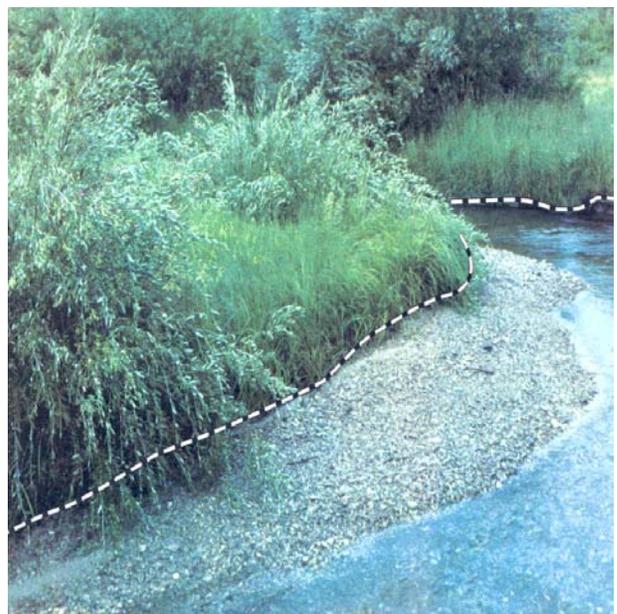


BIGHORN NATIONAL FOREST VEGETATION GRAZING GUIDELINES



Approved: /s/ William T. Bass
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ABSTRACT

This document is an effort to clarify and simplify the monitoring of existing livestock forage utilization on the Bighorn National Forest. It revises the April 1997 vegetation management guidelines. Utilization is being monitored to ensure that livestock grazing on the Forest is being conducted according to direction in the forest plan, Annual Operating Instructions, and allotment management plans. Guidelines set forth in this package are based on review of over 200 research papers pertaining to vegetation and watershed management. The utilization monitoring will verify whether current management and/or prescribed vegetation standards are resulting in the desired trend in vegetation or other resource values; if desired trend is not being achieved, the management/standards will be adjusted.

Robel pole band width and minimum stubble height¹ are the two suggested measurement protocols to evaluate forage utilization in riparian and upland sites. Livestock permittees are encouraged to use these techniques (or other measurement protocols agreed to by the Forest Service and the permittee) to complete the annual utilization monitoring described in this document. Photographs to document utilization are also recommended.

The utilization monitoring will focus on four key areas – wetland and riparian areas, upland areas, willow and aspen, and streambank disturbance or alteration. The monitoring techniques described here are designed to detect changes in (a) utilization in riparian areas and on upland sites beyond prescribed limits, (b) height or density of willows and/or aspen, and (c) bank disturbance beyond that recorded in the baseline year. The permittee(s) and Rangeland Specialist may also determine the need for additional monitoring to address site-specific concerns or problems.

Vegetation and watershed conditions must continue to meet or move toward forest plan standards. However, utilization in excess of prescribed or baseline limits may occur from time to time. When overuse does occur, adjustments in management should take place during the next grazing season to allow the necessary vegetative recovery to take place. The recommended management adjustments in this document are tools to be used, modified, or added to on a case-by-case basis.

The guidelines in this package are our best estimates of what is necessary to maintain and improve rangeland resources. By using the utilization monitoring approaches described, permittees will have more options to successfully manage the vegetative resource and meet resource objectives on the ground.

INTRODUCTION

Through the Rescission Act of 1995, the Bighorn National Forest has been directed to complete site-specific Allotment Management Plans (AMPs) on all grazing allotments by 2010. A schedule for completing the AMPs was developed in December of 1995, updated June 14, 2004, and is available for review at the Bighorn National Forest Supervisor's Office in Sheridan. As

¹ One or more *Carex* species will be monitored using the minimum stubble height method. The species to be monitored will be identified in the Allotment Management Plan or agreed to by the District Rangeland Management Specialist.

part of AMP development, each permittee will be asked to help establish specific objectives for their allotment(s), identify livestock management strategies to accomplish the objectives, and implement monitoring to determine if the management strategies are accomplishing objectives. Until an AMP is complete, the Forest will manage grazing use using the standards and guidelines in the Forest Plan and Annual Operating Instructions for each allotment.

