Rangeland Health Assessment

for Grassland, Forest & Tame Pasture

2016

Field Workbook

Alberta Government

Citation for this field workbook:

Adams, B.W., G. Ehlert, C. Stone, M. Alexander, D. Lawrence, M. Willoughby, D. Moisey, C. Hincz, A. Burkinshaw, J. Richman, K. France, C. DeMaere, T. Kupsch, T. France, T. Broadbent, L. Blonski, A. J. Miller. 2016. Rangeland Health Assessment for Grassland, Forest and Tame Pasture. AEP, Rangeland Resource Stewardship Section.

First Printing May 2003
Revised April 2005
Revised April 2009
Revised August 2010
Revised March 2016

To obtain additional copies of this booklet or the abridged version visit your local Rangeland Office or call on the RITE line 310-000 and ask for 780-427-3595 or visit www.alberta.ca and search rangeland health.

ISBN Number: 978-1-4601-2784-1 (Print Version)
978-1-4601-2785-8 (PDF Version)
Printed March 2016 (5th version)

Acknowledgements

We wish to express our sincere thanks to all those that have contributed to the development of this health assessment guide. We have had big shoes to fill. The first range condition guide for Alberta was published in 1966 by Sylver Smoliak, Bob Wroe, Alex Johnston, L.M. (Mac) Forbes and Scotty Campbell and has survived the test of time. Now, as they have taught us, it is our turn to build on their work and to try to improve on their practical tool. It is the authors' hope that we and others will continue the process of learning and refinement of the tools, now and in the future.

The philosophy of rating ecological function of rangelands has been inspired by riparian health tools developed by Dr. Paul Hansen and William (Bill) Thompson and the Cows and Fish Program. We would like to express our thanks to Paul Hansen and Bill Thompson, Bitterroot Restoration, Corvallis, MT, and to our Cows and Fish colleagues Lorne Fitch, Norine Ambrose, Greg Hale, Kelsey Spicer-Rawe, Kerri O'Shaughnessy and Michael Gerrand.

We have also borrowed heavily from the National Range and Pasture Handbook developed by the National Resource Conservation Services (USDA), and we have also been informed by the ongoing dialogue on range health provided by the International Society for Range Management. We appreciate the useful feedback provided in the early stages of this work by Dr. Jim Romo (University of Saskatchewan, Saskatoon), Dr. Edward Bork (University of Alberta, Edmonton) and Dr. Walter Willms (Agriculture and Agri-Food Canada, Lethbridge). We also would like to recognize significant support and contributions from: Keith Lyseng, John Laarhuis, Helen Newsham, Dan Smith, Al Robertson, Dave Downing, Russ Well.

We have been able to implement a province wide approach to rangeland health assessment due to collaboration with government staff who monitor rangelands throughout the province. They include: Doug Amundsen, Bert Arthurs, Georgia Barber, Bob Barlund, Alysia Book, Varge Craig, Jody Best, Nancy Boutilier, Diana Brierley, John Carscallen, Camille Ducharme, Richard Ehlert, Lori Enns, Felix Gebbink, Frank Gazdag, Kimberly Good, Roy Hewitt, Dennis Holowaychuk, Terry Hood, Dave Karasek, Brendan Kowalenko,

Brian Kremeniuk, Tracy Kupchenko, Kurt Kushner, Darren Labonte, Jim Linquist, Harry Loonen, Greg McAndrews, Kara McGonigle, Stew McKay, Dennis Milner, Tanis Mosentine, Candace Piccin, Ken Pitcher, Joel Politeski, Tanya Silzer, Debbie Stover, Keith Stretch, Karen Sundquist, Jake Willms, Andre Breault, Christine Boulton, Kelly Brouwer, Lynn Fitzpatrick, Robert Oakley, Brian Olson, Patrick Porter, Melissa Schening, Kimberly Will, Jaime Robinson, Ben Peterson, Rowshon Begam, Christine Buchanan, David Vanderwell, Dale Smith, Charlie Kaufmann, Danielle Gabruk, Hilary Baker, Elisabeth Scheidegger, Lindsey Fairfield, Leah Predy, James Hedges, Bruce Cairns.

Thanks also to the CGI team of Rob Warren, Dave Herbert and Michel Portsmouth for their able support in automating this system within the Public Lands data management systems. Currently the Rangeland Business Information Unit of Sarah Green, Ryma Aneliunas, and Alison Zimmer are providing data system updates, GIS technical support and data management for rangeland health assessments.

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ABOUT THIS WORKBOOK

Why Use This Workbook?

Rangelands are complex and diverse, but with practical field training it is possible to consistently evaluate the condition or health of a range site. This methodology provides a visual system that allows users to readily see changes in range health and recognize early warning signs indicating that management changes may be needed. Like the system of riparian health assessment developed by the Cows and Fish Program in Alberta, range health assessment is intended to help users “tune” their eyes to some key indicators of range health.

Who Is This Workbook For?

This workbook is for livestock producers, resource managers, environmental consultants, agency staff, industrial companies, protected area managers and anyone with an interest in the protection and maintenance of rangeland plant communities.

What Will The Workbook Do For Me?

The workbook can be used as an aid to field training and a field reference for on the ground range health assessments. Health assessments provide an indication of sustainability and resiliency. It is a snapshot in time of disturbance and/or management impacts on a particular site. Monitoring range health can highlight the impacts of disturbance, indicate management issues, guide management changes and evaluate outcomes. Assessments provide a means of tracking and communicating successes or arising issues.

Where Does It Apply?

The workbook is designed for application on a full spectrum of range landscapes, including native grassland, forest and tame pastures across Alberta. It is also useful for modified rangelands where range plant communities have become dominated by non-native species. It focuses on evaluating the level of impact disturbances are having on range health. Although the wording of the tool has an emphasis on grazing disturbances, any disturbance such as wildlife use and human activities (e.g., off road vehicle use, camping, etc.) could be evaluated.

INTRODUCTION

What are Rangelands?

Rangeland (syn. Range) is land supporting indigenous or introduced vegetation that is either grazed or has the potential to be grazed and is managed as a natural ecosystem. Rangeland includes grassland, grazeable forestland, shrubland, pastureland and riparian areas (Public Lands Range Resource Management Program 2002). Rangeland ecosystems have traditionally been valued as an important source of forage for the livestock industry. Today there is a growing awareness of the important functions and values that rangelands provide to society. We must act as careful stewards to maintain rangelands in healthy condition. This field workbook is intended as a tool to measure rangeland health and help producers, resource managers and all users to make sustainable use of these lands.

What is Range Health?

We use the term “range health” to mean the ability of rangeland to perform certain key functions. The term health conveys the meaning that all parts that make up the whole are present and working together. Range health is analogous to the health of the human body. When we are ill or under stress, important functions like circulation, immunity, cell growth, excretion, mental processes or reproduction may be impaired.

For rangelands, the key functions of healthy range (Table 1) include: net primary production, maintenance of soil/site stability, capture and beneficial release of water, nutrient and energy cycling and functional diversity of plant species. Healthy rangelands provide sustainable grazing opportunities for livestock producers and also sustain a broad range of benefits and values. Declines in range health will alert the range manager to consider management changes.

Table 1
Functions of healthy rangelands and why they are important.

Rangeland Functions	Why Is the Function Important?
Productivity	Efficiently utilize available energy and water resources to maximize biomass production
	Forage production for livestock and wildlife
	Consumable products for all life forms (e.g., insects, decomposers etc.)
Site Stability	Maintain the potential productivity of rangelands
	Protect soils that have taken centuries to develop
	Supports stable long-term biomass production
Capture and Beneficial Release of Water	Storage, retention and slow release of water
	More moisture available for plant growth and other organisms
	Less runoff and potential for soil erosion
	More stable ecosystem during drought
Nutrient Cycling/ Carbon storage	Conservation and recycling of nutrients available for plant growth
	Rangelands are thrifty systems not requiring the input of fertilizer
Plant Species Diversity	Maintains a diversity of grasses, forbs, shrubs and trees
	Supports high quality forage plants for livestock and wildlife
	Maintains biodiversity and wildlife habitat

The Range Health Concept

The range condition (RC) concept evolved in response to grazing management problems on western rangelands going back to the early 1900's. Alberta's first stocking guide for prairie grasslands was published in 1966 (Johnston et al. 1966). The RC approach measures the alteration of plant species composition due to grazing or other disturbances, relative to the climax plant community, the potential vegetation for the site. The RC approach has worked well in semi-arid grasslands and has been well accepted by ranchers and wildlife managers. It relies on descriptions of relatively undisturbed range sites and their plant communities. However, the evolution of scientific thought in North America has highlighted a number of shortcomings of the RC concept. One of the key assumptions is that all declines in range condition are reversible. Experience shows that this may not be the case. Successional pathways (how plant communities change over time) are influenced by both natural disturbances (e.g., fire, climate) and human disturbances (e.g., grazing or lack of grazing). Some changes are reversible but others lead to stable states that are relatively resistant to change. The Alberta Rangeland section has developed range plant community guides that provide further information about plant communities, succession, and response to disturbance for many of the sites you may be evaluating.

The traditional range condition approach did not consider management needs of soil. Range managers should be concerned if management practices are leading to accelerated erosion. A more robust range health assessment tool must include soils indicators like site stability. In developing the range health assessment procedure, we have reflected on the discussion of this concept within the International Society for Range Management and among federal and state agencies in the US. Since 1999, an Alberta Range Health Task Group has selected indicators and developed a scoring system to address key ecological processes and the diversity of Alberta rangelands and tame pastures.

How Is Range Health Measured?

Range health builds on the traditional range condition approach that considers plant community type in relation to site potential, and adds new and important indicators of natural processes and functions. Range health is measured by comparing the functioning of ecological processes on the area of rangeland being assessed to a Reference Plant Community (RPC) of a similar ecological site or range site. The RPC represents the potential plant community type for a specific ecological site or range site type with little or no disturbance (e.g., ungrazed or lightly grazed). An ecological site is similar to the concept of range site, but with a broader list of characteristics described. An ecological site, as defined by the Task Group on Unity and Concepts (1995), "is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation".

The Alberta Rangeland section has developed range plant community guides that provide further information about RPCs and the sites you may be evaluating (available on the Government of Alberta website).

This section explains the key indicators of range health and their importance. There are additional sections which have instructions and the actual grassland, forest or tame pasture health assessment questions and scoring criteria. In the Score Sheet section there are general field sampling instructions and blank score sheets. The Health Scores section provides some insights on what the scores mean, how to interpret them and examples of completed score sheets. The Reference section has a list of prohibited noxious and noxious weeds regulated in Alberta and credits and references for the workbook.

Why Does Range Health Matter?

Ask anyone what they would prefer, sickness or health. We can all describe what its like to be ill and how much better we can work and play when we are healthy. We can demonstrate the same contrast for rangelands. Healthy rangelands can sustain a broad range of values and benefits (Table 2). When range health declines, so does the flow of values and benefits we might otherwise enjoy.

Table 2
Values and benefits of healthy native rangeland.

Rangeland Users	Values and Benefits of Healthy Range
Livestock Producers	Lower feed costs
	Renewable and reliable source of forage production
	Stability of forage production during drought
	Greater flexibility and efficiency for alternate grazing seasons (e.g., autumn or winter where appropriate)
	Lower maintenance costs like weed control
	Does not require the input of inorganic fertilizers and other soil amendments and additives
	Reduced concern of noxious weed invasion
Resource Managers	Quality wildlife habitat
	Maintain fisheries habitat
	Maintain grazing opportunities
	Preventing soil erosion
	Timber production
	Increased total net benefits
The Public	Esthetic landscape values
	Watershed protection
	Water quality
	Large soil carbon sinks
	Biodiversity
	Opportunities for passive and consumptive recreation like hunting and tourism
Socio-Economics and Governance	Increased total benefits to society with fewer conflicts to resolve, less regulation and enforcement. This means lower costs!

What Are the Indicators of Range Health?

Native range health questions are indirect measures of the following indicators. Tame pastures, are areas of native rangeland that have been converted to agronomic species and they can be assessed using a modified version of native range health assessment. There are a few unique indicators and questions for rating the health of tame pastures (see Tame Pasture section).

A health assessment allows the manager to see whether important ecological functions are being performed.

1. Integrity and Ecological Status

Plant species composition is a fundamental consideration in range health assessment. Plant species composition influences a site's ability to perform functions and provide products and services. Native plant communities evolve within their environment and slowly change over time as environmental factors change. Significant short-term changes in plant composition do not normally occur unless caused by significant disturbances like continuous heavy grazing, high levels of recreational traffic, prolonged drought, prolonged periods of high precipitation, exotic species invasion, frequent burning or timber removal.

Plant species changes due to disturbance pressures are predictable:

- Perennial species that tend to be most productive and palatable, are also the most sensitive to disturbance and decline with increased disturbance such as a continuous and heavy grazing regime.
- With heavy grazing, species with greater adaptation to disturbance pressure will increase in abundance because they are provided opportunities to compete successfully. These disturbance-induced, weedy species include pussytoes, yarrow, strawberry, dandelion and noxious weeds.

Range management objectives for grasslands tend to favor the later stages of succession (late-seral to potential natural community (PNC) and high range health). In forested areas, successional stage dictates the reference plant community and management objectives are aligned to maintain health of the current stage. These plant

communities tend to be superior in capturing solar energy, in cycling of organic matter and nutrients, in retaining moisture, in supporting wildlife habitat values and in providing the highest potential productivity for the site. In contrast, grassland early seral stages represent plant communities with diminished ecological processes, which are less stable and more vulnerable to invasion by weeds and non-native species. They also have diminished resource values for livestock forage production, wildlife habitat and watershed protection.

Integrated range resource planning may identify seral stages that are required to accommodate the needs of a diversity of species. For example certain breeding birds like horned larks and burrowing owls prefer heavily grazed range with early seral stages, while Sprague's pipit favor lightly grazed range with late seral plant communities. To this end, the range health assessment may serve as a useful coarse filter tool to assess habitat quality and to gauge desired outcomes. A deliberate decision to manage for lower seral stages (and lower range health scores) must be guided by informed resource management objectives and not merely as a pretext to accommodate reduced range health scores much like the outdated range management concept of "sacrifice areas".

Managing for lower health scores poses a number of risks including the potential for invasion of exotic agronomic species and noxious weeds. Screening of sites that might be vulnerable to invasive species is an important consideration. Assessing what plant communities are the most suitable and what areas are less vulnerable to invasion by weeds or agronomic species, needs to be carefully evaluated. The goal of creating sites on the landscape that retain early seral stage components will not be met if invasive species encroach.

