

WYOMING RANGELAND MONITORING GUIDE

*A Cooperative and Voluntary Approach
to Monitoring Rangelands*

Version 2

July, 2008



ACKNOWLEDGEMENTS

The Wyoming Range Service Team produced this guide. The Team has been in place for several years. Its mission is to promote cooperation and coordination between the agencies represented on the Team, and communication between the Team and other rangeland management partners. The member agencies are:

- ◆ Bureau of Land Management.
- ◆ Forest Service.
- ◆ Natural Resources Conservation Service.
- ◆ University of Wyoming Department of Renewable Resources.
- ◆ University of Wyoming Extension Service.
- ◆ Wyoming Department of Agriculture.
- ◆ Wyoming Section of the Society for Range Management.

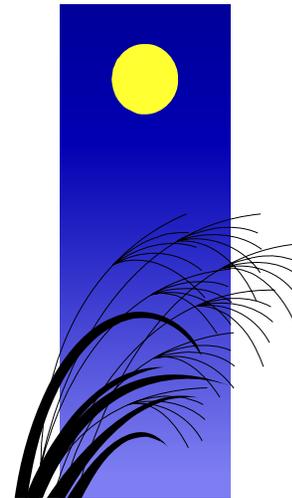
Some of our valuable partners have had the opportunity to review and support this guide. Many of those individuals and organizations have encouraged completion of this guide and are a significant part of the sustainable management of Wyoming's rangelands. The monitoring protocols presented in this guide are equally applicable in other States. Thank you for interest and we hope this guide serves you well.

- ◆ Wyoming Farm Bureau Federation.
- ◆ Wyoming State Grazing Board.
- ◆ Wyoming Stock Growers Association.
- ◆ Wyoming Wool Growers Association.

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INTRODUCTION



INTRODUCTION

Rangeland monitoring is the orderly collection, analysis, and interpretation of resource information (data) 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, or objectives.

LONG-TERM MONITORING

Long-term monitoring is the measurement of changes in plant community composition, cover, and structure; and 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.

SHORT-TERM MONITORING

In addition to long-term information, it is also critical to record annual use levels and impacts such as grazing use-intensity, pasture rotations, weather, 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.

Because of the differences in the kind of data collected, both short- and long-term monitoring information are required to effectively manage rangelands. This includes "why, where, and when" to monitor and instructions on the "Use of the monitoring Study Worksheets".

WHY MONITOR

Several reasons to monitor rangelands include:

- ◆ To determine whether management objectives are realistic and achievable. For example, is the basic rangeland health being maintained or improved?
- ◆ To determine whether the grazing management strategy meets the goals established for resource conditions and livestock on the unit.
- ◆ To provide a record of environmental and resource conditions, events, and management practices that may influence rangeland condition or health.
- ◆ To assist producers in managing livestock (for example, when to move livestock).
- ◆ To evaluate when management strategy changes are needed to better meet the identified objectives.

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. **Proper key area selection is critical to any monitoring activity.** 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. 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.

USE OF THE MONITORING STUDY WORKSHEETS

One of the often under emphasized pieces of rangeland monitoring work is the thoughtful creation and recording of the reason for installing a monitoring study and the purpose the study serves. How many monitoring studies exist with no permanent record of the study's objective?

There must be some fundamental reason to make the time and resource investment in the installation and reading of a monitoring study. However, the basic reason for the study is often lost as the years pass, as is other important logic supporting the decision to invest in a study site.

These worksheets have been developed to facilitate the orderly and logical planning of a study site:

Worksheet A is for setting up a monitoring study in a situation in which a change in grazing strategy is contemplated. It goes into more detail regarding how the impact of the proposed management would realistically achieve the objective.

Worksheet B is for designing monitoring plans in situations which are less complex. This form was created because many monitoring studies are installed to monitor "status quo" management, and thus don't require the detail involved in understanding the ecological impact of altered grazing management. The two forms have been designed to accommodate the unique aspects of planning these two categories of monitoring studies.

They are intended to be included in the permanent file for a study site, and one of these Monitoring Study Worksheets should be completed for every monitoring study. They record the pertinent information all study sites should have, such as site name, location, establishment dates, and principals involved. They were also designed to assist in the defining of monitoring objectives, and to stimulate thinking and planning regarding the site's establishment. They follow a logical sequence of inquiry:

1. What is the objective?
2. What is the current state?
3. What, if anything, needs to change?
4. What alteration, if any, in management would facilitate those changes?
5. What indicator(s) let you know that change (good or bad) is occurring?