The Bighorn National Forest Land and Resource Management Plan describes desired conditions for riparian and upland vegetation, watersheds, aspen, and soils at a landscape scale. It also includes standards and guidelines for management of these resources. The standards and guidelines cover the vegetation that may be removed by domestic livestock and wildlife, as well as that left ungrazed (herbage left ungrazed). Both types of standards are included to ensure that Forest vegetation management objectives are achieved.

Forest Plan standards for herbage left ungrazed in riparian areas (*Carex* stubble height) and upland range sites (Robe Pole band width), along with techniques to monitor aspen stands, willow populations, upland areas, and streambanks, will serve as interim guidelines for all Annual Operating Instructions. The interim guidelines will remain in effect until the Forest completes NEPA analysis as part of allotment management plan revision for the area in which the allotment(s) are located.

This analysis will verify whether current management and/or prescribed vegetation standards are resulting in the desired trend in vegetation or other resource values. If the desired conditions or trend is being achieved, the management/standards will remain in effect. If desired trend is not being achieved, the management/standards will be adjusted. If vegetation objectives are met and additional forage is available, the grazing season may be extended at the District Ranger's discretion. However, extensions in grazing season will not be granted if one or more allowable use standards are exceeded in any of the pastures previously grazed.

Livestock permittees are encouraged to complete the annual vegetative measurements described in this document or other measurements agreed to by the Forest Service and permittee. The Forest Service will monitor or spot check annual measurements, conduct more intensive long-term monitoring, and identify and describe desired conditions.

GUIDELINES

If the condition of the vegetative resource does not meet forest plan objectives, the guidelines described here will improve plant vigor, provide streambank protection, and aid deposition of sediments to rebuild degraded streambanks and increase the stability of the system over time (Elmore 1988, Clary and Webster 1989, Meyers 1989). The guidelines and monitoring protocols in this document are based on a review of over 200 research papers pertaining to vegetation and watershed management. A copy of the annotated bibliography with over 90 sources cited is available by request from the Bighorn National Forest, Forest Supervisor's Office, 2013 Eastside 2nd Street, Sheridan, Wyoming. 82801. See Appendix A for a summary of the literature supporting use of minimum stubble height and Robel pole band width as the monitoring techniques to evaluate utilization. Appendix B contains a list of key terms used in the following discussion.

Livestock tend to graze certain preferred areas first when placed in a pasture. They also tend to graze these areas repeatedly. As a result, these will generally be used to a higher intensity and

greater frequency than other areas of the same pasture. These areas of more frequent, intensive use are often designated as *key areas* for a particular pasture. Modifications to management or grazing practices may cause the boundaries of the key area(s) to change over time.

To safeguard key areas, livestock should be distributed across the pasture so they can utilize forage in other areas. Better livestock management results in more forage available for use without negatively impacting desirable plants. Livestock can be distributed through the use of salt, allotment riders, low stress livestock handling techniques, or temporary electric fence. It is important to distribute livestock throughout pastures at the outset rather than waiting until utilization in key areas is approaching the allowable use. If key areas are managed to sustain plant health then, in most cases, the remainder of the pasture will also be managed to sustain long-term health and vigor of the desirable forage plants as well. Even though the key area concept will be used to increase the effectiveness of the monitoring protocols identified in this document, it is important to remember the allowable use standards apply to all acres of suitable range within the allotment.

Utilization monitoring will focus on four components of designated key areas – wetlands and riparian areas, uplands, willow and aspen, and streambank disturbance or alteration. Key areas may only comprise a small percentage of the pasture or allotment but because of their relative importance, utilization monitoring in these areas will, in most cases, determine if allowable use standards are met throughout the allotment.

The following monitoring techniques are designed to detect changes in (a) grazing use in riparian areas and on upland sites beyond prescribed limits, (b) height or density of willows and/or aspen, and (c) bank disturbance beyond that recorded in the baseline year. Robel pole band width and minimum stubble height are the two suggested measurement protocols to evaluate forage utilization in riparian and upland sites; however, other methods may be used if agreed to by the Forest Service and the permittee. Photographs to document utilization are also recommended.