When disturbance impacts are reduced or removed, the present plant community may react in a number of ways:

- may remain static,
- may move toward a number of native plant communities including the potential natural community, or
- may move to a modified plant community type.

Modified plant communities are communities that have become dominated by non-native species. To the best of our knowledge, long-term rest of these modified plant communities does not return them to native species composition. A separate set of questions is used to determine the health status of these community types.

Some Important Ecological Concepts

- **Plant communities** are mixtures of plant species that interact with one another.
- **Succession** is the gradual replacement of one plant community by another over time.
- **Successional pathways** describe the predictable pathway of change in the plant community as it is subjected to different types and levels of disturbance over time.
- **Seral stages** are each step along a successional pathway.
- **Seral stages** begin at the pioneer stage of **early seral**, and progress upward in succession to **mid-seral**, then **late seral** and finally **potential natural community(PNC or climax)**.
- In grasslands the **Reference Plant Community (RPC)** is interchangeable with the term potential natural community as defined above, whereas in forested areas the RPC is the potential plant community type for a specific ecological site and forest successional stage. We call it “reference” because we use it for comparison to the assessment site.
- An **ecological site** is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.
- **Ecological status** is the degree of similarity between the present plant community and the reference plant community. Plant communities are **modified** when disturbance has altered them to a composition of greater than 70% non-native species (like smooth brome, timothy or Kentucky bluegrass).

Figures 1 & 2 on the following pages, provide a simplified example of how ecological status can be recognized on the landscape through a successional pathway commonly found in the Foothills Fescue grasslands. The plant communities (Figure 1), are primarily native with minor amounts of non-native plants. Range managers normally strive to maintain the reference plant community and later seral communities (Figure 1, upper left), which are dominated by rough fescue and Parry's oat grass. With light to moderate levels of disturbance, and relatively stable climatic conditions, the plant community may move back and forth between these upper states.

With prolonged and heavy disturbance pressures, the plant community will shift to more disturbance resistant species (Figure 1, lower left). In this example grazing resistant grasses and forbs are now dominant at successional stages termed mid to early seral. The presence and abundance of disturbance resistant species, like Idaho fescue, lupine or golden bean will help the manager to recognize these lower stages of ecological status.

These mid or early seral plant community can be further degraded with sustained heavy disturbance pressure. If there are invasive species present, the community may proceed across an ecological threshold to become a modified plant community as represented on (Figure 2). To the best of our knowledge, the process in this example is not reversible as represented by the "one-way" arrow. Once the plant community has crossed this threshold, the manager must work within the limitations of the modified state. Very heavy disturbance levels will result in communities dominated by weedy and disturbance-induced non-native species (lower right). With better range management, it may be possible to encourage a shift to more palatable and productive non-native species (upper right).

This model is a simplified presentation of ecological successional pathways and the threshold between native and modified plant communities. Other ecological thresholds often exist along successional pathways. For more detail on these pathways and thresholds please refer to the plant community and carrying capacity guide for the Natural Subregion you are working in (see Reference section).

Figure 1
Native Grassland Plant Community

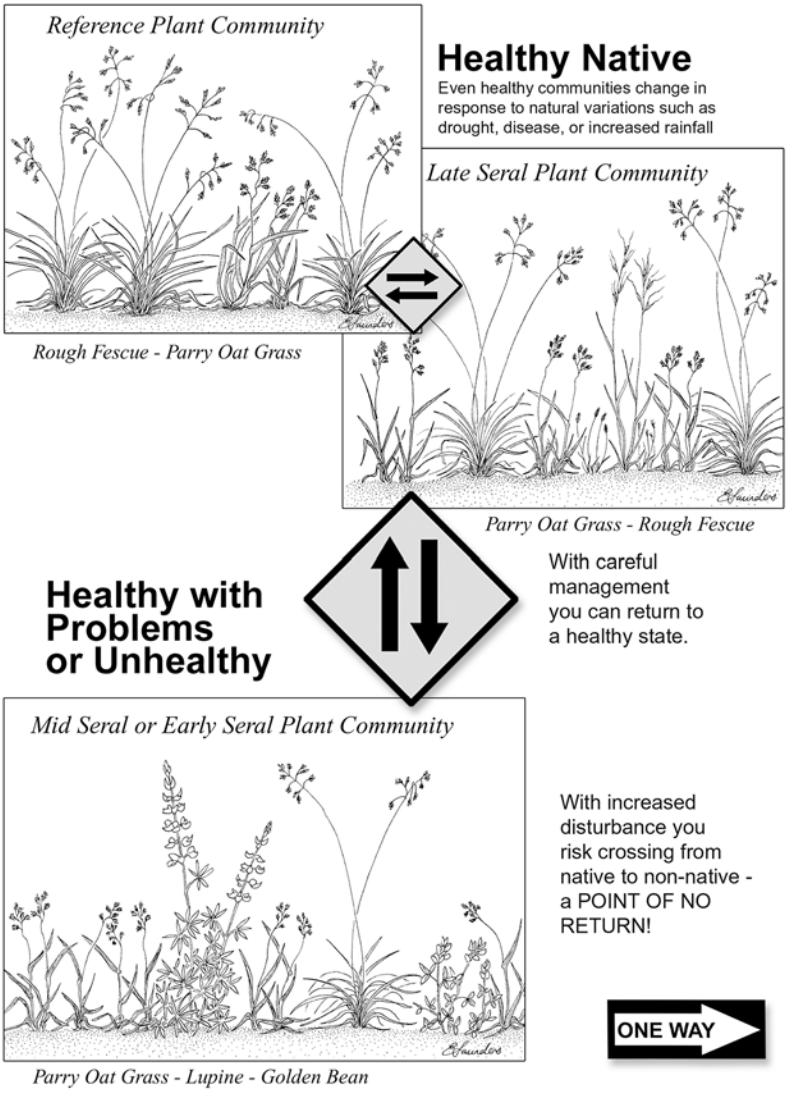
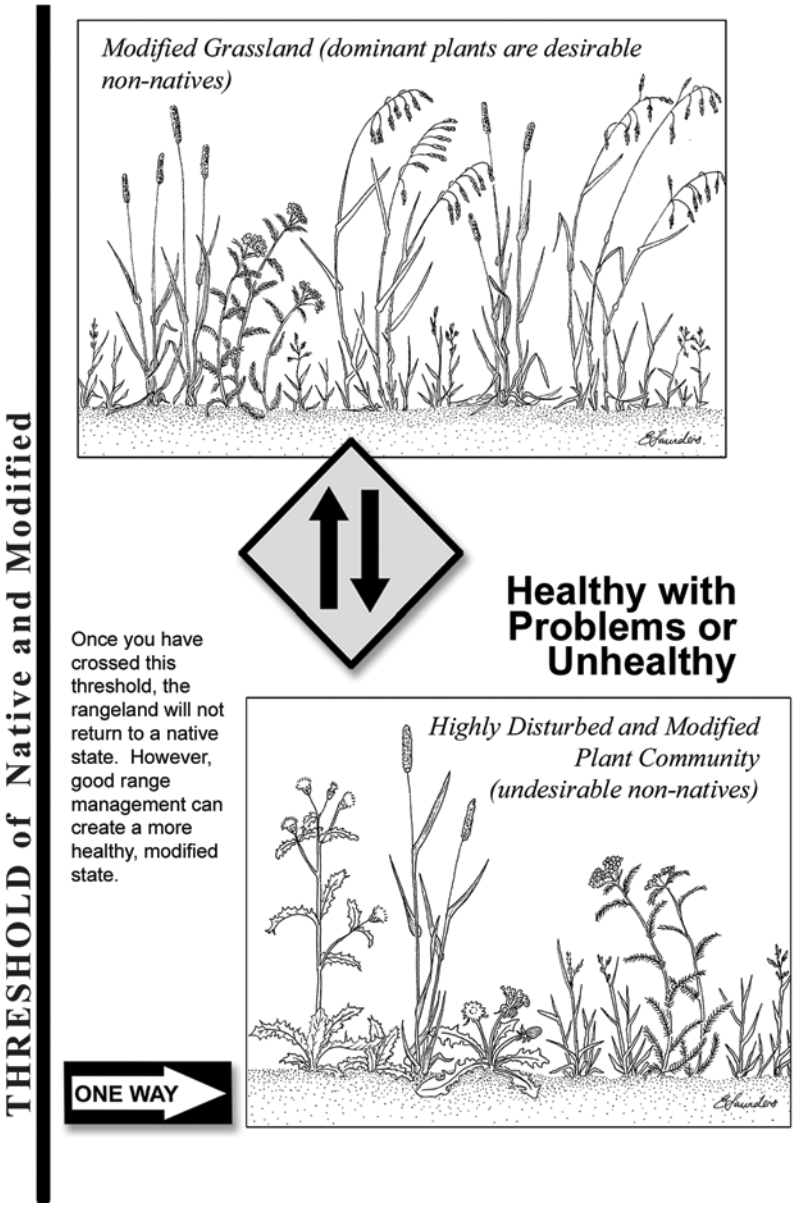


Figure 2
Modified Grassland Plant Community



2. Community Structure

Nutrient cycling and energy flow is more efficient in diverse plant communities with varied canopy structures and rooting depths that can use sunlight, water and nutrients from different zones in the canopy and soil. Plant community structure is particularly important in maintaining net primary production in forested rangelands, and in the maintenance of habitat values for a spectrum of wildlife. Integrated range resource management objectives may require that management objectives for community structure be altered to create more diversity in the landscape. The presence of over to under grazed patches may be an important source of plant canopy structure in rangelands providing valuable habitat diversity for both wildlife and plants.

3. Hydrologic Function and Nutrient Cycling

This indicator deals with abundance and distribution of dead plant material on an ecological site. Plant residue promotes moisture retention and nutrient cycling and is linked to the site stability indicator. When functioning properly, a watershed captures, stores and beneficially releases the moisture associated with precipitation events. Uplands make up the largest part of the watershed and have significant potential to contribute to these functions.

Live plant material and litter (either standing, freshly fallen or slightly decomposed plant residue on the soil surface) is important for infiltration (slowing runoff and creating a path into the soil), reducing soil erosion from wind and water, reducing evaporative losses and reducing raindrop impact. Litter removal will reduce forage yields by about 50% in mixed grass prairie and by about 30% during dry years in the foothills.

Plant residue on forested sites is the collective organic layers of litter, fermenting and humified residues above the mineral soil called LFH. LFH affects both the water and nutrient cycles, is an important rooting medium for many plants, protects the soil surface and provides a home for plant residue decomposers. Litter performs many of the same functions in tame pastures as it does in native grasslands and forests.

4. Site Stability

Rangelands show varying degrees of natural soil stability depending on climate, site, topography and plant cover. The amount of sediment produced by water and wind erosion from a particular ecological site type is termed geologic erosion. Managers strive to prevent additional erosion due to land management practices, by maintaining adequate vegetation cover and minimizing exposed soil. Adequate vegetation cover protects the soil surface from the impact of raindrops, detains overland flow, maintains infiltration and permeability and protects the soil surface from erosion. Soil loss is a serious concern since erosion tends to remove the finer lighter particles like clays, silts and organic matter which are most important to soil fertility and moisture holding capacity. Long term studies show that ongoing soil loss due to overgrazing or other disturbances, will eventually transform the soil into a shallower, drier, less productive and less stable soil type. Excess sediment production has the potential to negatively impact water quality since the fine particles that are eroded can carry nutrients and chemicals.

Some range sites are normally unstable and erosion and sediment production can be viewed as a natural process (e.g., badlands). Unstable sites will tend to exhibit significant exposed soil and have shallow soil profiles (e.g., seepage and slumping areas, badlands, thin breaks, saline lowlands, solonetzic soils, some sandy soils).

RANGE HEALTH HINTS

Vegetation Protects Soil

- Like a tent or umbrella, vegetation protects soil from the erosive impact of raindrops.
- Most healthy rangeland plant communities are stable and normally have adequate vegetation to prevent soil erosion.
- Some rangelands like badlands, certain steep river slopes and sand dune environments have naturally occuring bare soil and erosional processes.
- On any type of rangeland, managers should strive to prevent erosion beyond the geologic or natural extent.

5. Prohibited Noxious and Noxious Weeds

Noxious weeds are invasive plants that are alien species to the rangeland plant community. Weeds are seldom a problem where native plant vigor and cover are maintained although weed invasion may occasionally happen in healthy stands. Weeds may be introduced to relatively healthy stands by various means (e.g., rodent burrows, roads), but generally their presence indicates a degrading plant community. Weeds most often invade where high disturbance (e.g., long-term overgrazing) has resulted in space and resources (e.g., moisture) becoming available for them. Noxious weeds diminish the agricultural productivity of a site, threaten biological diversity, reduce function and sustainability of ecosystems. They also reduce the benefits and values to society while increasing management and control costs.

Getting Started

How to Use the Field Workbook

The field workbook is a training and awareness tool, and a guide to facilitate rapid, repeatable and consistent health assessments. Some basic training and familiarity with local plant community information is required to use the workbook effectively. It is intended for producers and resource managers as a tool to identify the presence, scale and magnitude of range resource issues and problems. It can be used to measure disturbance effects, the impacts of management changes. It will help formulate management objectives and practices to address specific issues.

The field workbook can be used at three levels:

- **Awareness**. Basic training will better "tune your eye" to the elements of range health, so that you can recognize general health impacts on the land.
- **Rapid Assessment**. With study and repeated field training, you can utilize the rapid assessment method provided in this field workbook.
- **Range Inventory**. With expert training, detailed range inventories (see Range Inventory Manual in the Reference section) can be completed and supplemented with a range health assessment.

Before You Go to the Field

Range health assessment requires that you have some basic understanding about the plant communities and range or ecological sites that you intend to assess. Range plant community guides developed by the Alberta Rangeland Section provide detailed information about plant communities and the sites you may be evaluating (available on the Government of Alberta website). These guides describe reference plant communities which are used to compare to the plant communities on the ground. A complete list of these documents is provided in the Reference section at the end of the workbook.

Make use of all reference materials available to you including:

- Soil survey reports
- Range Plant Community Guides
- Natural Subregion Reports
- Forest Ecosite Guides
- Plant identification books
- Lists of locally and provincially controlled weeds
- Previous range health assessment or inventory data, pictures, maps and reports

Picking the Site for Range Health Assessment

In addition to the following suggestions, further information on site selection and assessment methods can be found in the Score Sheets section.