6. What data set(s) would be a reflection of that indicator?
7. And, finally, what monitoring methodology provides that data?

Thoughtful answers, created in partnership with your Cooperative Monitoring partner, constitute a well thought out study plan addressing a relevant and defined objective.

MONITORING METHODS

The methods in this guide represent only a few of all the monitoring tools available in the data gathering toolbox. They 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 three categories.

General, Universal Methods

Site Information. This information is recorded for virtually all monitoring activities.

Site Location Map. Sketch a map displaying where the monitoring site is

Photo Information. Include this sheet in every photo to identify when and where the photo was taken.

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

Upland Site Methods

Landscape Appearance. This estimates general forage utilization. There is a separate form for herbaceous and for browse species.

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

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

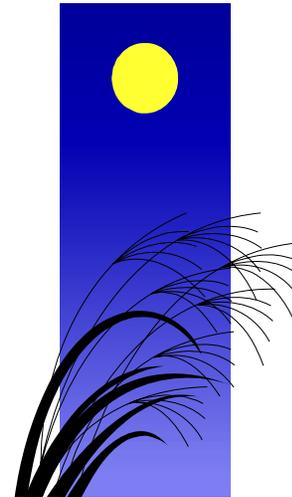
Grazing Response Index. Describes annual grazing use, and the effects of repetitive defoliation during the growing season.

Riparian Site Methods

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

Greenline Stability. Monitor the percentage distribution of riparian communities along a greenline.

MONITORING METHODS



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 describes each site from which data is collected and is very important for preventing 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 Located. Record the legal description of where the study site is located. Be as specific as 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 for the average year.

Exposure. *Optional.* Indicate the general aspect of the slope 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 that surrounding 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.

Vegetation

Dominant Plants. Identify the 3-5 most prolific species present on the study site. Be as specific as possible.

Primary Forage Species. Identify the 3-5 indicator species. These are most often the species that experience the most use during the time this pasture is grazed.

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.

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.

SAMPLE 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 Lake Creek Pasture Name Baldy
Study Site (# or name) #1 - Billy Creek Date 06/20/2001 Observer R. Jones
Monitoring Method(s) Landscape Appearance Date Study Established 06/20/2001
Study Located N S E W of Trail crossing on Lake Creek, 200 feet
NW 1/4 of SW 1/4 of Section 16 Twnshp 14N Range 26E
Access (opt.) Highway 86 to County Road 241
Ownership (opt.) Bob Robertson GPS Coordinates (as available) _____

Site Characteristics

Landform (opt.) Mountain meadow
Elevation (opt.) 5500 ft % Slope (opt.) 1 Average Annual Precipitation (opt.) 16"

Range Site	Current Growing Conditions	Exposure (opt.)	Soil (opt.)
<input checked="" type="checkbox"/> Upland (U)	<input type="checkbox"/> Above average (1)	<input type="checkbox"/> N <input type="checkbox"/> S	<input checked="" type="checkbox"/> Sand (1)
<input type="checkbox"/> Riparian (R)	<input type="checkbox"/> Average (2)	<input checked="" type="checkbox"/> NE <input type="checkbox"/> SW	<input type="checkbox"/> Silt (2)
	<input checked="" type="checkbox"/> Below average (3)	<input type="checkbox"/> E <input type="checkbox"/> W	<input type="checkbox"/> Clay (3)
		<input type="checkbox"/> SE <input type="checkbox"/> NW	<input checked="" type="checkbox"/> 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 Season of Use 6/1 to 7/1
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

Dominant Plants Needlegrass, timothy, and smooth brome

Primary Forage or Indicator ("Key") Species Needlegrass

Vegetation Uses

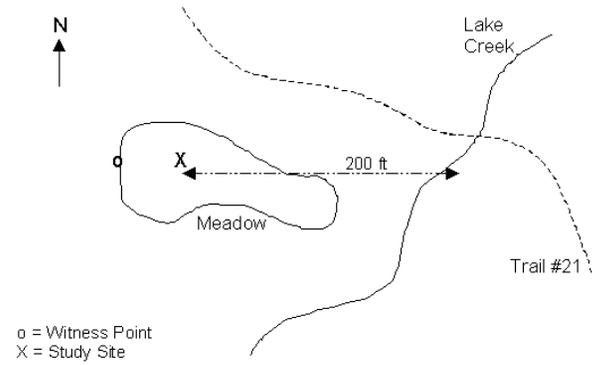
	Degree of Use			Optional Comment
	High	Moderate	Low	
Livestock _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Big game _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Rodent _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Insects _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Recreation _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<u>Non-motorized</u> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<u>Horse</u> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
<u>Dispersed camping</u> _____	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Other <u>Fishing</u> _____	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>Some banks trampled by fishermen</u>

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.