Photographs, Records and Reporting: Photo points, transects, site objectives, and methods for recording data will be identified in the Annual Operating Instructions. Permittees are encouraged to complete the photo record and record transect measurements. Stubble height measurements and any photographs taken should be turned in to the District Ranger at the end of each grazing season. Additional photographs may be taken at the permittees discretion. To be usable, **all photos need photo identification, date and location descriptions written on the back.** Photos and recorded data should be delivered to the Ranger District by December 1 each fall so they can be referenced in annual meetings discussing previous year's management. All data submitted will be maintained in the allotment file. **Data submitted by permittees must be signed by the individual who collected the data.**

Wetland and Riparian Areas

The objectives of the guidelines developed for the wetland and riparian areas are to improve and maintain the health, long-term productivity, competitiveness, and diversity of the native wetland species; enhance plant root structure to improve the stability of the streambanks; and provide a structural diversity of well-suited native species to dissipate energy during periods of over-bank flows. Normally this will mean increasing the occurrence of sedges within these areas and decreasing the amount of Kentucky bluegrass and other low growing species.

Allowable use stubble height guidelines: In early use and summer and fall use pastures with a satisfactory, existing rangeland condition, the stubble height remaining after utilization is 5 inches. In early use pastures in unsatisfactory rangeland condition, the stubble height remaining after utilization is 5 inches. In summer and fall use pastures where the existing rangeland condition is unsatisfactory, the stubble height requirement is 7 inches (see following table).

Table 1. Stubble height standards when measuring longest leaf of designated Carex species on allotments with riparian and wetland areas.

Season of Use	Existing Rangeland Condition	
	Satisfactory	Unsatisfactory
Early Use Pasture	5 inches	5 inches
Summer & Fall Use Pasture	5 inches	7 inches

*Satisfactory is defined here as meeting or moving toward desired vegetative condition, and unsatisfactory is defined as not meeting desired vegetative condition

Monitoring protocol: Generally, stubble height measurements will record the **longest available** leaf length from plants of the predetermined Carex species as specified in the AOI. Average leaf length can be used if the permittee and rangeland specialist agree to its use (standards described in Table 1 would be reduced 1 inch). The leaf measured must be standing above ground and be readily available to a grazing animal. Any portion of the leaf trampled in the mud or lying on the ground or in water is not considered available and will not be included in the measurements. Similarly, plants that are inaccessible to livestock (e.g., under willows, surrounded by rocks) will not be measured.

Stubble height measurements will be recorded using paced transects. Transects will be located in designated key areas, unless there is a specific reason (e.g., heavy grazing outside the area) to locate them elsewhere. The number of paced transects and the length of those transects will be determined by the size of the key area. Each transect will measure a minimum of 50 plants. At the permittee's request, a marker may be installed within a key area to designate where one set of measurements will be taken. Transect locations and the direction paced from that marker will be described so the permittee(s) and the Forest Service can re-read paced transects in the same approximate locations.

It may be necessary to read two transects and average results separately. One transect will be measured on the stream/land interface and a second transect within the riparian zone away from the stream edge. If the permittee(s) and Range Specialist agree, one transect read along the riparian zone away from the stream edge may be adequate to monitor a specific key area. This does not preclude other transects from being read elsewhere in the key area.

Measurements will be taken and documented within 7 days of livestock leaving a pasture. Interim measurements to determine livestock move dates are not required, however, it is recommended that this data be recorded and turned in at the end of the season. Photographs to document stubble height measurements are also recommended.

Uplands

While a heavy emphasis has been, and will continue to be placed on riparian vegetation, the upland vegetation is also important and must also be managed to meet forest plan standards.

Most key areas will include both riparian and upland rangeland sites, and permittees are encouraged to monitor utilization in both. Monitoring utilization in both riparian and upland sites within key areas is critical to ensure good management of the entire area.

The objectives of the guidelines developed for uplands are to enhance the health and long-term productivity of native species, improve and maintain plant root structure to enhance soil stability, and manage for species diversity and multiple age classes of native vegetation appropriate to achieve and maintain a condition class of good or better for each site. Vegetation will be managed to inhibit or decrease all non-native species where possible or in a manner to maintain vigor of the native plant species to resist further encroachment of non-native species where the non-natives are already established (examples include Kentucky bluegrass and timothy).

Allowable use guidelines: Beginning in 2005, uplands will be monitored to meet one of two standards. Visual obstruction readings (VORs) using a modified Robel pole will be used for uplands found on sedimentary soils below 9,200 feet elevation on the northern half of the Forest. For all other areas of the Forest, utilization will continue to be measured by a percentage of the annual production.