- Map and stratify the management/pasture unit you wish to monitor. This will allow you to better select uniform sites to assess by separating different soil and vegetation types. Avoid sampling across different vegetation types (e.g., native grassland into tame pasture) or management units. Assessment areas should be representative of the dominant plant communities you are concerned about in the pasture.

- Consider your monitoring objectives because it can influence the choice of assessment site. Do you want to monitor a portion of the pasture that is representative of the average for the management unit, or are you wanting to monitor a "hot" spot where problems are apparent?
- If you are in a riparian area, use one of the riparian health assessment guides developed by Cows and Fish Program staff.
- Variability is normal on rangelands. No matter how hard you try to assess within homogenous areas, you will find variation in the assessment parameters and other factors such as grazing pressure present and past. Don't worry about this. What is important is that you sample across your delineated assessment area and select the "best fit" of scoring criteria.
- If the pasture has a significant, uneven distribution of weeds or woody regrowth, you may want to consider dividing the pasture into smaller assessment areas.

When Should I Assess Range Health?

Generally, the best assessment is achieved when plants have had time to grow and are identifiable. The following are common health assessment windows:

- In the Grassland Natural Region - mid-June to late July
- In the Boreal Forest and Rocky Mountain Natural Regions - July and August
- Wetter or drier years will require that you modify assessment windows
- If you are interested in total current annual forage production, this is best measured towards the end of the growing season and before weathering and/or frosts, commonly late July or early August
- Repeated assessments over a series of years should be done within similar seasons and grazing conditions

How Much Time Does an Assessment Take?

- In the training phase, it may take 45 min to an hour to complete a range health assessment at a single site.
- With experience and the necessary reference materials, health assessments can be completed in 15 to 20 minutes.

Using the Range Health Assessments and Score Sheets

Three types of assessments and their related score sheets are in this workbook. Intuitively, you may know which assessment protocol to use (i.e., the grassland, forest or tame pasture assessment type). If you are not sure, use Figure 3 to help select the appropriate protocol. Is it grassland, forest or tame pasture? Go to the appropriate section and work through health assessment questions.

Score sheets allow you to record the date and location of your assessment including GPS coordinates. Carefully document and describe the area you have sampled for future reference. Space is provided to list dominant grasses, forbs, shrubs and trees and record the estimated vegetation cover. Plant species abundance will help you to identify the plant community.

A Few Words of Caution

As with any field workbook, this is just a guide that must be used with good judgment. A complex mosaic of community types will require that you subdivide your sampling area into smaller units. In addition, you may choose to make written comments to further support the differences. In some cases, a particular question may not fit the observation area. If so you must decide whether or not to include this question in the range health score. If something does not make sense to you, ask more questions and think things over before proceeding. We are interested in your feedback as well. This workbook will improve with your questions and comments. It will be an ongoing process as we strive to make a simple assessment in a complex world.

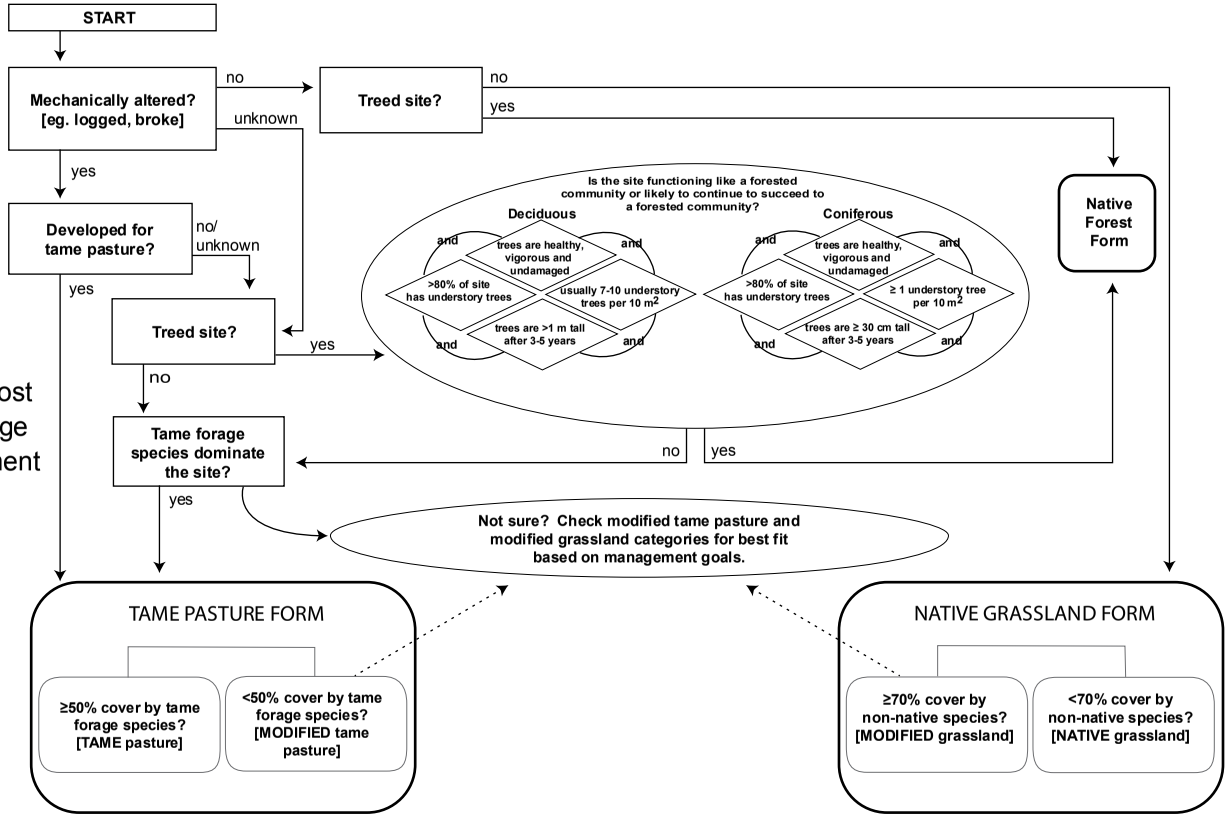


Figure 3
Diagram for selecting the most appropriate range health assessment protocol.

Notes

Grassland Health Assessment

Instructions and Scores

This assessment can be used for any grassland throughout the province. Before you proceed with the assessment, be sure you have reviewed the first section including the parts on the *Indicators of Range Health* and *Getting Started* and gathered the necessary reference materials. In the Score Sheets section there is additional information on site selection and assessment methods including estimating cover. Also note the blank score sheets provided near the back which can be used to record dominant plant species, associated cover values, scores and comments for each of the range health parameters. In the Health Scores section there is an example of a completed score sheet. Also read this section when you have finished the assessment to learn more about what your score means and how you can incorporate this information into your management plans.

This is not a stand-alone tool. Some background knowledge about the plant communities and sites that you may be evaluating is required. The Alberta Rangeland section has developed range plant community guides that provide necessary background information about the plant communities and range or ecological sites that you may encounter (see Reference section).

Range health is measured by comparing the functioning of ecological processes on the area of rangeland being assessed to a Reference Plant Community (RPC) of a similar range or ecological site.

Question 1. Integrity and Ecological Status

How do the plants on the site compare to the reference plant community (RPC)?

Plant species composition is the key indicator of grassland health. It strongly influences a site's ability to perform important ecological functions and provide products and services. In grassland communities, a few key grass species typically provide most of the biomass and indicate ecological status. Stages of plant succession

are based on the dominant plant species as well as key indicator species. These stages are called “seral stages” and they reflect the amount of disturbance to the plant community. With practice, you can use seral stages to recognize ecological status. Review the discussion starting on page 7 and the successional pathway figures on pages 11 and 12.

Traverse the map unit or polygon of interest and estimate plant species composition. Use available reference materials including: plant community guides, benchmark data and eco-site guides that describe potential natural communities and successional pathways.

If the plant community is a **native** grassland, answer **Question 1 A**. If the integrity of the native plant community has been lost and species are mostly non-native (greater than 70% of composition is of non-native species), the plant community is **modified** answer **Question 1 B**.

Question 1 A The plant community is a NATIVE GRASSLAND:

Q1A Scoring: The scoring examples are for specific natural subregions and range or ecological sites (Subregion: key plants).

40 The plant community closely resembles the reference plant community (RPC) for the site. Grazing or other disturbances are light. Examples:

- Dry Mixedgrass: Needle and thread - Northern wheat grass - Thread-leaved sedge
- Foothills Fescue: Rough fescue - Parry oat grass - Idaho fescue
- Peace River Parkland: Western porcupine grass - Sedge
- Central Parkland: Rough fescue – Western porcupine grass
- Montane: Rough fescue - Idaho fescue - Parry oat grass

27 Compared to the RPC, the plant community shows minor alteration due to grazing or other disturbances. Grazing impact is light to moderate. Examples:

- Dry Mixedgrass: Needle and thread - Blue grama
- Foothills Fescue: Parry oat grass – Rough fescue and minor amount of invaders like Kentucky bluegrass
- Peace River Parkland: Sedge –Wheat grass
- Central Parkland: Western porcupine grass -
- Rough fescue with minor amounts of Kentucky bluegrass
- Montane: Idaho fescue - Parry oat grass - Sedge

20 *On fescue grassland sites, rough fescue remains dominant or co-dominant with invader species like Kentucky bluegrass. This is an intermediate successional stage indicating declining ecological status with an increased cover of invasive species without major reduction of rough fescue. Invasive species are often responding to other factors such as elevated moisture as opposed to grazing or disturbance. Grazing impact is light to moderate. Examples:*

- *Foothills Fescue: Rough fescue – Kentucky bluegrass*
- *Foothills Parkland: Rough fescue – Kentucky bluegrass*
- *Central Parkland: Rough fescue – Kentucky bluegrass*
- *Montane: Rough fescue – Kentucky bluegrass*

15 Compared to the RPC, the plant community shows moderate alteration, due to grazing or other disturbances. Grazing impact is moderate to heavy. Examples:

- Dry Mixedgrass: Blue grama - Needle and thread
- Foothills Fescue: invaders form a significant component of the community, but native plant species are still present
- Peace River Parkland: Sedge – Pasture sage
- Central Parkland: Rough fescue – Kentucky bluegrass
- Montane: Kentucky bluegrass - Rough fescue

0 Compared to the RPC, the plant community shows significant alterations, due to grazing or other disturbances. Grazing impact is heavy to very heavy. If the grassland community you are evaluating is significantly invaded (>70% are non-native) the plant community is modified and you should go to question 1 B. Examples:

- Dry Mixedgrass: Blue grama - June grass - Forb
- Foothills Fescue: non-native species dominate the community
- Peace River Parkland: Dandelion - Sedge or Sedge - Low Forb
- Central Parkland: Kentucky bluegrass - Slender wheat grass
- Montane: non-native species dominate the community

Q1A Scoring Notes

- Only apply the 20 score option above in rough fescue grasslands.
- For grassland plant communities, the reference plant community (RPC) is the potential natural community for the site under light grazing disturbance.
- The RPC in grasslands is not assumed to be those plant communities that develop under prolonged periods of rest since the natural system evolved under cyclic disturbances such as fire and grazing. Prolonged rest allows a few competitive grass species to become dominant and to shade out other grasses and forbs that are important in the plant community.

Question 1 B The plant community is a MODIFIED GRASSLAND

This question reflects the need to identify grassland communities that have been modified to non-native species due to human and/or naturally caused disturbances. Recent data has shown that many native grasslands once modified, are not likely to change back to a native plant community regardless of management changes. This is particularly true of moist grasslands in the Montane, Subalpine, Lower Foothills, Upper Foothills, Foothills Fescue, Foothills Parkland, Central Parkland, Peace River Parkland, or Boreal Mixedwood

natural subregions. For modified grasslands, the objective is to manage the plant community for its modified grazing potential and prevent bare soil, erosion, undesirable forage species and weedy species. Should the plant community recover to less than 70% non-native plant species, use the scoring system in Question 1 A.

Q1B Scoring:

15 Site is dominated by palatable and productive non-native species. These plants are vigorous and reproducing.
Example: Smooth brome - Timothy

8 Site is a mixture of palatable/productive and weedy/disturbance-induced non-native species. Productivity is reduced due to the abundance of lower quality species. Palatable plants show evidence of reduced vigor (e.g., shorter stems, smaller leaves and seed heads). Less palatable plants are generally vigorous.

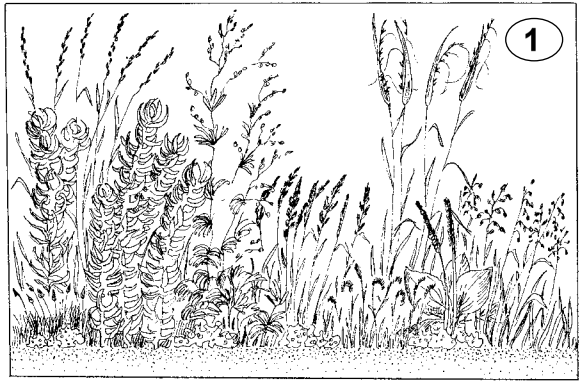
Example: Kentucky bluegrass – Timothy - Clover

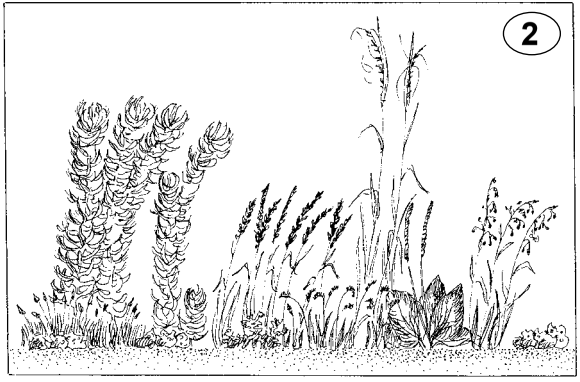
0 Site is dominated by weedy and disturbance-induced non-native species. All remaining forage plants have reduced vigor.

