

Pasture and Range Health FACTSHEET

MONITORING GRAZING LANDS

What is Monitoring ?

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

Why Monitor ?

Monitoring, while labour intensive, is an important component of any grazing management plan. It provides measurables that allow you to determine whether the objectives of these plans are being met. Without it, you are unable to determine what effect your grazing has had on the health of your tame pastures or native range. This includes determining the trend, or changes, occurring in the condition of your grazing areas.

Types of Monitoring

In addition to your pasture and range health assessment you may want to consider adding other methods of monitoring to your program. If you wish to do this, we would recommend adding either or both long-term and short-term components to your system.

Where do I Monitor ?

All grazing management plans should identify **key areas** that allow you to monitor grazing use. A **key area** as defined by the Society for Range Management is a relatively small portion of a pasture that is selected because of its location, use, or grazing value as a monitoring point for grazing use. It is assumed that **key areas**, if properly selected, will reflect the overall acceptability of current grazing management over the entire pasture. A **key area** should not include areas of livestock concentration, such as stream crossings, bridges, fence lines, and driveways. Although it is preferable to have a **key area** for every pasture, it is also important to limit the number of areas so that they can be monitored in a timely and acceptable manner. Overall, a **key area** should serve as an indicator of grazing use for the pasture and not include areas of livestock concentration.



When do I Monitor ?

All monitoring programs should take place at the same time each year and should be repeated at regular time intervals. Ideal monitoring times in British Columbia vary from May to September depending on location. Monitoring should also be conducted either before or after grazing use with follow-up monitoring being conducted under similar conditions. Long-term monitoring generally takes place every one to five years whereas short-term monitoring may be repeated at any time interval. Overall, it is important that any monitoring program be both systematic and rigorous.

Long-term Monitoring

This type of monitoring allows you to determine whether changes in the condition of your pasture or range are occurring. For example, is bare ground present, increasing or decreasing? We recommend using a combination of photo points, record keeping (livestock numbers, on/off dates, weather data) and trend information in long-term monitoring strategies.

Photo points: If done correctly, photo points can be a very powerful tool that will assist you in monitoring vegetation (plant) changes over time. The following section has been taken directly from Monitoring Montana Rangeland (1999).

Permanent photographs of a landscape are useful for detecting changes in vegetation structure and for visually documenting measured changes. Even if you take digital photos, be sure to print and store photos in plastic photo storage sheets. Slide the photo card (page) behind the photo in the plastic storage sheet.

Materials

- 1 meter square (3 ft²) frame
- Four large nails, bridge spikes, or rebar stakes
- Compass (if possible)
- 35 mm or digital camera with a 50 mm equivalent lens (1:1 ratio) - if a wide angle, telephoto, or zoom is used, record the lens and camera information
- Photo point (ID) board (chalk or whiteboard) or photo point (ID) card (adjacent) on a clipboard
- Thick marking pen

Methods

Once the plot is located, the marking and recording procedure is as follows:

1. Delineate the photo plot by placing a plot frame on the ground. A convenient frame is typically 1 meter square. Mark the plot position by driving large nails, bridge spikes or rebar rods into the plot corners. This will allow precise relocation of the plot for future observations.
2. With a felt pen and a yellow paper pad (white is too bright), make a plot sign to be included in the plot photo. The sign should include the plot identification and date, as well as any other information that seems important. Keep it as short as possible for legibility, however. Place the sign on the ground next to the plot frame.
3. Stand so your shadow is not cast across the plot, and hold your camera at arm's length in front of you, lens pointing down. It may be helpful to stand on something to ensure adequate coverage. Make a vertical photograph.

Example of Photo-point ID Board



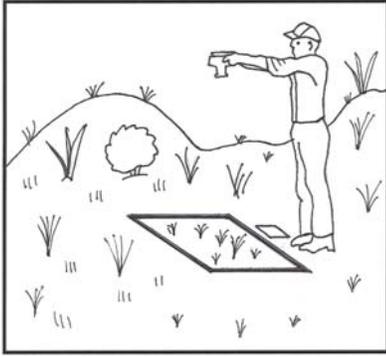
SITE

DATE

PLOT

LINE #

DIRECTION

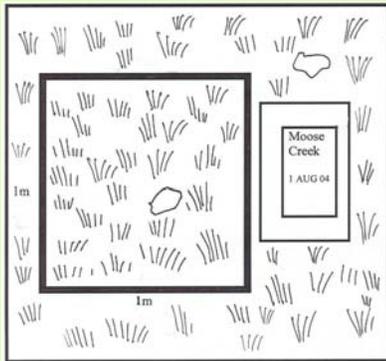


Taking an overhead photo

4. Step back from the plot 5 paces to get an oblique photograph of the plot and the skyline to the rear. The skyline should make up approximately 30% of this and any additional photos.