For those areas of the Forest using utilization by weight measurements, the allowable utilization will be 40% or less for those pastures where livestock leave the pasture prior to August 1st. The allowable utilization will be 50% or less for all other pastures.

For those areas of the Forest using VORs, a standing crop equivalent to a band reading of 5 or more on the Robel pole, as described by Uresk and Juntti, must remain when livestock leave a pasture. It is expected planning grazing periods around the physiological needs of the plants and maintaining a band reading of 5 will allow the uplands to meet the objectives stated in the previous section. Sites in satisfactory condition (meeting or moving toward desired vegetative condition) will be maintained in satisfactory condition and sites in unsatisfactory condition (not meeting desired vegetative condition) will most likely improve to satisfactory condition.

Table 2: Measurement guidelines for herbaceous vegetation in upland areas using the robel pole.

Area of Forest	Grazed Before August 1 Annually	Grazed on or After August 1 Annually
Sedimentary soils in northern half of forest below 9,200 feet elevation	VOR of 5 Bands	VOR reading of 5 Bands
All other areas	Utilization = 40% by weight	Utilizations = 50% by weight

Monitoring protocol: For those areas of the Forest using utilization by weight measurements, one of the monitoring protocols identified in the Rocky Mountain Region’s *Rangeland Analysis and Training Guide* will be used. The most common methodologies will include clipping of paired plots, use of height weight curves or gauges, or ocular estimates. In some cases, the specific methodology may be specified in the AOI where there is a need for a certain level of detail.

For those areas of the Forest using VORs, the protocol as described by Uresk and Juntti will be followed. Visual obstruction sampling can be conducted by 1 person. The pole (grey and white bands each ½ inch in width) should be placed vertically in the vegetation at arm’s length to avoid trampling effects on the vegetation or biased sampling, and then spiked into the ground to stand

freely. Visual obstruction readings (VORs) are made at a distance of 157 inches (4 meters) with the reader's eye at a height of 39 inches (1 meter). The lowest visible band is read and the measurement recorded. For example, the first band is numbered as 0 and if it were visible, this is the number recorded.

VOR measurements will be recorded using paced transects. Transects will be located in designated key areas unless there is a specific reason to put them in another location. A transect will consist of 20 stations, with stations at least 10 meters apart. Four transects are recommended in each key area. At each station, four VORs (1 for each cardinal direction) are recorded and then averaged.

Measurements should be taken and recorded within 7 days of livestock leaving a pasture. The measurement methods used in the uplands will be based on the techniques described in the Rocky Mountain Region's *Rangeland Analysis and Management Training Guide* (August 1996), such as plant height-to-weight relationship determined by the utilization gauge or the Visual Obstruction Method (Robel Pole), where applicable.

At elevations above approximately 9,200 feet, soils are shallow and growing seasons are shorter. On these sites, measurements will be taken prior to grazing. An allowable use level will be determined based on these pre-grazing measurements.

Willow and Aspen

On streams where willows and/or aspen are present or there is potential for them, it may be necessary or desirable to monitor willow and/or aspen stands in addition to the riparian and upland vegetation. The objective is to maintain or increase current woody plant density and height (specific desired condition objectives will be clearly described in the Annual Operating Instructions). Late summer, fall, and yearling grazing must be monitored closely due to the potential for impacts. Forage quality drops off later in the season causing livestock to shift use to forbs and shrubs; yearlings tend to use woody species the entire season.

Monitoring protocol: Where monitoring is necessary, permanent photo points will be established in key areas. The photos will be used to monitor plant density and average height. Baseline transects will need to be installed and documented cooperatively between the District and the permittee(s).

Bank Disturbance/Alteration

Bank stability is a key component of riparian area development and sustainability of the riparian area ecosystem. It is also an important component in the protecting aquatic habitats and meeting state of Wyoming designated beneficial uses of the water resource. Aquatic habitat can be lost if sediment yields are increased above natural levels for extended periods. An increase in sediment also has a direct affect on the diversity, productivity, and sustainability of the aquatic ecosystem.

Monitoring protocol: In areas where bank disturbance or alteration is occurring, baseline data collection will be the responsibility of the Forest Service in cooperation with the permittee(s). Generally, Greenline Stability will be monitored as described in the *Wyoming Rangeland Monitoring Guide* (August 2001), the *R-2 Rangeland Analysis and Management Training Guide* (August 1996), or in *General Technical Report RMRS-GTR-47* (April 2000). The desired

condition objective is based on preventing additional bank disturbance/alteration that cannot be recovered before the next grazing season and is beyond what is documented as baseline.