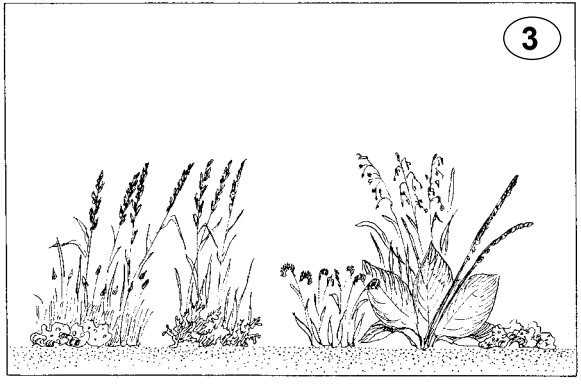
Example: Dandelion - Plantain

Q1B Scoring Notes

- We anticipate that further field studies will allow us to better understand the successional dynamics of modified plant communities. This coarse filter approach may be replaced with specific directions on how to score these communities within plant community guides.
- To function well, modified grasslands must be dominated by desirable species with all other health parameters receiving top health scores. A healthy modified plant community is not equal in ecological function to a healthy native plant community. A healthy score for a modified plant community simply recognizes that despite changes in the plant communities integrity, the site is being managed as well as can be expected based on current knowledge.







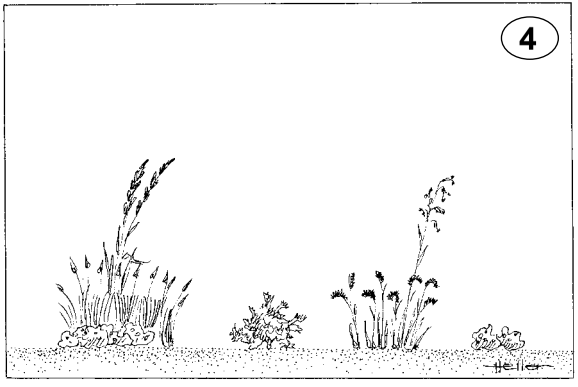


Figure 4

Changes in grassland plant community structure as disturbance levels increase.

1. All expected layers present.

2. Tall grasses and forbs reduced.

3. Tall layer absent and mid layer reduced.

4. Tall and medium layers absent; ground cover layer reduced.

Question 2.0 Plant Community Structure

Are the expected plant layers present?

Native grasslands normally have a diversity of plant species that vary in size, height and rooting depth. This characteristic of plants to grow in different "layers" is called structure. When plants occupy different layers, they are able to use sunlight, water and nutrients from different zones in the vegetation canopy and soil profile. This provides for efficient nutriet cycling and energy flow, supporting forage production and important habitats for wildlife.

Structural layers in grasslands may include:

1. low shrubs
2. tall graminoids and forbs
3. medium graminoids and forbs and
4. ground cover (graminoids, forbs, moss, lichen).

Always rate life form layers relative to the reference plant community (see Figure 4).

Q2 Scoring:

10 The life form layers closely resemble the reference plant community (RPC).

7 Compared to the RPC, one life form layer is absent or significantly reduced, or not fully expressed.

3 Compared to the RPC, two life form layers are absent or significantly reduced, or not fully expressed.

0 Compared to the RPC, three life form layers are absent or significantly reduced or not fully expressed.

Q2 Scoring Notes

- Use cover of major life form layers from range plant community guides to answer this question. Review benchmark data, plant community guides, photographs or adjoining lightly or ungrazed areas to gain an understanding of expected plant layers. Where possible, compare the unit to a benchmark on a similar site in

the area. Keep notes of the variety of species, life forms and age classes as you move across the unit and compare to the available data.

- In both native and modified plant communities, determine the normal life form layers expressed in the reference plant community and look for these layers, not the species (e.g., a modified plant community, where the RPC was Rough Fescue-Parry oat grass, now dominated by a vigorous stand of timothy and brome, still has a tall graminoid layer and would get full marks for this layer).
- "Significantly reduced" implies that the structural layer is reduced by more than 50% compared to the reference plant community.
- If two structural layers show moderate reduction (25 to 50%), then reduce the score by one category.
- If you think a structural layer is reduced, look to see if it is under stress (e.g., low shrubs with heavy browsing use of the 2nd year and older wood).
- If you are unsure how many structural layers should be present, check for grazing impact on the plants, especially shrubs. Browsing of generally unpalatable shrubs such as snowberry and sagebrush usually indicates more desirable shrubs have beereduced or eliminated by grazing or browsing.
- Note that moss and lichens are important diagnostic layers. These layers can be reduced by trampling (hoof impact), recreation or excessive shading (non-use with heavy litter build up).
- When a natural disturbance removes a life form layer, note the missing layer in the comments section and the likely cause (e.g., insect damage, drought, fire, decadence), but don't downgrade the score.
- While it is appropriate to rate agronomic grasses when they express as an expected structural layer, do not rank noxious weeds as a structural layer. Their contribution to functional structure is minimal and their presence may be short lived.
- Shrubland communities are commonly found between the grassland and forest plant communities in parkland landscapes. Evaluate these transition plant communities on their own unique characteristics because their presence may be part of normal

successional processes and may not relate to grazing impacts on site. Consult available range plant community guides to see how they fit into succession.

- Site management goals may require that you manage for lower structural scores:
  - maintenance of the ratio of grassland: shrub: forest cover in parkland
  - maintenance of patch diversity for prairie breeding birds and other wildlife - e.g., grazing practices adapted to reducing taller layers on a portion of the landscape
  - manipulation of woody cover adjoining certain riparian area

Question 3.0 Hydrologic Function and Nutrient Cycling

Does the site retain moisture?
Is the expected amount of litter present?

In grasslands, litter acts as a physical barrier to heat and water flow at the soil surface (review functions of litter on page 13). Litter conserves scarce moisture by reducing evaporation, improving infiltration and cooling the soil surface.

This question evaluates the ability of a site to retain scarce moisture based on amounts of organic residue. Litter weight (lb/ac) estimates are made in representative areas and compared to “litter normals” that are appropriate to the site being

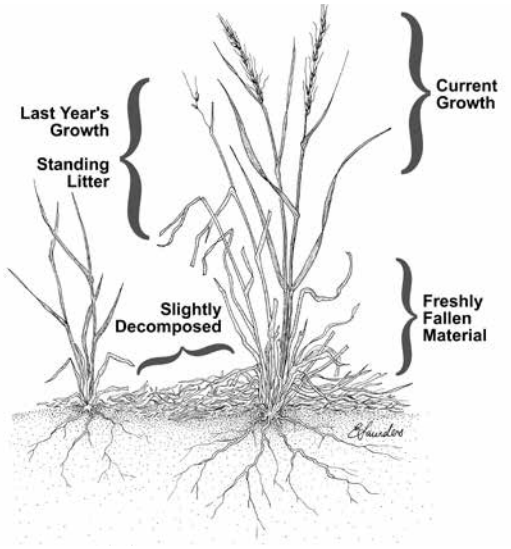


Figure 5
Types of litter associated with native grasslands and tame pastures.

* Elevation

Rangeland Health Assessment Litter Thresholds (lb/ac)

Natural Subregion (Soil Zone)	Range Sites	Healthy		Healthy with Problems		Unhealthy
		Average	*>65%*	*65%*	*35%*	*<35%*
Aspen Parkland (Black)	Loamy	1500	(>975)	975 - 525		<525
	Sandy	1100	(>715)	715 - 385		<385
	Sands	800	(>520)	520 - 280		<280
	Choppy sandhills	400	(>260)	260 - 140		<140
Foothills Fescue, Foothills Parkland and Montane (Black)	Thick Black Loamy	1400	(>910)	910 - 490		< 490
	Orthic Black Loamy	1200	(>780)	780 - 420		< 420
	Shallow to Gravel and Limy	1000	(>650)	650 - 350		<350
	Thin Breaks	500	(>325)	325 - 175		<175
Mixed Grass (Dark Brown)	Loamy (>1100m)*	900	(>585)	585 - 315		<315
	Loamy (<1100m) + Limited	600	(>390)	390 - 210		<210
	Thin Breaks, Limey and Shallow to Gravel	300	(>195)	195 - 105		<105
Dry Mixed Grass (Brown)	Loamy	400	(>260)	260 - 140		<140
	Blowout	250	(>160)	160 - 85		<85
	Thin Breaks	150	(>95)	95 - 50		<50

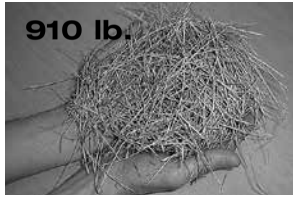


Figure 6
Litter thresholds for native grassland communities.

evaluated. Litter is sampled from a number of representative areas by hand raking from a .25 m^2 area or plot frame. Figure 6 provides litter normals for a broad range of natural subregions and range site types. Litter normals are developed from long-term benchmark monitoring of healthy and productive sites under light to moderate grazing.

Litter includes ungrazed residue from previous years growth including standing stems, fallen stems and leaf material, and partially decomposed material (see Figure 5). Estimate litter across the entire unit. Your reference should be light to moderately grazed range with enough litter to retain moisture. Look at the distribution, evenness and patchiness of litter across the site.

Q3 Scoring:

25 Litter amounts are more or less uniform across site and include standing dead plant material, fallen dead plant material and variably decomposed material on the soil surface. Litter standing crop (lb/ac) is in the range of 65 to 100% of expected levels under moderate grazing levels.

13 Litter amounts appear slightly to moderately reduced and are somewhat patchy across the site. The standing dead plant material is less frequent in distribution with fallen dead plant material and variably decomposed material on the soil surface being the dominant litter types. Litter standing crop (lb./ac.) is in the range of 35 to 65% of expected levels under moderate grazing levels.

0 Litter amounts appear greatly reduced or absent. The extent and distribution of exposed soil has increased. There is little or no standing or fallen litter. Decomposing material on the soil surface is the main type of litter. The distribution of litter is fragmented across the site. Litter standing crop (lb./ac.) is in the range of less than 35% of levels expected under moderate grazing levels.

Q3 Scoring Notes

- In the grassland natural region, litter reserves are closely linked to forage yield. The extra effort it takes to estimate litter levels provides a strong prediction of the site's ability to retain moisture.

- Another option for learning to measure litter amounts is by collecting litter and making your own litter bags. You can then compare these bags to the area being scored for litter. Hand rake litter from a .25 m^2 frame, oven dry it and weigh it into kg/ha (grams x 40) or lb/acre (grams x 35.6). Obtain a variety of bags that represent the thresholds of the RPC found in litter normals (Figure 6). See the appropriate range plant community guide to determine litter normals for ecological sites not provided in the table.
- Examples of sample weights and corresponding lb/ac value:
  Sample 1 25.5 g = 910 lb/ac
  Sample 2 21.8 g = 780 lb/ac
  Sample 3 18.2 g = 650 lb/ac
  Sample 4 16.4 g = 585 lb/ac
  Sample 5 10.9 g = 390 lb/ac
  Sample 6 7.3 g = 260 lb/ac
  Sample 7 4.5 g = 160 lb/ac
- These values represent most of the key litter threshold values listed in Figure 6.
- When rating range health, practice hand raking litter from representative areas (from .25 m^2 frames; 50 cm x 50 cm or 18 inches by 18 inches) and then make comparisons to the standards found in the ziplock litter samples or the pictures in Figure 6.
- When raking litter don't include in the sample any herbage that grew in the current year. Only include the standing stems that appear to be from previous growing seasons.
- Compared to native plant communities, modified communities produce less forage during dry periods. Litter on modified sites is more subject to loss from weathering processes. As a result, modified sites may not be capable of sustaining litter reserves at the threshold level for healthy moisture holding capacity.
- In the Chinook prone foothill environment, litter weathering loss on wind scoured slopes, crests and saddles can be significant and may retard the rate at which litter accumulates on a site in response to management changes.

Question 4.0 Site Stability

4.1 Is the site subject to accelerated erosion?
4.2 Is there human-caused bare ground?

Accelerated erosion occurs when disturbance impacts reduce vegetation cover and/or increase physical impact on rangeland resulting in increased rates of wind erosion and water erosion from rainfall and snowmelt over and above what is expected for the site. Also included are possible increases in erosion of sites adjoining riparian areas from overland flow associated with streams and rivers.

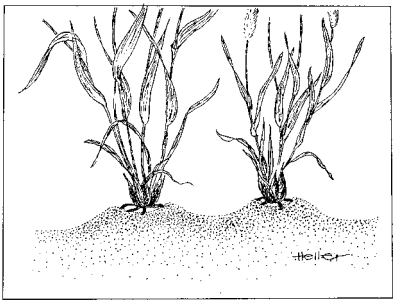
To recognize accelerated erosion and estimate "human-caused" bare ground, you need to know the normal erosion processes and soil exposure levels for your site. Most sites in Alberta have continuous ground cover. If the ecological site is normally unstable, then you must look for human-caused erosion over and above normal or geologic rates. Early or initial erosion may require close observation by getting down close to the ground and looking under green live plant cover to see if there is any movement of light surface material (litter or soil). Look for evidence of erosion on any slope as deposition of soil particles at the bottom of slopes.

Use benchmark data or field guides applicable to the site to determine if it is naturally unstable or if the extent of bare ground is within the normal range for the site. Reduced live plant and litter cover from excessive disturbance can lead to erosion. Indicators of a heavy to very heavy grazing regime include abundant manure, hoof tracks and plant pedastalling (Figure 7). Slopes may show signs of hoof shearing and soil exposure from higher stock or wildlife trampling.

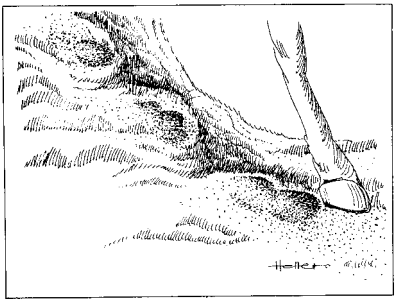
Is the site being observed normally stable or unstable, check below?

