management program.

LITTER. Uppermost layer of organic debris on the soil surface; essentially freshly fallen or slightly decomposed vegetative material.

MONITORING. Monitoring is the orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives. This process must be conducted over time to determine whether or not management objectives are being met.

OBJECTIVE. A clear, quantifiable statement of planned results to be achieved within a stated time period. An objective is achievable, quantifiable, and explicit. The completion of an objective must occur within a stated time frame and the results must be documented.

PERCENT USE. The percentage of current year's forage production that is consumed or impacted by grazing animals. May refer to a single species or to a plant community.

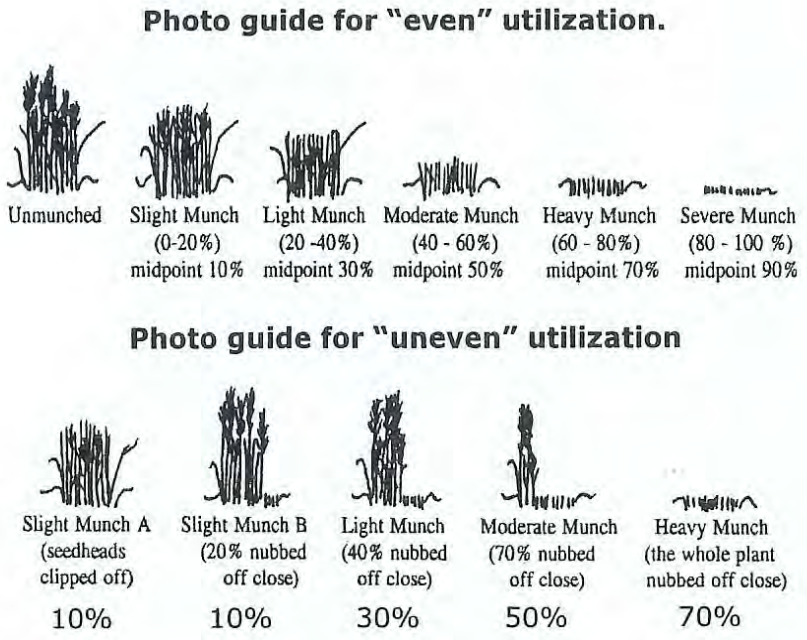
PHOTO POINT. A permanently identified point from which photographs are taken at periodic intervals. Sometimes called a camera point.

STREAMSIDE. Often this is where the greenline occurs. The Greenline is the first line of perennial vegetation that forms a lineal grouping of community types (at least six inches wide and a step long) on or near the low water edge. Where there is no greenline (such as on a bare bank), the streamside to be monitored is between the high-flow water edge and the low-flow water edge or often at the water edge.

TRANSECT. A linear plot, usually represented by a line, along which are often placed regularly spaced plot frames, loops, or other devices.

TREND. The direction of change in an attribute as observed over time.

UTILIZATION. The proportion of the current year's growth consumed or trampled through grazing or browsing. Usually expressed as a percent. See the photo guides below (from McKinney. 1997. Rangelands 19(3):4-7).



VIGOR. The relative robustness of a plant in comparison to other individuals of the same species. It is reflected primarily by the size of a plant and its parts in relation to its age and the environment in which it is growing.

INFORMATION SOURCES

USDA Forest Service
Intermountain Region
324 25th Street
Ogden, UT 84401
(801) 625-5306

Bureau of Land Management
1340 Financial Blvd
P.O. Box 12000
Reno, NV 89520-0006
(775) 861-6400

Natural Resources Conservation Service
1365 Corporate Blvd
Reno, NV 89502-7102
(775) 857-8500

Nevada Section of the Society for Range Management
Executive VP Chuck Saulisberry
(775) 883-0345
chuckjos1@charter.net

Nevada Department of Agriculture
Main Office
350 Capitol Hill Ave
Reno, Nevada 89502
(775) 688-1180 or (775) 688-1182