The methods discussed in this section are not intended to limit monitoring efforts or methodologies. Additional monitoring and alternative monitoring techniques can be utilized to address site specific needs, concerns, or problems. In any case, a permittee is free to use any methodology that they desire. However, if the Forest Service is to support the data findings, the methods used must be scientifically peer reviewed and accepted, properly applied, and must be approved in advance by the District Ranger.

DATA CERTIFICATION AND DISPUTE RESOLUTION

In situations where conflicting data is turned in or questions arise regarding data collected, the permittee(s) and the Range Specialists will meet on the ground and repeat the measurements together. If immediate re-measurements are not possible due to weather conditions or time constraints, joint measurements will be taken the following season. Delaying resolution until the following season will not prevent the District Ranger from initiating resource recovery efforts if necessary.

If Forest Service spot checks indicate that guidelines are being exceeded and the permittee(s) has turned in data to the contrary, the following questions need to be explored:

- ◆ Consistent data collection (e.g., is the same methodology being used)?
- ◆ If consistent, then why are the guidelines being exceeded?
- ◆ Inconsistent data collection (what are the differences in methodology being used? How will the inconsistencies be corrected)?
- ◆ Are permittees and Range Specialists communicating on pasture and allotment objectives?

If there is still a dispute after the data and methodology have been reviewed, the District Ranger will make the final decision.

ADMINISTRATIVE ACTIONS

Administrative actions have always been available for use in the administration of term grazing permits. Part 2, Clause 8(c) of the term permit gives the Forest Officer in charge the discretion to defer the placing livestock on an allotment or require the early removal of livestock from an allotment when grazing use would damage the resource. If administrative actions are not successful, Forest Service Handbook R2 Supplement 2209.13 allows the Forest Officer to suspend or cancel permits.

While administrative actions are available if necessary, they are seldom desirable in that they bottom line objective is always to achieve sound land management. The monitoring efforts described in this document increase the permittees' options for successfully managing utilization to meet vegetative resource objectives on the ground.

RECOMMENDED ADJUSTMENTS

Vegetation and watershed conditions must continue to meet or move toward forest plan desired conditions. However, utilization in excess of prescribed or baseline limits may occur from time to time. When overuse does occur, adjustments in management should take place during the next grazing season to allow the necessary vegetative recovery to take place. Prior to the beginning of the next grazing season, the permittee(s) and the Rangeland Specialist should cooperatively develop the adjustments. Permittees are encouraged to suggest corrective actions that will maintain vegetative health and vigor and still meet their livestock management needs.

Recommended Adjustments if Guidelines are Exceeded

The following recommended management adjustments are tools to be used, modified, or added to on a case-by-case basis. The livestock operator and Rangeland Specialist can, and should, discuss other management adjustments such as changing the season of use, improvements (fences, water, salting practices, etc.), and hiring full or part time riders. The prescribed adjustments or rest periods neither remove the continuing responsibility of the permittee to meet allowable use standards or to comply with the provisions of the AOI, nor do they remove the ability and/or the responsibility of the Forest Service to take permit action in cases where violations make additional action necessary.

Herbaceous Vegetation

Table 3: Recommended management adjustments for herbaceous riparian vegetation with the remaining stubble height of 6 inches average or 7 inches longest leaf length.

Actual Height (ht)	Pasture(s) Adjustment
Average ht. = less than 6 inches in the first year. Longest leaf length = less than 7 inches in the first year.	Work with permittee to modify grazing practices (e.g., pasture rotation, length/season of grazing).
Average ht. = less than 6 inches second year. Longest leaf length = less than 7 inches the second year	Up to 20 day shorter season or add one inch to the following year stubble height.
Average ht. = 3 inches or less 1st year = 4 inches or less 2 nd year guidelines are exceeded. Longest leaf length = 3.5 inches or less 1 st year, 5 inches or less the 2 nd year the guidelines are exceeded.	Up to Resting a pasture the following year.

Table 4: Recommended management adjustments for herbaceous riparian vegetation with the remaining stubble height of 4 inches average or 5 inches longest leaf length.