SAMPLE SITE LOCATION MAP

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



SAMPLE SITE LOCATION PHOTOGRAPH

Show **Photo Information Sheet** in all photos if possible.



PHOTO INFORMATION SHEET

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

SAMPLE PHOTO INFORMATION SHEET

UNIT NAME:

Lake Creek

PASTURE NAME:

Baldy

STUDY SITE:

#1-Billy Creek

OBSERVER:

R. Jones

DATE:

06/20/2001

PERMANENT PHOTOS

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.
2. Identify the date and location within the picture.
3. Take the picture during the same stage of plant growth each year.
4. Include the same skyline in the landscape picture.
5. Carefully relocate the photo points each time.

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 from the same designated point at approximately the same time of year. 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. Previous photographs (or photocopies) can also be helpful in "framing" the photo consistently from year to year.

Notes

- ◆ A single photograph from a permanently marked site (for example, 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 retaking it can provide good information on past use and trend of a site.

PHOTO-POINT TRANSECT

Equipment

- ◆ Site Information and Photo-Point Transect Forms.
- ◆ Two carpenter rulers, two transect stakes, 100-foot tape.
- ◆ Camera and Photo Information Sheet.

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 a relocatable bearing point.

Using the two carpenters 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 the transect, take a photograph looking back down the transect to the 0-foot mark.

Use the **Photo Information Sheet** in all photographs if possible. **A complete transect will include a total of 5 photos.**

MONITORING TREND WITH PHOTOS

Equipment

- ◆ Digital camera or 35 mm camera with color print film – exposure index of 100.
- ◆ 3x3 foot frame – 2 carpenter’s rulers or PVC pipe...both work well.

Things to Remember

- ◆ Take photos of the plot and of the general view.
- ◆ If retaking photos, be sure to match the plot frame size used previously.
- ◆ Permanently mark at least 3 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 as white is too bright.
- ◆ Usually take the photo from the north side of the plot to avoid casting a shadow into the photo.
- ◆ Include at least 3 photo plots per pasture.
- ◆ 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!!!**

SAMPLE PERMANENT PHOTO-POINT TRANSECT

Unit Name Lake Creek Pasture Name Baldy
Study Site (# or name) #1 - Billy Creek Date 06/20/2001 Observer R. Jones
Grazing System Rest rotation Season of Use 6/1 to 7/1
Study Located N S E W of Trail crossing on Lake Creek, 200 feet
NW 1/4 of SW 1/4 of Section 16 Twnsp 14N Range 26E
Photo Direction Northwest
Photo Subject(s) Landscape photo of transect with trail crossing in background
Photo Purpose Monitoring and relocation
Camera Pentax Lens 38mm Film Speed 200



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. 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, or objectives for the area.

This method is usually used only on key areas. 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).

Procedure

Select a key area 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 the 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 the transect (use either paces or steps – paces are simply 2 steps). When the predetermined numbers of paces or steps 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 the 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 record the product. Calculate the average utilization, by dividing the sum of products (B) by the total count (A).

SAMPLE LANDSCAPE APPEARANCE METHOD (Herbaceous)

Unit Name Lake Creek Pasture Name Baldy
 Transect ID #1 - Billy Creek Date 06/20/2001 Observer R. Jones
 Animal Kind/Class Cattle Season of Use 6/1 to 7/1 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%)	•••	6	78.0	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%)	••••	12	360.0	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 seedstalks of herbaceous plants remain intact. Fewer than 50% of the young plants are grazed.
41-60% (50.0%)	•••••	9	450.0	The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15-25% of the number of current seedstalks 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%)	••••••	4	280.0	The rangeland has the appearance of complete search. Herbaceous species are almost completely utilized, with less than 10% of the current seedstalks 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	264.0	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%)		0	0.0	The rangeland appears to have been completely utilized. More than 50% of the low-value herbaceous plants have been utilized.
Totals		A 37	B 1439.5	
Average Utilization = $\frac{B}{A}$			39%	