College of Agriculture Biotechnology and Natural Resources
University of Nevada Reno
Mail Stop 222
1660 N. Virginia Street
Reno, Nevada 89557-0107
(775) 784-1660

University of Nevada Cooperative Extension
University of Nevada Reno, Mail Stop 404
Reno, NV 89557-0106
(775) 784-7070

Nevada Agricultural Foundation
P.O. Box 780
Lovelock, Nevada 89419

SITE INFORMATION FORM

Complete this form when conducting any of the study methods in this booklet to provide an important summary of site information. If no study methods are conducted, completing this form alone will still provide a record of valuable information. All fields are required unless otherwise indicated with an "opt." Complete the blanks to the best of your knowledge.

_____ Initial _____ Annual

Unit Name_____ Pasture Name_____

Study Site (# or name) _____ Date_____ Observer_____

Monitoring Method(s) _____ Date Study Established _____

Study Located ___N __S __E __ W _____

_____1/4 of _____ 1/4 of Section _____ Township_____ Range_____

Access_____

Ownership (opt)_____ GPS Coordinates Lat._____

Long._____

Site Characteristics

Landform _____

Elevation _____ % Slope _____ Avg. Annual Precipitation _____

Range Site	Current Growing Conditions	Exposure (opt.)		Soil (opt)
__ Upland (U)	___ Above average (1)	___ N	___ S	__ Sand (1)
__ Riparian (R)	___ Average (2)	___NE	___ SW	___ Silt (2)
	___Below average (3)	___ E	___ W	___ Clay (3)
		___ SE	___ NW	___ Loam (4)

Other Climatic Information (opt. snow depth/persistence, temperatures, storms/flooding, etc.)

_____

_____

Unit/Pasture Use Information

Kind & Class of Animal_____ Season of Use_____to_____

Number_____ Grazing System_____

Current Year Grazing Management _____

Other Notes (opt. for example, growth stage of plants at time of use) _____

_____

RECORD FOR LIVESTOCK OPERATORS

(Note: this form keeps the records that many ranchers note in their pocket herd book)

Pasture:_____ Observer:_____

If this form is used for several pastures, write the name(s) on the first line for that section.

Move Date	Number of Livestock			Remarks[1]
	Put in	Taken out	Kind and Class	

Salting/Supplementation Date(s)	Product	Locations

Waters[2]	On Date	Off Date	Effects on Grazing Use

Riding/Herding Date	Effects of Grazing Use

Use by Other Herbivores or Recreationist	Effects

[1] "Remarks" may address death losses, grazing problems involving water or livestock distribution, forage conditions, or other important matters that influenced grazing user such as fire, gates left open, etc. Continue on the back of the form if necessary.

[2] Waters include those that can be turned on or off such as a trough or intermitent waters that are occasionally or seasonally dry.

Vegetation

Dominant Plants _____

Primary Forage or Indicator ("Key") Species _____

Vegetation Uses

	Degree of Use			
	High	Moderate	Low	Optional Comment
Livestock	____	_____	____	_____
Big game	____	_____	____	_____
Rodent	____	_____	____	_____
Insects	____	_____	____	_____
Recreation	____	_____	____	_____
Motorized	____	_____	____	_____
Horse	____	_____	____	_____
Dispersed camping	____	_____	____	_____
Other (e.g. Fishing)	___	_____	____	_____
				_____

Notes (Use additional pages if necessary)

_____

_____

_____

_____

_____

SITE LOCATION MAP

Show witness mark location, study site, or other information to aid in locating site

SITE LOCATION PHOTOGRAPH

Show Photo Information Sheet in all photos if possible

PHOTO INFORMATION SHEET

UNIT NAME:

PATURE NAME:

STUDY SITE:

OBSERVER:

DATE:

PERMANANET PHOTO-POINT TRANSECT

Unit Name_____ Pasture Name_____

Study Site (# or name)_____ Date_____

Observer_____

Grazing system_____

Season of Use_____to_____

Study Located ___N ___S ___E ___W of _____

_____ ¼ of _____ ¼ of Section _____

Twnsp _____ Range_____

Photo Direction_____

Photo Subject(s)_____

Photo Purpose_____

Camera_____

Lens_____ Film Speed_____

Landscape Appearance Method (Herbaceous)