Actual Height (ht)	Pasture(s) Adjustment
Average ht = less than 4 inches in the first year. Longest leaf length = less than 5 inches in the first year.	Work with permittee to modify grazing practices (e.g., pasture rotation, length/season of grazing).
Average ht. = less than 4 inches second year. Longest leaf length = less than 5 inches the second year	Up to 20 day shorter season or add one inch to next year stubble height.
Average ht. = 2 inches or less 1st year. = 3 inches or less 2 nd year guidelines are exceeded. Longest leaf length = = 2.5 inches or less 1 st year, 4 inches or less the 2 nd year the guidelines are exceeded.	Up to Resting pasture the following year.

Table 5: Recommended management adjustments for upland vegetation with the Robel pole.

Actual use	Pasture(s) Adjustment
A. Actual use exceeds Robel Pole reading by 2 band widths or annual Operating Instructions prescribed use by 10% by weight first year	Work with permittee to modify grazing practices (e.g., pasture rotation, length/season of grazing).
B. Actual use exceeds Robel Pole reading by 2 band widths, the annual Operating Instructions prescribed use by 10% by weight the second year or exceeds Pole reading by 3 band widths the 1 st year.	Up to 20 day shorter season, 20% less utilization the next year or 2 band widths to the robel pole.
Use exceeds the previous actual use standards in A or B above	Up to Resting pasture the following year or permit adjustments.

Willow and Aspen: If monitoring clearly shows willows or aspen are shorter than the previous year or density is decreasing, a 6-inch stubble height on the taller herbaceous vegetation in the understory may be implemented the following year. If this action fails to meet the plant needs, additional action, such as temporary fencing of aspen clones, will be taken to assure plant needs are met the following season.

Appendix A – Literature Review for Selection of Monitoring Protocols

The rationale for recommending minimum stubble height and visual obstruction measurements is based on a review of the scientific literature and is summarized as follows:

- ◆ Bryant 1985, Chaney and Elmore 1990, Chew 1991, Clary and Webster 1990, Marlow et al. 1987, and Skovlin 1984 report that when the riparian vegetation is used properly in terms of season, frequency and intensity of use, the vigor and production of the vegetation is improved; stream bank erosion is reduced and the general health of riparian habitat is maintained.
- ◆ Warren P. Clary, (1995) noted when defoliation, compaction, and nutrient return effects are considered in mountain meadow sedge-dominated communities, grazing once annually during the growing season to a 5-cm (2-inch) stubble height in the spring, or to a 10-cm (4-inch) stubble height in late summer, or at a utilization rate exceeding 30% total annual production can reduce herbage production significantly.
- ◆ Ratliff and others (1987) suggested that for site protection the herbage remaining after grazing should equal the proportion of production that decomposes annually. This translated into utilization rates of 35 to 45 percent on excellent-condition meadows down to 20-30 percent on poor-condition meadows.
- ◆ Platts (1982) suggested that rest-rotation grazing with 65 percent use or higher resulted in altered riparian habitat conditions while 25 percent use or less had little effect.
- ◆ Elmore (1988) suggested that 3 to 4 inches of stubble height would maintain plant vigor, provide streambank protection, and aid sediment deposition to rebuild degraded streambanks. Elmore also suggested that in some situations the use of willows begins when use on herbaceous plants reaches about 45 percent.
- ◆ Meyers (1989) evaluated 34 grazing systems in place for 10-20 years. Vigorous woody plant growth and at least 6 inches of residual herbaceous plant height at the end of the growing/grazing season typified the riparian areas in excellent, good, or rapidly improving condition. This residual plant cover appeared to provide adequate streambank protection and sediment entrapment during high stream flow periods.
- ◆ Clary (1988) developed an approximate relationship between percentage utilization and stubble height of riparian graminoids with the exception of bluegrass. His data suggests that average utilization levels of 24 to 32 percent were obtained when riparian graminoids were grazed to a 6-inch stubble height, that average use levels of 37 to 44 percent were obtained when grazing to a 4-inch stubble height, and that average use levels of 47 to 51 percent were obtained when grazing to a 3-inch stubble height.
- ◆ Olson and Richards (1989) noted that a plant's ability to recover from grazing depends on the availability of meristematic tissue. If grazing does not remove current meristematic tissue, the plant will be able to recover from the herbivory event and the long-term productivity and competitiveness of the plant will not be adversely affected.