Site normally stable: ☐ Site normally unstable: ☐

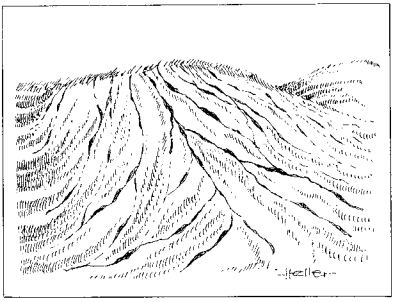
a) Pedastalling (Micro)



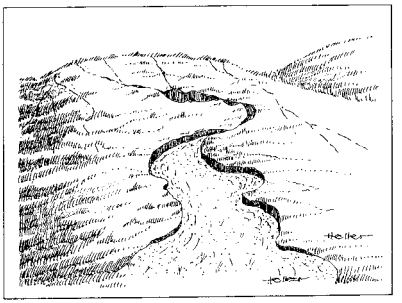
b) Hoof Shearing (Micro)



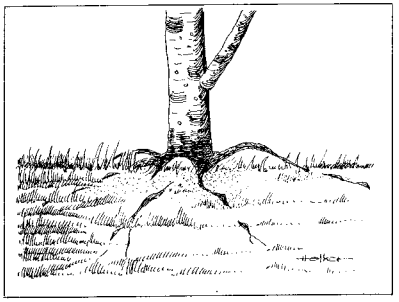
c) Rill Erosion (Macro)



d) Gully Erosion (Macro)



e) Root Exposure (Macro)



g) Trailing (Macro)

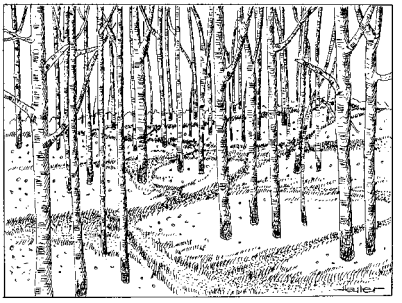


Figure 7
Examples of soil erosion.

Question 4.1 Evidence of site accelerated erosion.

Q4.1 Scoring: (see Figure 7)

10 No sign of soil movement, deposition of soil/litter, plant pedestalling, coarse sand or aggregate remnants, flow patterns and/or scouring, or hoof shearing beyond the natural extent for the site.

7 Some evidence of slight soil movement or deposition of soil/litter, plant pedestalling, coarse sand or aggregate remnants, flow patterns and/or scouring that is human-caused and beyond the natural extent for the site. Old erosion features may be stable and vegetated. Flow patterns may be short and shallow.

3 Moderate amounts of soil movement or deposition of soil/litter, plant pedestaling, flow patterns and/or scouring is visible across site. Erosion features are active but limited to the site with no off-site movement of material. Flow patterns have a well-defined branching pattern. Signs of hoof shearing may be evident in localized patches.

0 Extreme amounts of soil movement with material being carried off site. Flow patterns are obvious and fan deposits may be present. Rills are abundant and deep. Gullies are deep with sharp edges. Erosion features are active. Pedestalled plants with exposed roots and rocks exposed or sitting on the surface. Hoof shearing may be common across the site, beyond localized patches.

Question 4.2 Increase in human-caused bare soil

Q4.2 Scoring: (See scoring notes and Figures 8 and 9)

5 less than 10% cover of exposed soil is human-caused

3 greater than 10 and up to 20% cover of exposed soil is human-caused

1 greater than 20 and up to 50% cover of exposed soil is human-caused

0 greater than 50% cover of exposed soil is human-caused

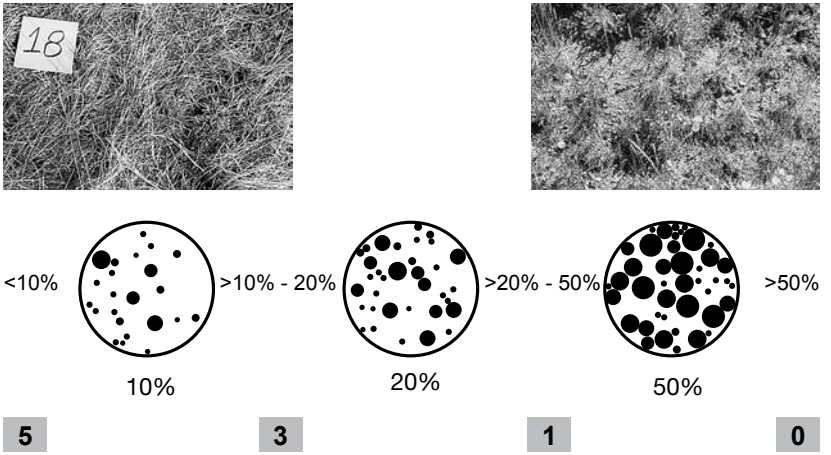


Figure 8
Increase in human-caused bare soil as disturbance levels increase.

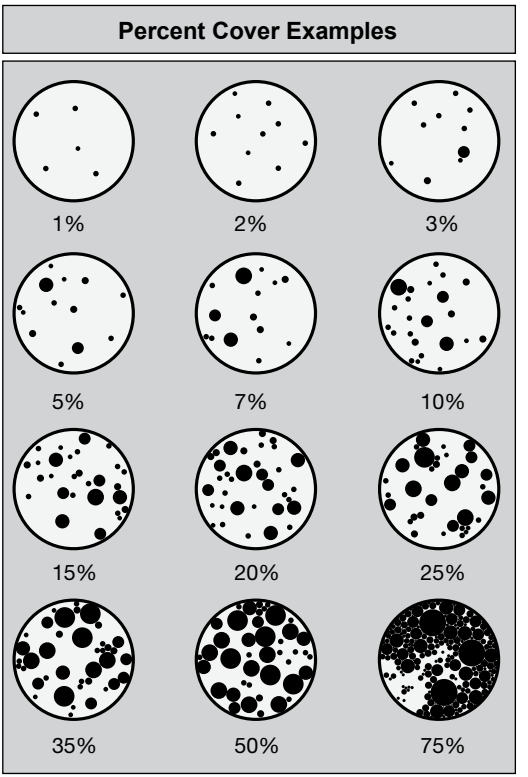


Figure 9
This graphic helps to develop a mental picture of the percent cover of bare soil or vegetation.

Q4.2 Scoring Notes

General Scoring Notes

- The check box allows you to recognize the significance of hazards associated with increased soil exposure on normally stable sites.
- Human-caused bare soil is the result of disturbance processes that are subject to human control (e.g., grazing, OHV, recreational impacts). Human-caused bare soil is that portion that is over and above what is normally expected for the site.
- To estimate human-caused bare soil, first estimate total bare soil, subtract the amount considered to be expected or naturally occurring. The difference will be considered human-caused bare soil. Report this amount on the field sheet. Take time to record moss and lichen cover as well as this layer helps stabilize the site.
- Range plant community guides provide soil exposure standards for judging the “human-caused” portion.
- This question focuses on increased soil exposure and the increased potential for soil erosion on range sites that are normally stable and less of a concern where ongoing soil loss is a natural process.
- Note that Little Club Moss should be included in the estimate of moss/lichen cover.

Rodent Burrowing and Bare Soil

- On healthy sites, rodent burrowing activity is normally limited in its extent and impact on the amount of bare soil.
- Bare soil from rodent burrows tends to increase on modified and heavily grazed sites.
- Ground squirrel and pocket gopher activity increases in response to foraging opportunities associated with introduced and weedy species, especially tap-rooted forbs like dandelion.
- Therefore on modified and heavily grazed sites, a significant portion of the bare soil from rodent burrows should be considered human-caused.

Livestock and Wildlife Impacts on Bare Soil

- Large numbers of elk and deer may increase bare soil on preferred range sites.
- Winter ranges may be especially prone to hoof shear resulting in increased bare soil.
- When wildlife impacts result in increased soil exposure, treat it as human-caused and note the source of the impact in the comment section.

Question 5.0 Prohibited Noxious and Noxious Weeds

5.1 Are prohibited noxious or noxious weeds on the site?
5.2 Density and distribution of noxious weeds.

The presence of noxious weeds (i.e., both prohibited noxious and noxious) can provide clues as to the health and function of the site. Noxious weeds commonly establish where excessive disturbance has caused an increase in bare ground and available moisture and/or nutrients. When present, they can have a negative impact on forage production and the many other values of rangeland. Early detection of noxious weeds is required to limit their spread and reduce control costs.

This two part (5.1 and 5.2) question evaluates the degree of noxious weed infestation on the site. Noxious weed foliar cover, density and distribution (patchiness or evenness) is considered. Include any weeds listed as prohibited noxious and noxious in the Alberta *Weed Control Act*, or any problem weeds elevated by the local government (e.g., Municipal District). The Reference section has a list of prohibited and noxious weeds for Alberta.

Use the score sheet to record detailed information for each noxious weed species observed and any control treatments applied. This data helps assess the risk of further weed expansion and guides weed control programs. Depending on the size of the infestation and invasive potential of the weed species present, this data may also trigger the need to complete an Invasive Plant Form (see Reference section).

In order to score 5.1 and 5.2, the observer must consider all noxious weeds collectively. To score 5.1 use the cumulative cover of all noxious weeds (e.g., 10% Canada thistle + 5% downy brome = 15% cover of noxious weeds). To score 5.2 use the cumulative density and distribution for all noxious weeds. You may wish to comment on the total area (e.g., acres, m^2) of the management unit affected by the combination of noxious weeds in addition to what was recorded for individual species.

Question 5.1 What is the cumulative cover of noxious weeds?

Q5.1 Scoring: (Use Figure 9)

5	No noxious weeds
3	< 1%
1	1 to 15%
0	> 15%

Question 5.2 What is the cumulative density distribution class of noxious weeds?

Q5.2 Scoring: (Use Figure 10)

5	No noxious weeds
3	A low level infestation (density distribution class 1, 2 or 3)
1	A moderate infestation (density distribution class 4, 5, 6 or 7)
0	A heavy infestation (density distribution class 8, 9, 10, 11, 12 or 13)

Q5.1 and 5.2 Scoring Notes

- Variations in weed infestation can be averaged across the site.
- The density and distribution of dots in Figure 10 relates to the density and distribution of weeds in the sampling area. Scores decline as infestation increases as indicated on the right side of the figure.
- If you add weeds from a local weed control list, record this in your comments.

- Do not include nuisance weeds or disturbance species for this question (e.g., dandelion, strawberry, plantain, yarrow).
- If the assessment site has a significant but uneven distribution of weeds, you may want to consider dividing it into two smaller assessment areas.

Density Distribution

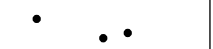
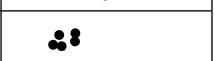
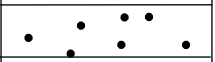
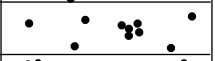
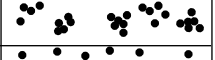
Class	Description of abundance in polygon	Distribution	Weeds Score
0	None		5
1	Rare		3
2	A few sporadically occurring individual plants		
3	A single patch		
4	A single patch plus a few sporadically occurring plants		1
5	Several sporadically occurring plants		
6	A single patch plus several sporadically occurring plants		
7	A few patches		
8	A few patches plus several sporadically occurring plants		0
9	Several well spaced patches		
10	Continuous uniform occurrences of well spaced plants		
11	Continuous occurrence of plants with a few gaps in the distribution		
12	Continuous dense occurrence of plants		
13	Continuous occurrence of plants with a distinct linear edge in the polygon		

Figure 10
Density distribution guide for rating weed infestation.

Forest Health Assessment

Instructions and Scores

This assessment can be used in deciduous, mixed-wood and coniferous forests at any successional stage including cutblocks and burns throughout the province. Before you proceed with the assessment, be sure you have reviewed the first section including the parts on the *Indicators of Range Health* and *Getting Started* and gathered the necessary reference materials. In the Score Sheets section there is additional information on site selection and assessment methods including estimating cover. Also note the score sheets provided near the back which can be used to record dominant plant species, associated cover values, scores and comments for each of the range health parameters. In the Health Scores section there is an example of a completed score sheet. Also read this section when you have finished the assessment to learn more about what your score means and how you can incorporate this information into your management plans.

This is not a stand-alone tool. Background knowledge about the plant communities and sites that you may be evaluating is required. The Alberta Rangeland section has developed range plant community guides that provide necessary background information about the plant communities and ecological sites that you may encounter (see Reference section).

Range health is measured by comparing the functioning of ecological processes on the area of rangeland being assessed to a Reference Plant Community (RPC) of a similar ecological site. On forested rangelands, the RPC represents the potential plant community type for a specific ecological site and successional stage with little or no disturbance (e.g., ungrazed or lightly grazed). The successional stage is determined by the existing type of tree canopy. For example on a given ecological site, a forest may establish and progress with time from deciduous to a mixed-wood and eventually to coniferous dominated stand. The observer must evaluate the impact disturbance and/or management is having on the assessment site while taking into account the successional stage it is presently in.

Range plant community guides developed by the Alberta Rangeland section will enable the user to better understand forest succession and determine the appropriate RPC.

Cutblock Assessments

A cutblock is an area recently logged and is in the process of regeneration. Generally sites logged within 25 or 15 years for coniferous and deciduous, respectively, are considered to be cutblocks. For cutblocks, the RPC is the undisturbed community, of the same ecosite phase, that was present prior to logging. A common management goal for a cutblock is to have it regenerate back to the RPC. The potential of the cutblock to fully regenerate can be monitored through various successional stages. Ensure that notes document harvesting succession as well as silviculture prescriptions. Be aware that, a zero year cutblock may not express this potential as much as another closer to free to grow standards (Alberta Regeneration Survey Manual 2008). Fires may also fit these criteria and should be noted on the health form. The Alberta Rangeland section's range plant community guides will have descriptions of RPCs, successional communities and additional information regarding the assessment of cutblocks.

Timber harvesting and silviculture practices used in cutblocks can have an impact on every ecological function evaluated during a health assessment, even in the absence of grazing. Therefore, it may be difficult to discern whether impacts on range health are due to livestock grazing or timber harvesting. It is recommended that impacts to the regenerating cutblocks be assessed regardless of the cause of the disturbance (i.e., record what you see without judgment to maintain assessment consistency). Any impacts that can be clearly attributed to one disturbance type or the other should be recorded as comments on the score sheet.

If the assessed site is a cutblock, be sure to check the box on the score sheet. There is a second box to indicate if a more detailed level 1 status assessment was also completed. For further information on cutblock regeneration as it relates to grazing and timber harvesting see the Alberta Cutblock Assessment Tool (Level 1 Status Assessment 2008).

The following criteria are applied as a benchmark to determine if the site is functioning as a regenerating deciduous or coniferous forest (adapted from Alberta Regeneration Survey Manual 2008).

Deciduous Forest

- Saplings should be healthy, vigorous and undamaged.
- Understory tree density is usually 7 to 10 trees/10 m^2 (circular plot radius of 1.76 m), distributed over 80% of the block.
- After 3-5 years post-harvest, a minimum tree height of 100 cm is expected.
- After 8-14 years post-harvest, a minimum tree height of 200-250 cm is expected.