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ to _____ Sample Interval _____

Class (Midpoint)	Dot Tally	(#) Count	# x Midpoint	Description of Landscape Appearance
0-5% (2.5%)				The rangeland shows evidence of no grazing, or of negligible use.
6-20% (13.0%)				The rangeland has the appearance of very light grazing. The herbaceous forage plants may be topped or slightly used. Few current seedstalks and young plants are grazed.
21-40% (30.0%)				The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60-80% of the number of current seed stalks of herbaceous plants remain intact. Fewer than 50% of the young plants are grazed.
41-60% (50.0%)				The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15-25% of the number of current seed stalks of herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants have been utilized.
61-80% (70.0%)				The rangeland has the appearance of complete search. Herbaceous species are almost completely utilized, with less than 10% of the current seed stalks remaining. Shoots of rhizomatous grasses are missing. More than 10% of the number of low-value herbaceous forage plants have been utilized.
81-94% (88.0%)				The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seedstalks of herbaceous species. Herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.
95-100% (97.5%)				The rangeland appears to have been completely utilized. More than 50% of the low-value herbaceous plants have been utilized.
	Totals	**A**	**B**	
Average Utilization = B/A			**%**	

Landscape Appearance Method (Browse)

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ to _____ Sample Interval _____

Class (Midpoint)	Dot Tally	(#) Count	# x Midpoint	Description of Landscape Appearance
0-5% (2.5%)				Browse plants show no evidence of use; or browse plants have the appearance of negligible use.
6-20% (13.0%)				The available leaders of palatable browse plants have the appearance of very light use.
21-40% (30.0%)				There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 60-80% of the available leader growth of the palatable browse plants remains intact.
41-60% (50.0%)				Browse plants appear rather uniformly utilized and 40-60% of the available leader growth of the palatable browse plants remain intact.
61-80% (70.0%)				The use of the browse gives the appearance of complete search. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on palatable browse plants. Between 20-40% of the available leader growth of the of the palatable browse plants remain intact.
81-94% (88.0%)				There are indications of repeated coverage. There is no evidence of terminal buds and usually less than 20% of available leader growth on the palatable browse plants remains intact. Some patches of 2nd and 3rd year's growth may be utilized. Hedging is readily apparent and the browse plants are more frequently broken. Repeated use at this level will produce a definetly hedged or armored growth form.
95-100% (97.5%)				Less than 5% of the available leader growth on browsed plants remain intact. Some, and often much, of the more accessible 2nd and 3rd year's growth of the browse plants has been utilized. All browse plants have major portions broken.
	Totals	**A**	**B**	
Average Utilization = B/A			**%**	

Range Utilization - Key Forage Plant Method

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ Vegetation Type _____

Midpoint	Key Species		Key Species		Description of Use Classes
(x)	Frequency (f)	f * x	Frequency (f)	f * x	
					1. No Use (0%): The rangeland shows no evidence of use by grazing animals.
					2. Slight (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seed stalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.
					3. Light (21-40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed, and 60-80 percent of the number of current seed stalks of key herbaceous plants remain intact. Most young plants of key species are undamaged. The available leaders appear cropped or browsed in patches, and 21-40 percent of the available leader growth of the key browse plants has been removed.
					4. Moderate (41-60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number of current seed stalks of key herbaceous species remain intact. No more than 10 percent of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized, and 41-60 percent of available leader growth of key browse plants has been removed.
					5. Heavy (61-80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with less than 10 percent of the current seed stalks remaining. More than 10 percent of the number of low value herbaceous forage plants has been utilized. Approximately 61-80 percent of the available leader growth of the key browse plants has been removed.
					6. Severe (81-100%): The rangeland has a mown appearance, and there are indications of repeated coverage. There is no evidence of reproduction of current seed stalks of key herbaceous species. There is no evidence of terminal buds, and 81-100 percent of available leader growth on the key browse plants has been removed. Some, and often much, of the second and third previous years' growth on the browse plants has been utilized.
Totals →					
Σfx/Σf					

Remarks: _____

Note: f = the frequency or number of observations within each class interval (f column), x = the class interval midpoint (x column) and Σ = the summation symbol.