SAMPLE LANDSCAPE APPEARANCE METHOD (Browse)

Unit Name Canyon Pasture Name Aspen Lake
 Transect ID LA - a2(b) Date 08/10/2001 Observer E. Smith
 Animal Kind/Class Cow/calf Season of Use 7/15 to 8/15 Sample Interval 30 ft

Class (Midpoint)	Dot Tally	(#) Count	# x Midpoint	Description of Landscape Appearance
0-5% (2.5%)	••	2	5.0	Browse plants show no evidence of use; or browse plants have the appearance of negligible use.
6-20% (13.0%)	•	1	13.0	The available leaders of palatable browse plants have the appearance of very light use.
21-40% (30.0%)	•••	3	90.0	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%)	••••	8	400.0	Browse plants appear rather uniformly utilized and 40-60% of the available leader growth of the palatable browse plants remains intact.
61-80% (70.0%)	•••••	2	140.0	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 palatable browse plants remains intact.
81-94% (88.0%)	••••••	4	352.0	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 2 nd and 3 rd 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 definitely hedged or armored growth form.
95-100% (97.5%)		0	0.0	Less than 5% of the available leader growth on browsed plants remains intact. Some, and often much, of the more accessible 2 nd and 3 rd year's growth of the browse plants has been utilized. All browse plants have major portions broken.
Totals		A 20	B 1000.0	
Average Utilization = $\frac{B}{A}$			50%	

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

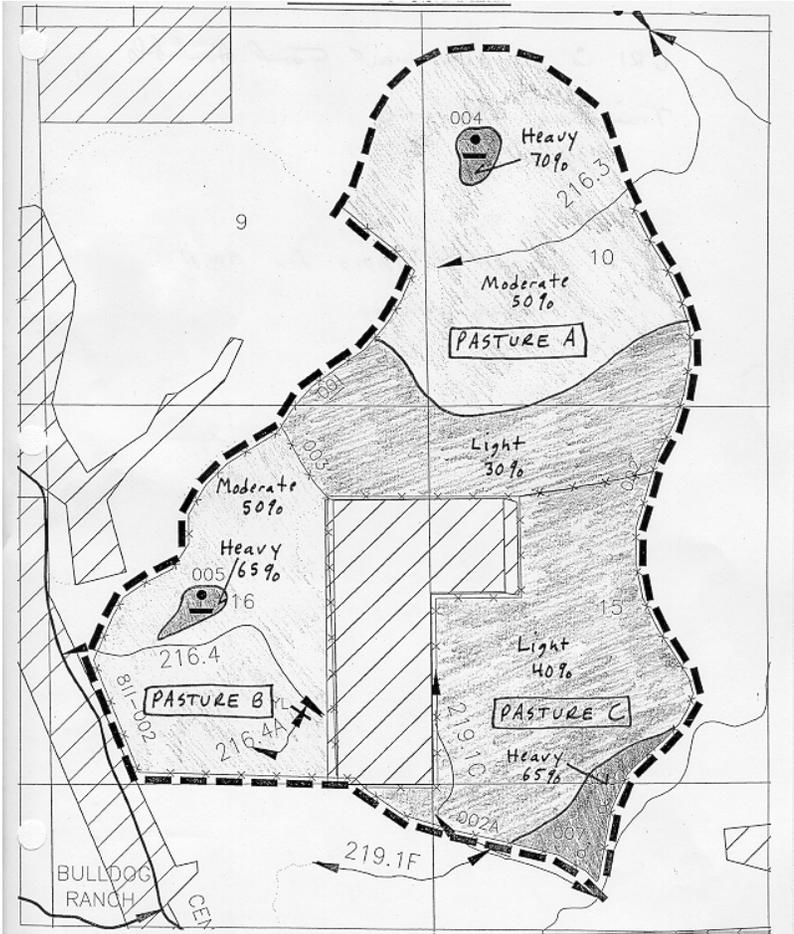
In most cases, do not attempt to map sites at smaller than a five-acre scale. However, if areas smaller than five acres occur (such as creeks, springs, or seeps), the degree of utilization on these sites should be noted on the map.