If you would like to get additional photos, complete step 5. If not, continue onto Step 6.

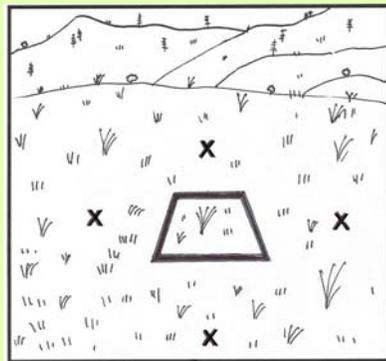
5. Repeat the oblique photo procedure from each of the other three sides of the photo plot. If the sun is shining, you probably are going to catch your shadow in at least one of these views. Try to make it as inconspicuous as possible. You now have a record of the plot and its setting in four directions.



Example of an overhead photo

6. If you have a compass, determine the bearing of at least one of the oblique photos. Again, this will aid in plot relocation. Also, record the bearing and distance of the photo plot (perhaps one of the corner markers) from a witness marker: rock, fence post, marked tree. If there is not obvious witness, place a steel fence post at a distance of at least 50 feet (to avoid animal attraction).

7. Remove the plot frame. You may wish to spray paint the corner pins to help find them at later dates.



Taking additional photos

8. When the photographs are processed, file the prints and negatives in the monitoring record book. A convenient way to file both negatives and prints is to use a 5 x 7-inch manila envelope, which can be punched for a three-ring binder or kept in a file. Each study site should have its own envelope. Negatives are particularly valuable, and should be kept in a secure place. Prints also may be displayed in an album or on pages in a binder.

Trend: By repeating the rapid assessments in the British Columbia Environmental Farm Plan Grazing Management Guide you can monitor the trend of your grazing lands and highlight the successes or failures of your grazing management practices.

Short-term Monitoring

This type of monitoring allows you to determine whether or not your management system is being followed (i.e., stubble height, relative use, browse evaluation). We recommend using both Form 1 and 2 to track your progress and establish a record of annual-use. This section will explain how to fill in the categories listed on these two forms.

Stubble Height: Table 1 gives you general rules of thumb for the height of forage that should remain after grazing or harvesting various British Columbia forages. To determine stubble heights it is generally recommended that you establish a 10 pace transect in your *key area* and measure. The stubble height of your key plant species should then be measured at every pace and averaged out once 10 paces are reached. If possible, the stubble height of each species or life form should be calculated. If plant species identification is difficult you may want to consider lengthening your transect to 50 paces.

Table 1. General rules of thumb for the height of forage that should remain after grazing or harvesting for various British Columbia forages.

Table 1 STUBBLE HEIGHTS FOR VARIOUS FORAGE SPECIES		
PLANT SPECIES	AVERAGE STUBBLE HEIGHT	
	Centimeters	Inches
Kentucky Bluegrass	5 to 10	2 to 4
Bluebunch Wheatgrass	15	6
Rough Fescue	15	6
Idaho Fescue	10 to 15	4 to 6
Bluejoint	7 to 10	3 to 4
Pinegrass	10 to 15	4 to 6
Alfalfa	7 to 10	3 to 4
White Clover	2 to 7	1 to 3
All Other Clovers	7 to 12	3 to 5
Orchardgrass	7 to 15	3 to 6
Tall Fescue	5 to 7	2 to 3
Smooth Bromegrass	7 to 10	3 to 4
Crested Wheatgrass	7	3

Other important factors to consider when using stubble heights.

- Stubble heights should only be used as an annual monitoring *tool* or as an indicator for adaptive management.
- Stubble heights should vary depending on local variables and the timing, duration and intensity of livestock use.
- The linkages between stubble heights and riparian/ upland functions have not been extensively researched nor documented through long term monitoring.
- Stubble height as an annual indicator of grazing use in riparian areas should only be used where existing science suggests that it is an appropriate indicator and in combination with long-term monitoring of vegetation and channel parameters.
- The use of stubble height standards should be restricted to “sites near the stream edge, areas that can be described as streamside, or near-stream areas of water-loving (hydrophilic) or potentially water-loving vegetation.

- Stubble height is not appropriate to use as a long-term monitoring tool to determine trend.
- It is inappropriate to use stubble height numeric values as a sole means to manage toward achieving long-term objectives.

Relative Use: Determine Relative Use as follows:

Select *key areas* to monitor.