Coniferous Forest

- Seedlings should be healthy, vigorous and undamaged.
- Understory tree density is usually 1 tree/10 m^2 (circular plot radius of 1.78 m), distributed over 80% of the block.
- After 3-5 years post-harvest, a minimum tree height of 30 cm is expected.
- After 8-14 years post-harvest, a minimum tree height of 100 cm is expected.

Other cleared sites

Occasionally, areas that were cleared for tame pasture development will have a substantial amount of deciduous tree regeneration. The criteria described in the Alberta Regeneration Survey Manual (2008, see above) is also a good way to determine if the site is functioning like a forest or a tame pasture. Areas that meet these criteria could be assessed using the Forest Health Assessment. However, if the management intent behind the clearing was to create tame pasture, then the Tame Pasture Health Assessment could be used and woody regrowth managed appropriately. The decision diagram on page 19 will assist with choosing the appropriate health assessment protocol.

How do the plants on the site compare to the reference plant community (RPC)?

This parameter considers species composition of the plant community.

- Plant species composition is a key indicator of forest health.
- Plant species influence a site's ability to provide ecological services.
- Shrubs, forbs and grasses provide a diversity of forage and nutrient values.
- Changes to plant species composition can reduce forage production and management flexibility.

One management goal is to maintain the production potential of the plant community at the level produced under a light to moderate grazing scheme. As disturbance (e.g., grazing pressure) increases from light or moderate, to heavy or very heavy, there is a change in the understory species composition from desirable decreaser species (e.g., low bush cranberry, red osier dogwood, tall lungwort, showy aster) to less desirable increaser (e.g., snowberry) and invader species (e.g., Kentucky bluegrass, clover or timothy). Species are grouped by their response to grazing disturbance. Decreasers and increasers are native to specific ecological sites, whereas invaders are not. RPCs are made up of decreaser and increaser plants in varying proportion. A plant that is a decreaser on one ecological site might be an increaser on another because sites have varying potential to support plants.

Figure 11 illustrates the general concept of how plant group's (i.e., decreaser, increaser and invader) may respond to sustained and increasing disturbance with an associated score. Notice how the proportions of these plant groups change with light disturbance on the left to very heavy disturbance on the right of the graphic. Decreasers are typically palatable forage plants adapted to a light to moderate level of defoliation, declining then disappearing as disturbance levels increase and are maintained at high levels. Increasers are palatable to unpalatable, and are adapted to and

increase with moderate to heavy disturbance. Some increasers (type 1) will begin to decline with sustained heavy disturbance whereas others (type 2) continue to increase. Invader plants are very competitive under heavy to very heavy disturbance, taking advantage of available moisture and nutrients left by weakening or disappearing native plants. Most invaders have reduced palatability to discourage utilization or are adapted to withstand heavy and repeated defoliation. It is important to note that although this is a common pathway, some plant communities may respond differently depending on environmental conditions. Refer the range plant community guides developed by the Alberta Rangeland section for detailed information on RPCs and how they respond to disturbance.

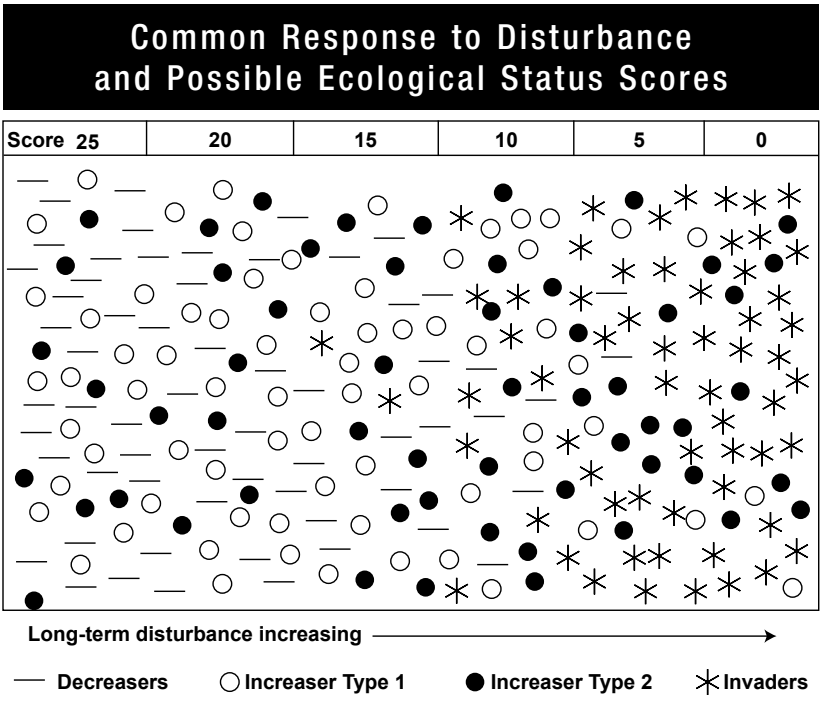


Figure 11
Common Response to Disturbance and Possible Ecological Status Scores

Q1 Scoring: (Use Figure 11 and also Figure 17 (density distribution) for evaluating invaders)

25 composition resembles the Reference Plant Community (RPC); no reduction in decreasers; no invaders present (density distribution (DD) class 0); disturbance is light to undisturbed

20 composition resembles the RPC; a reduction in decreasers only occurs in unprotected areas; there is a greater proportion of increasers; invaders are rare (DD class 0-2); disturbance is light to moderate

15 composition has a greater proportion of increasers; decreasers are reduced throughout; small patches of invaders may be present but not dominant (DD class 1-7); disturbance is moderate

10 composition has significant patches of invaders (DD class 8-10); decreasers are limited to small protected areas or absent; disturbance is heavy with some moderately disturbed patches

5 invaders are dominant (DD class 11-12); palatable increasers and invaders are common; disturbance is heavy throughout

0 invaders are dominant throughout (DD class 11-12); palatable increasers and invaders are uncommon; disturbance is very heavy

Question 2.0 Plant Community Structure

Are there any changes in forest plant community structure?
Are the expected plant layers present?
What level of utilization is occurring and how is this affecting growth form and vigour?

Forest plant communities are biologically diverse with a variety of woody, broad-leaved plants and grass species present. Commonly, shrubs and forbs dominate the understory. The characteristic growth of plants in different "layers" is termed structure. When plants occupy different layers, they are able to use sunlight, water and nutrients from different vertical zones above and below ground. This diversity supports many uses and values including optimum grazing values for livestock and provides diverse habitats for many wildlife species.

When evaluating structure and utilization, compare the observed plant community to the Reference Plant Community (RPC). Structural layers in forest communities may include up to five distinct layers . Some RPCs will naturally have fewer than five layers. For example, spruce dominated forests may only have an overstory and a ground cover layer due to the lack of sunlight reaching the ground; aspen forests commonly have all five layers listed below.

1. overstory tree layer (e.g., aspen, balsam poplar)
2. understory tree and tall shrub layer (e.g., aspen and conifer regeneration, alder or willow)
3. medium shrub layer (less than 2 m; e.g., rose, raspberry, low bush cranberry)
4. tall forb layer (e.g., fireweed, wild sarsaparilla, cow parsnip, tall grasses)
5. ground cover layer (e.g., low growing grasses and forbs, ground shrubs (e.g., bearberry), mosses and lichens)

When comparing the assessed plant community to the RPC, structural layers may be reduced as grazing pressure or other types of disturbance increases (e.g., recreation, oil and gas, logging, forest fire, insects; see Figure 12). These changes appear as modifications

to the expected plant community layers, plant growth form and vigour. With a reduction in structure the values and benefits from the site decline.

Utilization by livestock and wildlife, as well as other disturbances, can affect the appearance or growth form of plants. Repeated browsing of shrubs can lead to a hedged or umbrella shaped appearance. Many forbs and grasses develop a low-growing, ground-hugging, growth form in response to prolonged heavy grazing. Heavy grazing of rhizomatous species can result in a low, mat-like growth form. Livestock preference for different plants varies between kinds of livestock (e.g., cattle vs. sheep) and can change depending on season of use. Preferred species vary between plant community types as preferences are often relative to what other plants are available. In this question, the amount of utilization or browsing of shrubs observed is used as an indicator of grazing pressure. As grazing pressure increases and preferred shrubs become more heavily utilized, livestock and wildlife browsing increasingly shifts to less preferred species. If heavy utilization is continuous over many years it will lead to a shift in plant community composition as addressed in question one.

Plant vigour is an expression of overall health or robustness and can refer to an individual, species or class of plant. Plant vigour must be good before range health can improve. When assessing plant vigour, consider the plant's size, reproductive capability, number of shoots or tillers and the amount of new growth. Also, look at the mixture of age classes (there should be young, medium and mature plants), the amount of dead or decadent plants, as well as, the number and density of plants. Keep in mind that current growing conditions have a big influence on the apparent health of plants. If possible compare the site to surrounding areas (of the same ecological site type that are not disturbed), this will provide an indication of plant vigour relative to disturbance.

Q2 Scoring: (see Figure 12)

35 All expected life form layers are present. Plant growth form and vigour closely resembles the Reference Plant Community (RPC). Utilization of woody species is light.

27 All expected life form layers are present, however due to utilization and disturbance, the preferred plants are showing reduced vigour and a change in growth form (see Table 3 and scoring notes). Utilization of preferred shrubs is moderate and utilization of non-preferred shrubs is light.

18 One life form layer is significantly reduced or absent. There is a significant reduction in vigour and alteration of growth form of preferred plants due to utilization and disturbance. Utilization of preferred shrubs is heavy. Non-preferred plants may be showing reduced vigour and some alteration in growth form. Utilization of non-preferred shrubs is moderate.

9 Two life form layers are absent or significantly reduced. Vigour of preferred plants is poor and their growth form has been severely altered through utilization and disturbance. Preferred shrubs are absent or very heavily utilized. Non-preferred plants are showing significant changes in both vigour and growth form. Utilization of non-preferred shrubs is heavy.

0 Three life form layers are absent or significantly reduced. Preferred plants are absent or have severely altered growth form and very poor vigor. Non-preferred plants show poor vigour and severely altered growth form due to utilization and disturbance. Non-preferred shrubs are absent or very heavily utilized.

35
all layers present, light use

27
all layers present, moderate use

18
1 layer reduced or absent

9
2 layers reduced or absent

0
3 layers reduced or absent

Figure 12
Changes in forest plant community structure as disturbance increases. (An example where five life form layers are expected.)

Table 3: Assessing life form layers, utilization, plant growth form and vigour

			Preferred Shrubs, Forbs and Grasses			Non-preferred Shrubs, Forbs and Grasses	
SCORE	**Life Form Layers**	**Preferred shrub utilization**	**Vigour**	**Growth form**	**Non-preferred shrub utilization**	**Vigour**	**Growth form**
35	All present	Light	Good	Normal	None - Light	Good	Normal
27	All present	Moderate	Slightly reduced	Slightly altered	Light	Good	Normal
18	1 absent or reduced	Heavy	Significantly reduced	Significantly altered	Light to Moderate	Good to Slightly reduced	Slightly altered
9	2 absent or reduced	Very heavy or absent	Poor	Severely altered	Heavy	Significantly reduced	Significantly altered
0	3 absent or reduced	Preferred shrubs absent	Very poor or absent	Severely altered or absent	Very heavy to non-preferred shrubs absent	Poor	Severely altered

Q2 Scoring Notes

- In general preferred species for cattle include shrubs like low-bush cranberry, red-osier dogwood and saskatoon, forbs like tall lungwort, asters, peavine and vetch and most grasses. Non-preferred species for cattle include shrubs like buffalo-berry, hazelnut, snowberry and gooseberry and forbs like bedstraw and wild sarsaparilla. For additional information on the forage value of individual plant species, refer to the book Northern Range Plants (Stone, C and D. Lawrence, 2000).
- When assessing forage utilization, include both livestock and wildlife use.
- When assessing shrub utilization randomly select 2 or 3 plants of each preferred species. Determine the percentage of utilization by comparing the number of leaders browsed with the total number of leaders available on the branch (count only the 2nd year growth and older).
- Use the following guidelines for shrub utilization:
    - Light = less than 25% of available second year and older leaders browsed
    - Moderate = 26 to 50% of available second year and older leaders browsed
    - Heavy = 51 to 75% of available second year and older leaders browsed
    - Very Heavy = more than 76% of available second year and older leaders browsed
- When assessing growth form and vigour, consider both woody (shrubs) and herbaceous plants (grasses and forbs).
- Usually one layer will not be significantly affected or absent before the other layers are impacted. Equivalents can be considered and noted in comments. For example, if two layers are somewhat reduced but not enough to be significant, together the two affected layers could be scored as the equivalent of one layer missing or significantly reduced.

Question 3.0 Hydrologic Function and Nutrient Cycling

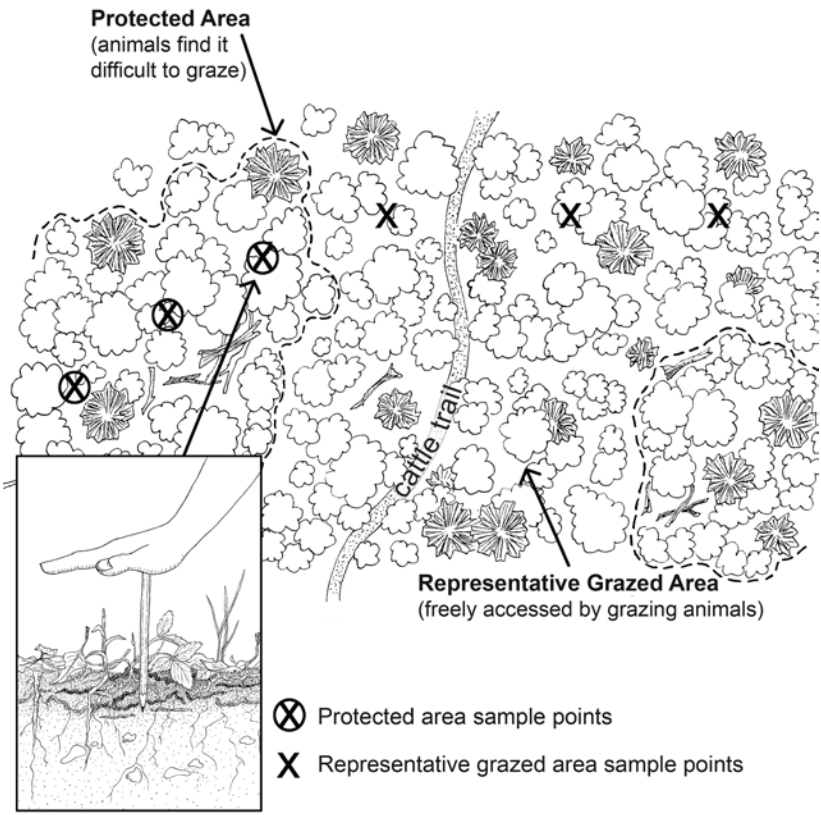
What is the thickness of the surface organic layer (LFH)/ has the LFH been compacted?
In forest systems that lack the LFH layer, has the mineral soil been compacted?