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.

GRAZING USE MAP



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 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.

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 $\frac{3}{4}$ " 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, 3 years, 5 years, etc.) provides an indication of trend on the site.

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.

SAMPLE COVER BY LIFEFORM TRANSECT

Unit Name Tongue River Pasture Name Willow Ridge

Transect ID #3 Date 06/23/2001 Observer J. Hicks

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

You may record dot counts optionally for separate species (e.g., perennial vs. annual species, desirable vs. undesirable 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)	33%	26%	17%	9%	3%	6%	6%

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 monitoring tool that 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 describe annual grazing use, interpret annual grazing effects, 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.

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

FREQUENCY

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 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:

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. 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

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

<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 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 2 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 time each year will usually receive the higher ratings or +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 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. In addition, intensity is not as critical a parameter during the dormant season, because we are not concerned with producing regrowth.

SAMPLE 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 Table Mountain Pasture Name _____
 Transect ID #7 Date 07/21/2001 Observer G. Stumbaugh
 Grazing System Rest rotation Season of Use 6/1 to 7/15

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

Pasture Name	Site ID	Frequency	Intensity	Opportunity	GRI (Total)
Pat Park	#1	+1	-1	+1	+1
	#2	0	0	-1	-1
	#3	0	0	+1	+1
Long Draw	#1	-1	-1	-2	-4
	#2	+1	0	-2	-1
Aspen Camp	#1	0	0	+1	+1
	#2	+1	+1	-1	+1
Mesa Top	#1	-1	0	-1	-2
	#2	0	+1	0	+1
	#3	0	-1	+1	0
	#4	-1	0	+1	0

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 greenline or in wet or dry meadow sites within the riparian area. In some instances monitoring is based on species groups, such as sod-forming species with similar growth form and response to grazing.

Stubble height monitoring consists of two closely related but distinct concepts and processes: trigger and residual monitoring.

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.

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

Residual Monitoring

Residual stubble height monitoring is conducted on sedge-rush communities along the greenline, following the end of the grazing or the growing (whichever occurs later) season. Retention of a specified height of vegetative plant material along the greenline 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, 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 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 (this is the **sample interval**). This will vary depending on the size and shape of the site selected.

Record the sample interval in the *Sample Int.* blank at the top of the form.

Determine how many paces (2 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 36 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 Greenline Stability Method can be taken along the same transect.

SAMPLE STUBBLE HEIGHT

Unit Name East Fork Pasture Name Willow Spring
 Transect ID #2 Date 08/04/2000 Observer R. Werf
 Animal Cow/calf Season of Use 7/15 to 8/15 Sample Interval 30 ft

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

Species (Group) <u>beaked sedge</u>		Species (Group) <u>Kentcky blue</u>		Species (Group)			
Column A	Column B	Column A	Column B	Column A	Column B		
1	4	26	7	1		26	
2	7	27	7	2		27	
3	6	28	5	3		28	
4	8	29	6	4		29	
5	2	30	9	5		30	
6	5	31	9	6		31	
7	3	32	4	7		32	
8	6	33	4	8		33	
9	9	34	6	9		34	
10	4	35	7	10		35	
11	4	36	6	11		36	
12	3	37		12		37	
13	2	38		13		38	
14	5	39		14		39	
15	4	40		15		40	
16	2	41		16		41	
17	3	42		17		42	
18	6	43		18		43	
19	2	44		19		44	
20	7	45		20		45	
21	4	46		21		46	
22	5	47		22		47	
23	3	48		23		48	
24	6	49		24		49	
25	5	50		25		50	
Sub	115	Sub	70	Sub	104	Sub	50
Grand Total	185	Grand Total	154	Grand Total		Grand Total	
Average Height (Tot/#)	5.1	Average Height (Tot/#)	4.3	Average Height (Tot/#)		Average Height (Tot/#)	

GREENLINE STABILITY

The greenline is the first perennial vegetation on or near the water's edge.

Equipment

- ◆ Site Information Form and Greenline Stability Form.
- ◆ Tape measure or folding carpenter ruler.
- ◆ Camera and Photo Information Sheet.

Procedure

Locate the greenline monitoring transect along a stream reach representative of the area and of streams being sampled. 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 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 re-locatable, 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 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).