Rate the Relative Use of your *key areas* by putting it into one of the following five categories:

- | | |
|-----------------|---|
| 1. None- Slight | No visible use of key (best) forage plants. |
| 2. Light | Only preferred areas and key forage plants are grazed. |
| 3. Moderate | Key areas and key forage plants are uniformly grazed. |
| 4. Heavy | Key forage plants are almost completely used. Some use on low value plants. |
| 5. Severe | Pasture appears mowed. Key forage plants are weak from repeated grazing. |

Forage Production: The following section suggests a procedure to calculate the amount of forage produced on your grazing lands.

1. Select a site that represents your pasture.
2. Determine the number of plots to be sampled. The number of plots selected will depend on the purpose for which the estimates are to be used, uniformity of the vegetation, and other factors. The number of plots will typically vary from 1 to 10.
3. Adapt size of plots to the kind of plant cover to be sampled. Plots can be circular, square, or rectangular. The area of a plot can be expressed in square feet, in acres, or in square meters. If vegetation is relatively short and plot markers can be easily placed, 0.25 and 1 square-meter plots are well suited to use in determining production in pounds per hectare. The 1-square-meter plot is generally used in areas where vegetation density and production are relatively light. The 0.5 square-meter plot is satisfactory in areas of homogeneous, dense vegetation like tame pastures or wet meadows.
4. After plots are selected, harvest all of the plants located within the plot. Harvest all herbaceous plants originating in the plot at ground level. Harvest all current leaf, twig, and fruit production of woody plants originating in the plots. If harvesting forage production only, then harvest to a height of 1.5 meters above the ground on forestland sites. This includes all parts of plants whose stems originate in the plot, i.e., all aboveground parts that extend beyond a plot boundary. Exclude all parts of herbaceous plants and shrubs whose stems originate outside a plot, even though their foliage may overlap into the plot. Divide the harvested plants into grasses (and grass-like), forbs and shrubs.
5. Air-dry samples, Weigh and record the weight of the grasses (and grass-like), forbs and shrubs.

Production Score: If you're short of time, rate the production of your *key area* by putting it into one of the following five categories:

1. Extreme Drought (no growth this year)
2. Below Average
3. Average
4. Above Average
5. Extremely High (maximum potential)

Browse Evaluation: The following sections have been adapted from the National Range and Pasture Handbook. Refer to page 8, Browse Resource Evaluation table.

In addition to grasses and forbs, it is also important to determine whether woody vegetation is being used. Woody plants play an important role in maintaining or restoring the functionality of native range ecosystems. Over utilization (heavy use in the diagram below) of woody plants can result in a reduction of woody plant vigour, leading to the elimination of preferred woody plants and an invasion of disturbance and/or weed species. It is also important to note however, that light to moderate use helps maintain woody plant vigour.

Use Form 1 (page 8) to evaluate the composition and trend of your browse resource as well as document the actual use of key browse species over time. This information can be used to identify problems, formulate alternatives, and measure progress in attaining browse management goals.

Browse Composition: Evaluate the occurrence of browse plants according to preference categories. Categorize your browse plants as preferred, desirable, or non-preferred (by using the Ministry of Agriculture, Food and Fisheries/ BC Chapter Society for Range Management Range Plant Field Guides). Table 2 below provides examples of how to categories specific browse plants.

Occurrence: After a thorough observation of the *key area*, determine the occurrence of each listed species and place a checkmark or an x in the appropriate block as defined.

<i>Abundant</i>	The species dominates or characterizes the area observed; it makes up greater than 5% canopy and often greater than 20%.
<i>Common</i>	The species is easily found, but is not present in abundance; it usually makes up 1-5% canopy.
<i>Scarce</i>	Insignificant amounts of the species is present and may be difficult to find; it usually makes up far less than 1% canopy.

Table 2 Example of Preference Categories		
Preferred	Desirable	Non-preferred
Trembling Aspen	Black Twinberry	Soopolallie
Elderberry	Willows	Snowberry
	Saskatoon	Big Sage
	Rose	Alder
	High Bush Cranberry	Juniper
	Bitterbrush	Tall Oregon-grape
	Red-Stemmed Ceanothus	Hardhack
	Red-Osier Dogwood	Choke Cherry
	Gooseberry	Douglas Maple

Browse composition is judged as good, fair, or poor based on the preponderance of entries in the shaded boxes. For example, if there were four entries in the fair blocks, one in the good blocks, and 2 in the poor blocks, the overall browse composition would be judged as fair.