STUBBLE HEIGHT

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of Use _____ to _____ Sample Interval _____

Record at least 36 stubble heights for each species or species group. More readings can be taken if desired.

Species (Group) _____ Species (Group) _____ Species (Group) _____

	Column A		Column B		Column A		Column B		Column A		Column B
1		26		1		26		1		26	
2		27		2		27		2		27	
3		28		3		28		3		28	
4		29		4		29		4		29	
5		30		5		30		5		30	
6		31		6		31		6		31	
7		32		7		32		7		32	
8		33		8		33		8		33	
9		34		9		34		9		34	
10		35		10		35		10		35	
11		36		11		36		11		36	
12		37		12		37		12		37	
13		38		13		38		13		38	
14		39		14		39		14		39	
15		40		15		40		15		40	
16		41		16		41		16		41	
17		42		17		42		17		42	
18		43		18		43		18		43	
19		44		19		44		19		44	
20		45		20		45		20		45	
21		46		21		46		21		46	
22		47		22		47		22		47	
23		48		23		48		23		48	
24		49		24		49		24		49	
25		50		25		50		25		50	
Sub		Sub		Sub		Sub		Sub		Sub	
Grand Total				**Grand Total**				**Grand Total**			
Avg. Height (Tot/#)				Avg. Height (Tot/#)				Avg. Height (Tot/#)			

COVER BY LIFEFORM TRANSECT

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Litter includes everything but soil, moss and lichen, or live plants.

You may record dot counts optionally for separate species (e.g., perennial vs. annual species, desireable vs. undesireable species, or noxious weeds vs. native forbs) if doing so will help meet objectives. "Other" categories below may be used for specific species or groupings of interest.

	Grasses	Forbs	Shrubs	Litter	Moss/ Lichen	Rock	Bare Ground
Perennial							
Annual							
Noxious							
Other:							
Other:							
Other:							
Total (=100)							

Plant Density

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Animal Kind/Class _____ Season of use _____ Vegetation Type _____

Area counted: 3- by 100-foot; 10, 3- by 5-foot; or 25, 2- by 5-foot quadrats

KEY SPECIES	TRANSECT 1 Numbers	TRANSECT 2 Numbers	TRANSECT 3 Numbers	average
Total				
Total				
Total				
Total				

Note - circle the quadrat sample size; use a dot-count procedure to record the plant numbers.

STREAMSIDE STABILITY

Unit Name _____ Pasture Name _____

Transect ID _____ Date _____ Observer _____

Existing Community Type	Value	Dot Tally	Count	Rating
Anchored rock/logs	10			
Trees (coniferous & deciduous)	7			
Willows	8			
Other shrubs (sagebrush, cinquefoil, etc.)	5			
Wet sedges & rushes	9			
Other sedges	4			
Wet grasses (for example, hairgrass, canarygrass, reedgrass, cordgrass)	8			
Other grasses (for example, bluegrass, redtop, bentgrass, barley, muhly)	3			
Sandbars, loose rock, bare soil (unvegetated areas)	1			
		Total		
			Numerical Rating	

Multiply the **value** for each community type by the number of tally points **(count)** to get the **rating**. Sum all the **ratings** and divide by the **total count** (number of paces) to get the **numerical rating**. Use the table below to determine the overall **stability rating** for the riparian/stream reach sampled.

Numerical Rating	Stability Rating
9-10	Excellent (very high)
7-8	Good (high)
5-6	Moderate
3-4	Poor (low)
0-2	Very Poor (very low)

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 _____

Frequency

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

Intensity

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

Opportunity

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

Pasture Name	Site ID	Frequency	Intensity	Opportunity	GRI (Total)