SAMPLE GREENLINE STABILITY

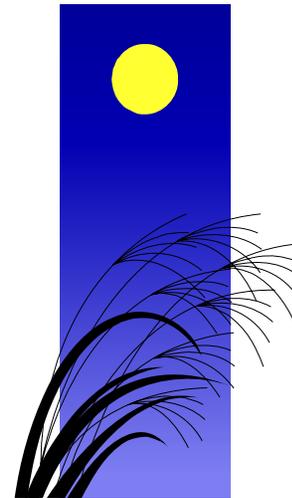
Unit Name Elk Creek Pasture Name Big Draw
 Transect ID #8 Date 08/21/2001 Observer B. Hill

Existing Community Type	Value	Dot Tally	Count	Rating
Anchored rock/logs	10		12	120
Trees (coniferous & deciduous)	7		7	49
Willows	8		21	168
Other shrubs (sagebrush, cinquefoil, etc.)	5		10	50
Wet sedges & rushes	9		44	396
Other sedges	4		13	52
Wet grasses (for example, hairgrass, canarygrass, reedgrass, cordgrass)	8		26	208
Other grasses (for example, bluegrass, redtop, bentgrass, barley, muhly)	3		49	147
Sandbars, loose rock, bare soil (unvegetated areas)	1		18	18
Total			200	1208
Numerical Rating				6.0

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)

GLOSSARY



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 foliage of plants. 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, and 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 remains 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 that contain a species and the total number of sample units.

GREENLINE. The first perennial band of vegetation nearest the water's edge. Riparian areas that are in high seral status with stable stream banks will exhibit a continuous line of vegetation at the bankfull discharge level. Rocky stream types may have a significant amount of rock causing breaks in the vegetation; rock is considered part of the green line. Other breaks may occur in the first perennial band of vegetation. The amounts of all components should be recorded, for example, perennial vegetation, rock, bare ground, and other watercourses.

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. The orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives.

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.

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 available forage 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).

Photo guide for "even" utilization.

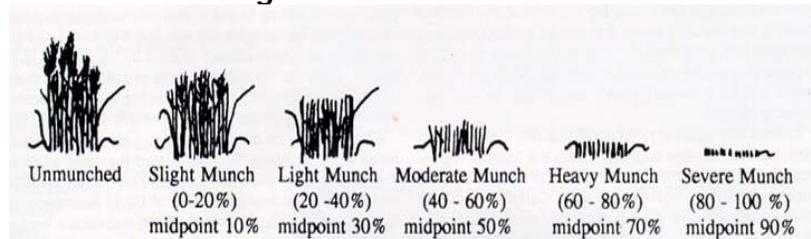
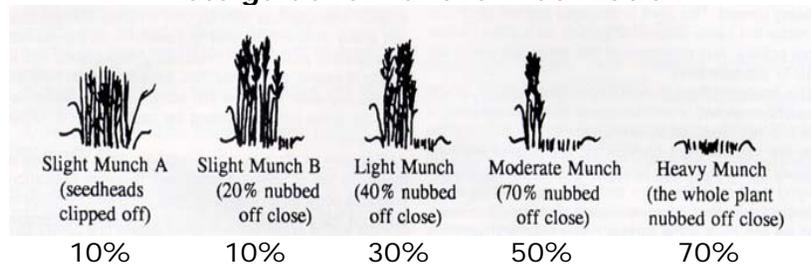
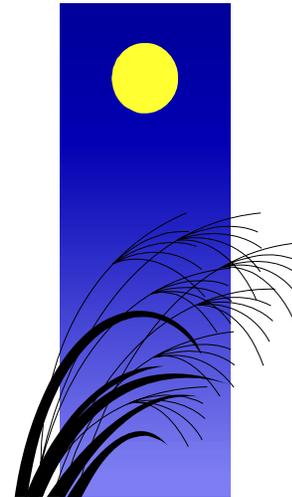


Photo guide for "uneven" utilization



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.

CONTACTS & ASSISTANCE



INFORMATION SOURCES

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Sheridan, WY 82801
307-674-2600

Black Hills National Forest
1019 N 5th Street
Custer, SD 57730
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Bridger-Teton National Forest
340 North Cache
Jackson, WY 83001
307-739-5500

Medicine Bow/Routt National Forest
2468 Jackson Street
Laramie, WY 82070
307-745-2300

Shoshone National Forest
808 Meadow Lane
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