Browse Trend: Evaluate the health and vigor of the browse resource based on signs of past use and on reproduction. Hedging and browse lines are distinctive growth forms that occur on shrubs or trees subjected to long term heavy use. After a thorough examination of the selected species in the area, determine the level of hedging or browse line and status of reproduction and place a checkmark or x in the appropriate block as defined below.

Hedging or browse line: Hedging is evaluated on short shrubs which are entirely or mostly within reach of browsing animals. Browse line is evaluated on taller shrubs and trees where a portion of the plant is above browsing height.

Not evident On shorter plants, there is little or no evidence of hedging. On taller plants, there is little or no reduction of lower growth. Production of lower branches and twigs is similar to those above the reach of animals.

Moderate On shorter plants, most recent year's twigs have been browsed, resulting in branching and re-branching from lateral buds; growth form is somewhat compact. On taller plants, there is a visible thinning of growth up to browsing height; lower branches and twigs are considerably less productive than those beyond reach of the animals.

Severe Shorter plants are very compact or have a stunted appearance; may be characterized by very short twigs, stubby branches, small leaves, low production or excessive number of dead branches. On taller plants, a browse line is strikingly evident; there is little or no production on twigs within reach of animals; most lower branches are absent.

Reproduction: A reproduction evaluation is made to determine the future potential of a species in the community. The presence of young seedlings is only one measure of reproduction. The survival of new plants for the first 1 to 5 years is often the limiting factor, even though new seedlings or root sprouts may be present in some abundance in some years. A good distribution of various age plants from young to fully mature is a better indicator of successful reproduction.

Abundant The population of a species is increasing in the community; more young plants are present than are old plants.

Adequate Sufficient seedlings and young plants are present to approximately maintain the appropriate population status of the species in the community; plants that are decadent or dying are being replaced by new plants.

Inadequate Few or no seedlings or young plants are present; population is either declining or stagnated with mature plants.

Utilization of Current Year's Growth: This section of the form is used to record the actual degree of use on key species in the same area over a period of years. Browse use is usually determined sometime between late fall and late winter. Degree of use is expressed as the percentage, by weight, of the current year's twig and leaf production within reach of browsing animals that has been consumed. Use is most easily estimated by comparing accessible twigs to twigs which are inaccessible to browsing animals. Determinations should be made by observing many twigs on a number of different plants. Current year's twig growth is distinguished from older twigs by color, texture, and size.

The following checklist will assist you in developing and implementing a monitoring program to coincide with your grazing management plan.

How Do I Develop a Monitoring Program ?

- Define monitoring objectives.
- Assemble background information (maps, photos).
- Select *key areas* you would like to monitor.
- Describe each monitoring site's management and current conditions (Fill out form on last page).
- Select monitoring strategies and indicators (riparian assessment, photo points, herbaceous and browse utilization, stubble height, etc.).
- Establish permanent transects and begin monitoring.

FOR FURTHER INFORMATION CONTACT

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FORM 2. MONITORING DATA FORM AND ANNUAL USE RECORD FOR GRAZING MANAGEMENT

(Use one form for each monitoring location – you will not necessarily use all columns. After Herrick et al. (2003))

Pasture _____

Key Area _____

Precipitation (mm/inches) _____

Length of pace (if pace transect used) _____ cm/inches.

Date	Number and class of livestock	Livestock Date in	Date out	Photo (Y or N), (date & time)	Average stubble height ¹ (cm/in.)	Average ungrazed plant height ² (cm/in.)	Grazed % height ³ or Relative Use score ⁴ (circle one)	Browse Evaluation (described above)	Production score ⁵	Remarks (include any other management information and observations on weeds, wildlife use, fires, etc.)

¹ **Average stubble height.** Measure at least 10 plants. Measure basal height of the plant (or longest leaf). Be sure to measure same species for grazed and ungrazed pastures.

¹ **Average ungrazed plant height.** Measure at least 10 plants. Measure basal height of the plant (or longest leaf). Be sure to measure same species for grazed and ungrazed pastures.

³ **Grazed % height.** Divide “Average grazed plant height (stubble height)” by “Average ungrazed plant height” (two previous columns) and multiply by 100.

⁴ **Relative use score.** 1. None-Slight (no visible use of key (best) forage plants). 2. Light (only preferred areas and key forage plants grazed). 3. Moderate (*key areas* and key forage plants are uniformly grazed). 4. Heavy (key species closely grazed and low forage value plants moderately grazed). 5. Severe (pasture appears mowed, key forage plants are weak from repeated grazing).

⁵ **Production score.** 1. Extreme Drought (no growth this year). 2. Below Average. 3. Average. 4. Above Average. 5. Extremely High (maximum potential)