In forest plant communities, water and nutrient cycles are related to the organic layer of litter, fermenting and humified vegetation above the mineral soil (referred to as the LFH, see Figure 14). In its natural state, LFH is spongy and loosely stacked organic material.

A healthy LFH layer performs important functions including storing and releasing energy and water, buffering erosive forces, reducing evaporation and providing nutrients for forest plants. The thickness of the LFH varies between ecological sites and reference plant communities (RPC), so some field sampling may be required to determine normal thickness for your particular site. There are successional stages of forests (cutblocks, recent burns and certain conifer forests) that lack a developed LFH layer. On these forest types, assessment of compaction should be performed on mineral soil and compared between protected and disturbed areas.

By using the ‘Poke Test” (Figure 13) to measure the sponginess (compressibility and resistance) and thickness of LFH, you can obtain an indirect measurement of the health of the nutrient and water cycling processes on the site. Be sure to review the Poke Test method and the scoring notes on the following pages.

Poke Test Site Example and Method



The “Poke (Pencil) Test Method” can be used to assess LFH thickness and mineral soil compaction or LFH compressibility. To do this, place the eraser end of a sharp pencil (or similar object) in the middle of your palm and then, with a straight arm, push the pencil into the LFH. Thickness of the LFH can be estimated by the distance the pencil penetrates before it hits mineral soil. For compressibility, gauge the resistance you feel as the pencil moves through the LFH. Compare the average from the protected areas to the average of the unprotected areas. Generally, a thinner LFH or more penetration resistance is found where disturbance has affected the site.

Figure 13
Example of representative sample site selection in protected versus disturbed/grazed areas for the “Poke Test”.

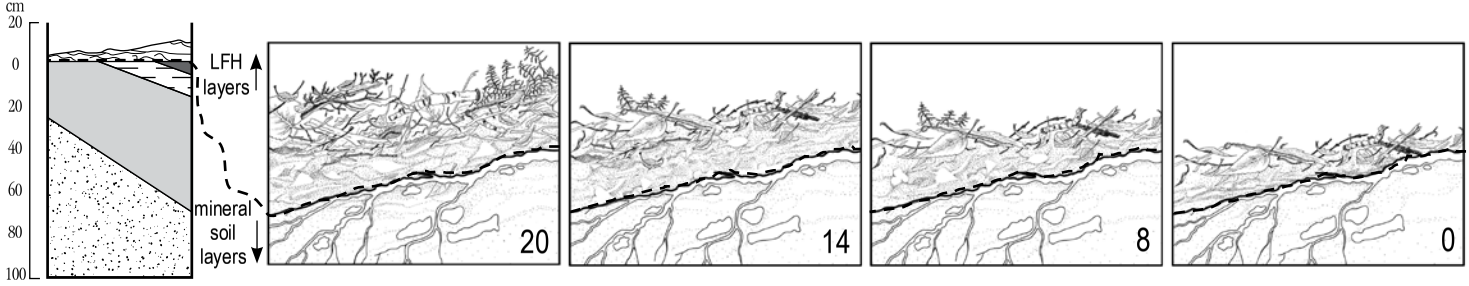


Figure 14
Impact of increasing disturbance on LFH thickness with probable scores. The first drawing shows the presence of LFH layer overlaying mineral soil layers.

Q2 Scoring: (see Figure 14)

20 **LFH Thickness** - When measuring the LFH thickness between protected and disturbed areas there is no significant difference. For average sites the difference is minimal (less than 10%). LFH is continuous.

Mineral Soil Compaction/ LFH Compressibility - When measuring compaction between disturbed and protected areas, there is no significant difference. There is less than 20% difference in effort in the compressibility or resistance to penetration by a pencil between protected and disturbed areas.

14 **LFH Thickness** - There is a difference in LFH thickness between protected and disturbed areas. For average sites the difference is between 10 to 25%. LFH is somewhat patchy due to thickness variation.

Mineral Soil Compaction/LFH Compressibility - Disturbed areas are more compacted and more difficult to compress; significantly more resistant to penetration (up to 50% more effort required).

8 **LFH Thickness** - Difference in LFH thickness between protected and disturbed areas is typically 26 to 50%. LFH is clearly patchy both by measurement and by visual assessment.

Mineral Soil Compaction/ LFH Compressibility - Disturbed areas are significantly compressed and much more resistant to penetration by a pencil relative to that in protected areas (50 to 200% more effort required). Protected areas are relatively small and isolated.

0 **LFH Thickness** - Difference in LFH thickness between protected and disturbed areas is typically greater than 50%.

Mineral Soil Compaction/ LFH Compressibility - Compaction and resistance to penetration very high (greater than 200% more effort required, which might even break the pencil). Protected areas tend to be difficult to find.

Q3 Scoring Notes

- When choosing a score consider all the criteria; LFH thickness, compressibility, distribution and mineral soil compaction. All the criteria must be satisfied in order to award a particular score.
- LFH thicknesses for common plant communities may be found in the range plant community guides developed by the Alberta Rangeland section
- **Protected areas** refer to areas that grazing animals find difficult to access and therefore are likely to be ungrazed or lightly grazed and relatively untrampled (e.g., between clumps of closely spaced trees, underneath dense shrub cover, or areas with considerable deadfall). Recreational or industrial activities have not impacted these areas. Representative **disturbed/ grazed areas** are areas freely accessed by grazing animals, recreation or industrial activities.
- When selecting representative areas for comparison ensure that they have the same potential to accumulate LFH (i.e, the same ecological site and forest successional stage).
- You may want to do several samples to represent the variation found, for example, do at least three protected and three similar disturbed sites. For a more systematic approach, sample in a transect beginning no closer than 40 cm from a tree and moving out to grazed areas stopping before you come to a trail.
- If you need additional information to score the health and function of the LFH, use a shovel or knife as the sampling tool. Take at least three samples of the LFH in a protected area and compare them to the LFH in a similar, disturbed site. Use the measurements found here along with the “Poke Test Method” to determine the score that fits best.
- **Earth Worms** - In the **Lower Foothills Natural Subregion** of the province you may encounter earthworms in the forest soil. If so, the above LFH comparative sampling methods should still apply. How do you tell if earthworms are present?
    - earthworm casts /feces(round cylinders about 2 mm in diameter by 5 mm long) may be found in clumps
    - the soil mixing may alter LFH thickness or create light and dark streaks within the LFH and down into the mineral soil

Question 4.0 Site Stability

This is a two part question assessing overall site stability.

4.1 Is there evidence of accelerated erosion?
4.2 Is there human-caused bare ground?

Accelerated erosion due to human management activities is a serious issue, leading to long-term negative impacts on the site potential. If we recognize the early signs of accelerated erosion, or increases in human-caused bare ground, we can make management changes before the situation becomes serious. To recognize accelerated erosion and estimate "human-caused" bare ground, you need to know what normal soil erosion processes are expected for the Reference Plant Community (RPC). Sandy forest sites or steep river breaks may be naturally unstable and erodible. The majority of forest range sites in Alberta have continuous ground cover (i.e., < 5% bare soil) and are stable.

Noting if the site is normally stable or normally susceptible to erosion is important to interpreting observations (scoring) correctly. Be sure to check the appropriate box on the score sheet before answering question 4.1 and 4.2 (see Score Sheet section)

Question 4.1 Evidence of accelerated erosion.

Q4.1 Scoring: (Use Figure 15)

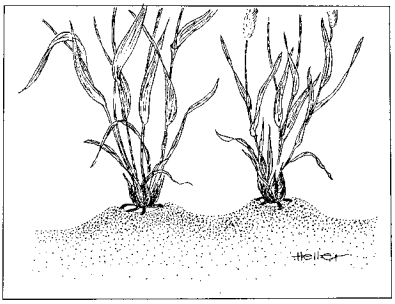
5 No erosion beyond the natural extent for the site.

3 Some micro evidence. Old erosion features may be stable and vegetated or flow patterns on site short and shallow.

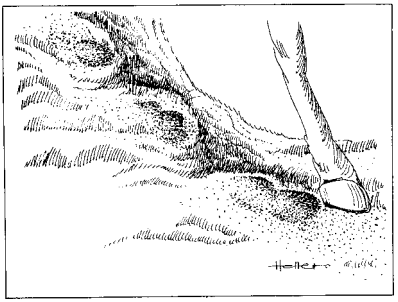
1 Macro evidence of moderate amounts of soil movement or deposition of soil or organic material. Erosion features are active but there is no off-site movement of material. Flow patterns have a well-defined branching pattern.

0 Macro evidence of extreme amounts of soil movement with most material being carried off site. Erosion features are active and unvegetated. Pedestalled plants with exposed roots or rocks recently exposed sitting on the surface.

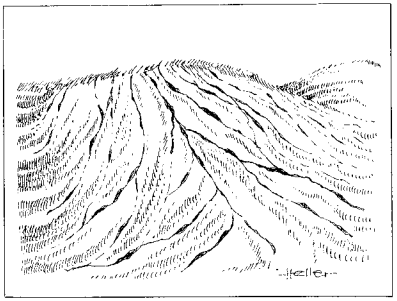
a) Pedastalling (Micro)



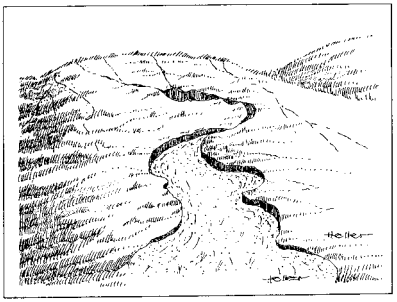
b) Hoof Shearing (Micro)



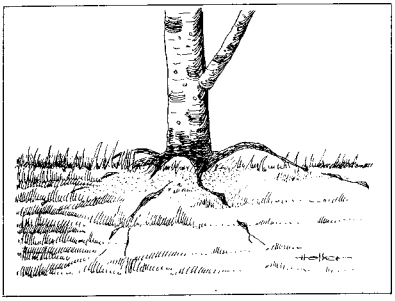
c) Rill Erosion (Macro)



d) Gully Erosion (Macro)



e) Root Exposure (Macro)



g) Trailing (Macro)

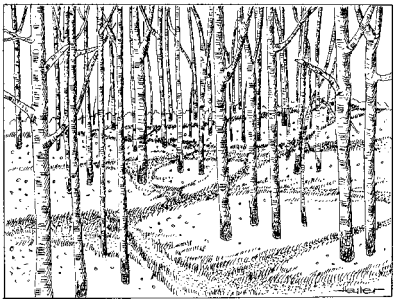


Figure 15
Examples of soil erosion.

Question 4.2 Increase in human-caused bare soil.

Human-caused bare soil is that portion that is over and above what is normally expected for the site. It is the result of disturbance processes that are subject to human control (e.g., grazing, OHV, recreational impacts, timber harvesting). To estimate human-caused bare soil, first estimate total bare soil, subtract expected or naturally occurring bare soil (refer to RPC or use 5%) and the difference is human-caused bare soil.

In the early stages of cutblock regeneration up to 30% bare soil may be present. However, as the block undergoes succession, bare soil will decrease over time. On conifer cutblocks, site preparation is often intentionally planned to achieve an even distribution of mineral and organic soil mixing in order to create suitable soil micro sites for tree seedlings. Site preparation methods can result in varying degrees of soil exposure.

Q4.2 Scoring: (see Figure 16)

5	Human-caused bare soil is < 1% cover
3	1 to 5%
1	6 to 15%
0	> 15%

Q4.1 and 4.2 Scoring Notes

- Record the percent human-caused bare soil on the score sheet. Also record moss and lichen cover since they help to stabilize the site.
- Human-caused bare soil includes any found in the bottom of erosional features.
- Bare soil from rodent burrows tends to increase on heavily grazed sites. Rodent activity increases when there is an increase of weedy, tap rooted species. On heavily grazed sites, most of the bare soil from rodent burrows should be considered human-caused bare soil.
- High ungulate use may lead to site instability. Preferred ranges and winter sites are especially prone to erosion and increased bare soil. When wildlife impacts cause site instability, treat it

as human-caused and note the source of the impact in the comments section.

- Earthworm activity is not considered human-caused.
- If timber harvesting or silviculture methods have contributed to erosion or human-caused bare soil, record this information in the comments.

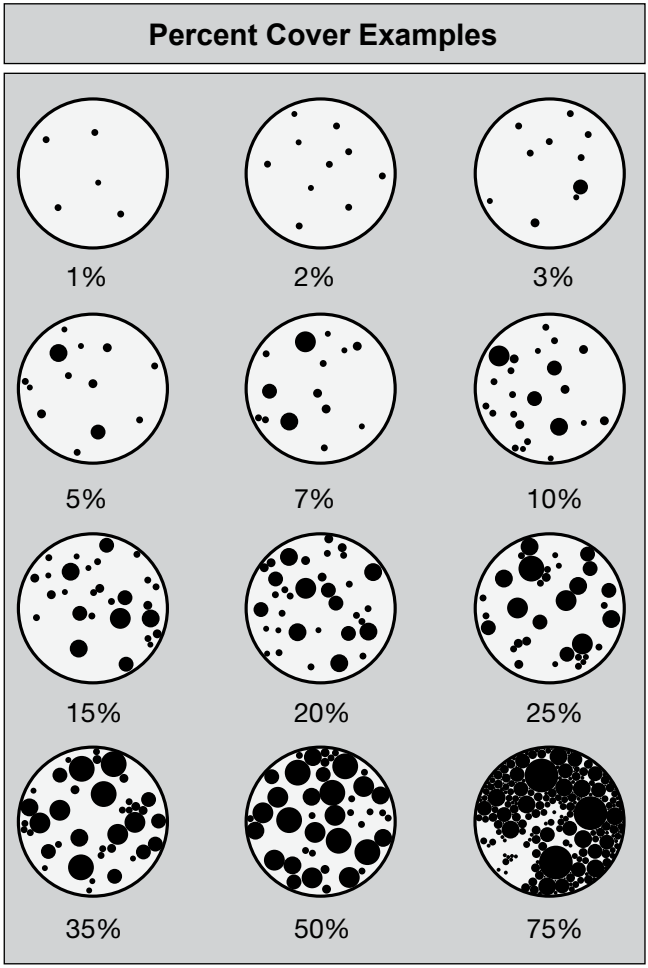


Figure 16
This graphic helps to develop a mental picture of the percent cover of bare soil or vegetation.