- ◆ Benkobi et al. noted that regression results showed that visual obstruction was highly related to standing crop. Prediction of average standing crop was made with high accuracy and precision. The visual obstruction technique is simple, cost effective, and provides dual information pertinent to livestock and wildlife management (Benkobi, L.; D. Uresk, G. Schenbeck, and R.M. King 2000).
- ◆ Heady and Dennis noted that Hedrick (1958) summarized that average utilization of the key species over a number of years which approximates 50% removal is a reasonable expression of proper utilization for most grassland ranges. They also referenced that Valentine (1970) agreed with the 50% guide for good condition *Bouteloua eriopoda* ranges but recommended 32 % removal on ranges in poor condition. They also conclude that the 40% that remains as organic residue can be measured directly. It is this portion that initiates future growth, protects the soil, and indicates the health of the range. Quantity of material rather than proportion of the crop is the better indicator of grazing effects. Standards of range utilization based on those amounts can indicate range condition and eliminate the inaccuracies of estimating the proportion of the herbage crop that has disappeared. The physiological dependence of each plant on the ungrazed or remaining regenerative tissue make reconstruction of the total crop of doubtful value in evaluation range responses. Therefore, amount of ungrazed herbage should be increasingly used to express proper utilization (Heady, H.F. and D.R Child 1994).
- ◆ Holechek, Pieper, and Herbel suggested that on key areas average stubble heights of 30 to 35 cm (12 to 14 inches) for tall grasses, 15 to 20 cm (**6 to 8 inches**) for mid grasses, and 5 to 8 cm (2 to 3 inches) for short grasses are recommended minimums for proper use. They also listed grazing intensities for bunchgrass (heavy=53%, moderate=35%, light=20%) and noted that moderate grazing in northern mixed prairie equates to 40 to 50% use of key species. (Holechek, J.L., R.D Pieper, and C.H. Herbel, 1989).
- ◆ Holechek, Pieper, and Herbel suggested another approach is to estimate residue or stubble left on the range at the end of the grazing season rather than the amount removed. Bement (1969) illustrated this approach for shortgrass range in Colorado, considering both livestock performance and vegetational composition. The reader is referred to Jasmer and Holechek (1984) and Cook and Stubbendieck (1986) for more detailed discussions of how to measure utilization and other vegetational attributes (Holechek, J.L., R.D Pieper, and C.H. Herbel, 1989).
- ◆ Uresk and Juntti (currently unpublished) described a methodology for using visual obstruction readings to measure standing crop for vegetative types found on sedimentary soils below 9,200 feet in elevation on the northern half of the Bighorn National Forest. Structural categories for standing crop were identified for the four distinct categories of Short, Short Intermediate, Tall Intermediate and Tall. The modified pole may be employed to provide management information for herbivore grazing, wildlife and most importantly, guidelines to maintain the structure of a plant community for diversity of plants and herbage production. Management decisions by area or pasture could be carried out by establishing limits of herbage left ungrazed by band numbers only. Once the desired band width has been achieved, then livestock are to be removed to maintain the resource objective.

Appendix B – List of Key Terms

Wetland - Areas with shallow standing water or seasonal to year-long saturated soils (including bogs, marshes, and wet meadows).

Riparian area - refers to land adjacent to perennial streams, lakes, and reservoirs and including other well developed riparian vegetation (primarily intermittent streams). This land is specifically delineated as the transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem and is defined by soil characteristics and distinctive vegetation communities that require free and unbound water (water influence zone). "Green line" and riparian area are not identical. Within the riparian zone the "green line" is that narrow strip of vegetation immediately adjacent to the water. For clarification of management, the Bighorn National Forest vegetation riparian grazing guidelines apply to the entire riparian area.

Key areas - A portion of range selected because of its location, grazing or browsing value, or use. It serves as a monitoring and evaluation focal point for range condition, trend, and degree of grazing use. Properly selected key areas give an indication of the overall ability of current grazing management to meet all resource management objectives. A key area guides the general management of the entire area of which it is a part.

Key Management Species - Those species which must, because of their importance within the plant community, be specifically identified and considered in the management program.

Bank Damage/Alteration - Streambanks that show signs of sloughing, dislodged stones or logs, and/or trampling from animals or human-related influences.