Question 5.0 Prohibited Noxious and Noxious Weeds

5.1 Are prohibited noxious or noxious weeds present on the site?
5.2 Density and distribution of noxious weeds.

The presence of noxious weeds (i.e., both prohibited noxious and noxious) can provide clues as to the health and function of the site. Noxious weeds commonly establish where excessive disturbance has caused an increase in bare ground, available moisture and/or nutrients. When present, they can have a negative impact on forage production and the many other values of forest rangeland. Early detection of noxious weeds is required to limit their spread and reduce control costs.

This two part (5.1 and 5.2) question evaluates the degree of noxious weed infestation on the site. Noxious weed foliar cover, density and distribution (patchiness or evenness) is considered. Include any weeds listed as prohibited noxious and noxious in the Alberta *Weed Control Act*, or any problem weeds elevated by the local government (e.g., Municipal District). The Reference section has a list of prohibited and noxious weeds for Alberta.

Use the score sheet to record detailed information for each noxious weed species observed and any control treatments applied. This data helps assess the risk of further weed expansion and guides weed control programs. Depending on the size of the infestation and invasive potential of the weed species present, this data may also trigger the need to complete an Invasive Plant Form (see Reference section).

In order to score these questions, the observer must consider all noxious weeds collectively. To score 5.1 use the cumulative cover of all noxious weeds (e.g., 10% Canada thistle + 5% downy brome = 15% cover of noxious weeds). To score 5.2 use the cumulative density and distribution for all noxious weeds. You may wish to comment on the total area (e.g., acres, m2) of the management unit affected by the combination of noxious weeds in addition to what was recorded for individual species.

Question 5.1 What is the cumulative cover of noxious weeds?

Q5.1 Scoring: (Use Figure 16)

5	No noxious weeds
3	< 1% cover
1	1 to 15%
0	>15%

Question 5.2 What is the cumulative density distribution class of noxious weeds?

Q5.2 Scoring: (Use Figure 17)

5	No noxious weeds
3	A low level infestation (density distribution class 1, 2 or 3)
1	A moderate infestation (density distribution class 4, 5, 6 or 7)
0	A heavy infestation (density distribution class 8, 9, 10, 11, 12 or 13).

Q5.1 and 5.2 Scoring Notes

- Variations in weed infestation can be averaged across the site.
- The density and distribution of dots in Figure 17 relates to the density and distribution of weeds in the sampling area. Scores decline as infestation increases as indicated on the right side of the figure.
- Do not rate nuisance weeds or disturbance species in this question (e.g., dandelion, strawberry, plantain, yarrow).
- If you add weeds from a local weed control list, record this in your comments.
- If the assessment site has a significant but uneven distribution of weeds, you may want to consider dividing it into two smaller assessment areas.

Density Distribution

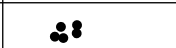
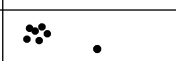
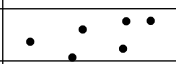
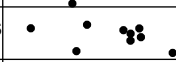
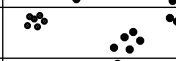
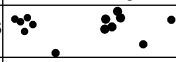
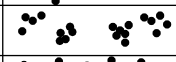
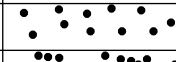
Class	Description of abundance in polygon	Distribution	Weeds Score
0	None		5
1	Rare		3
2	A few sporadically occurring individual plants		
3	A single patch		
4	A single patch plus a few sporadically occurring plants		1
5	Several sporadically occurring plants		
6	A single patch plus several sporadically occurring plants		
7	A few patches		
8	A few patches plus several sporadically occurring plants		0
9	Several well spaced patches		
10	Continuous uniform occurrences of well spaced plants		
11	Continuous occurrence of plants with a few gaps in the distribution		
12	Continuous dense occurrence of plants		
13	Continuous occurrence of plants with a distinct linear edge in the polygon		

Figure 17
Density distribution chart for rating weed infestation

Tame Pasture Health Assessment

Instructions and Scores

This assessment can be used for any tame pasture throughout the province. Before you proceed with the assessment, be sure you have reviewed the first section including the part on *Getting Started* and have gathered the necessary reference materials. In the Score Sheets section there is additional information on site selection and assessment methods including estimating cover. Also note the score sheets provided near the back which can be used to record dominant plant species, associated cover values, scores and comments for each of the range health parameters. In the Health Scores section there is an example of a completed score sheet. Also read that section when you have finished the assessment to learn more about what your score means and how you can incorporate this information into your management plans.

This is not a stand-alone tool. Background knowledge about the plant communities and sites that you may be evaluating is required. The Alberta Rangeland section has developed range plant community guides that provide necessary background information about the plant communities and range or ecological sites that you may encounter (see Reference section).

Tame pastures are developed with the intention of replacing native vegetation and introducing (seeding) specialized tame (non-native) forage species such as smooth brome or alfalfa. Tame pasture health refers to the ability of the pasture to perform important functions that contribute to long term stability. These functions include:

- maintain tame plant vigour and forage production,
- maintain site potential by protecting soil from erosion and degradation,
- capture and beneficially release water, and
- cycle nutrients and energy.

Tame pasture health is measured by comparing the functioning of ecological processes on the area of rangeland being assessed to a Reference Plant Community (RPC) of a similar range or ecological site. Healthy tame pastures are able to fully perform these functions whereas unhealthy cannot. For livestock producers, healthy tame pastures provide sustainable grazing opportunities along with watershed and soil protection. Good management will help maintain the productivity and extend the life of tame pastures, as well as reducing costs associated with fertilizer, weed and brush control and re-seeding or rejuvenation. An absence of seeded forages or desirable native forage species may be an indication that the grazing regime is too heavy and that range health is declining.

This assessment should only be used on areas that were originally developed for, and currently managed as, tame pasture. Do not include areas that were left native in the assessed area (e.g., riparian areas, knolls and slopes, buffer strips, patches of forest cover, etc.). Do not use this tame pasture health assessment in regenerating cutblocks[1]. If the land was not cultivated, or if the management intent is to have the site revert back to native species consider using the grassland or forest health assessments.

Occasionally areas that were cleared for tame pasture development will have a substantial amount of deciduous tree regeneration. When forest cover is cleared for tame pasture development, livestock producers usually implement management practices such as controlling the timing and intensity of grazing, applying herbicides, breaking, discing or other mechanical treatments to control the regeneration of trees and shrubs. It can sometimes be difficult to decide if a cleared area is a functioning forest or a tame pasture. The following criteria (from the Alberta Regeneration Survey Manual, 2008) are benchmarks to determine if the site is functioning as a regenerating forest, or as a tame pasture. Areas that meet the criteria below could be assessed using the forest health assessment. If the area does not meet the criteria or if the management intent behind the clearing was to create tame pasture, then the tame pasture health assessment could be used and woody regrowth managed appropriately. The decision diagram on page 19 will assist with choosing the appropriate health assessment protocol.

[1] For further information on cutblock regeneration as it relates to grazing and timber harvesting see the Alberta Cutblock Assessment Tool (Level 1 Status Assessment 2008).

Forest regeneration criteria* adapted to determine site function:

Deciduous Forest

- Saplings should be healthy, vigorous and undamaged.
- Understory tree density is usually 7 to 10 trees/10 m^2 (circular plot radius of 1.76 m), distributed over 80% of the block.
- After 3-5 years post-harvest, a minimum tree height of 100 cm is expected.
- After 8-14 years post-harvest, a minimum tree height of 200-250 cm is expected.

Coniferous Forest

- Seedlings should be healthy, vigorous and undamaged.
- Understory tree density is usually 1 tree/10 m^2 (circular plot radius of 1.78 m), distributed over 80% of the block.
- After 3-5 years post-harvest, a minimum tree height of 30 cm is expected.
- After 8-14 years post-harvest, a minimum tree height of 100 cm is expected.

* (from the Alberta Regeneration Survey Manual, 2008)

An assessment is completed within a single pasture/management unit and on an area of uniform potential. A pasture unit may contain a variety of sites with different plant communities as a result of pasture development practices/conditions or site potential. If required, map the pasture unit subdividing areas of differing site potential and assess each separately.

Question 1.0 Plant Community Composition

Do introduced forage plants dominate the site?

The composition of the observed plant community will determine if you use the 1A scoring criteria for a '**tame**' pastures or the 1B scoring criteria for '**modified**' tame pastures (see below). **You must only answer 1A or 1B**. The tame pasture plant community should resemble its' reference plant community (RPC), that is, the introduced (i.e., non-native) forage species that were initially seeded. Tame grasses and legumes are fundamental to a productive tame pasture. Maintaining these planted species maximizes forage production. When pastures are homogenous (i.e., dominated by plants that grow at the same time, with similar forage quality, etc.), management is easier and more effective. Therefore, it is important that managers know what plants are currently growing in the pasture.

In some cases, a tame pasture may be modified to the point where introduced forage species no longer dominate the stand. This can be due to individual or a combination of factors, including the development method (e.g., scarifying and broadcast seeding) and past grazing regime. In some situations, the amount of introduced forage species is so low that it is questionable if the pasture can be managed to regain the dominance of these forage plants. A mixture of tame and native species makes effective management of a pasture difficult, as different species will mature at different times and require different rest intervals following grazing. The scores of 1B are less than 1A to account for these issues. Modified tame pastures can still be managed for their "modified" potential, while preventing weed and erosion problems. In a modified tame pasture there is more emphasis placed on the contribution of desirable native forage species towards the total productivity.

The observer must first determine if the pasture is a tame pasture (Question 1A) or a modified tame pasture (Question 1B). This decision is based on the % cover of introduced forage plants in the pasture.

- If 50% or more of the vegetation cover (relative) in the pasture is from introduced forage plants, proceed to Question 1A. The pasture is considered a tame pasture.
- If less than 50% of the vegetation cover (relative) in the pasture

is from introduced forage species, proceed to Question 1B. The pasture is considered a modified pasture.

Question 1A Tame Pasture

To be considered a tame pasture, at least 50% of the vegetation cover must be from introduced forage species. Introduced forage species include tame forage species that were seeded or that have established in the pasture by natural means (e.g., wind, animals and water) or through livestock grazing. This question indirectly estimates (through cover) the contribution of introduced forage species towards the total productivity of the pasture (adapted from Wroe et al. 1988).

In this question, the % cover being estimated is **relative cover**. To score this question, the observer must determine the % cover of all **introduced forage species relative to the total % vegetation cover** (live vegetation excluding noxious weeds and woody regrowth) found in the assessment area. In other words, estimate how much introduced forages contribute to the total vegetation cover.

Q1A Scoring:

12	90% or greater of the cover (relative) is from introduced forage species
9	75 to 89% of the cover (relative) is from introduced forage species
5	50 to 74% of the cover (relative) is from introduced forage species

Q1A Scoring Notes:

- See Table 4 (1A) for a list of introduced species commonly found in tame pastures. Introduced forage species do not include native species, noxious weeds, woody plants and weedy or disturbance induced species.
- Further information regarding noxious weeds is found in the Reference section.
- Do not include bare soil, litter, and any areas covered only by noxious weed species or woody regrowth in the estimate of total % vegetation cover, as these elements are considered in

other health questions. If noxious weeds or woody regrowth are layered over other vegetation, only include the other vegetation in the estimates of cover.

Question 1B Modified Tame Pasture

The pasture is modified if less than 50% of the cover in the pasture is from introduced forage species.

This question indirectly estimates (through cover) the contribution of native and introduced forage species towards the total productivity of the pasture (adapted from Wroe et al. 1988). Only include native forage species, plus any introduced forage species that were seeded or that have established in the pasture by natural means (e.g., wind, animals, water) or through livestock grazing. This collection of forage species will be referred to as "included" species in following text.

In this question, the % cover being estimated is **relative cover**. To score this question, the observer must first determine the % cover of all **included forage species relative to the total % vegetation cover** (live vegetation excluding noxious weeds and woody regrowth) found in the assessment area. In other words, estimate how much the included forages contribute to the total vegetation cover.

Q1B Scoring:

9	75% or greater of the cover (relative) is from included species (i.e., a mixture of desirable native species and introduced forage species)
5	40 to 74% of the cover (relative) is from included species
0	less than 40% of the cover (relative) is from included species

Q1B Scoring Notes:

- See Table 4 (1B) for a list of included species commonly found in tame pastures. Include desirable native forage species that have the potential to make a substantial contribution to forage production and are readily grazed by livestock. Do not include noxious weeds, woody plants and weedy or disturbance induced species.
- Further information regarding noxious weeds is found in the Reference section.

- Do not include bare soil, litter, and any areas covered only by noxious weed species or woody regrowth in the estimate of total % vegetation cover, as these elements are considered in other health questions. If noxious weeds or woody regrowth are layered over other vegetation, only include the other vegetation in the estimates of cover.

Table 4 Commonly occurring plants in tame pastures categorized to assist in answering questions 1 and 2.

	1A introduced forages	**1B** included forages	**2.1** tall productive forages	**2.1** grazing induced forages	**2.2** weedy/ disturbance induced non-forages
Cover estimation method	**relative**	**relative**	**relative**	**relative**	**absolute**
Introduced					
Kentucky bluegrass	Y	Y	-	Y	-
smooth and meadow brome	Y	Y	Y	-	-
timothy	Y	Y	Y	-	-
crested wheat grass	Y	Y	Y	-	-
meadow foxtail	Y	Y	-	Y	-
quack grass	Y	Y	-	Y	-
creeping red fescue	Y	Y	-	Y	-
alfalfa	Y	Y	Y	-	-
white clover	Y	Y	-	Y	-
dandelion	N	N	-	-	Y
Native (naturally occurring)					
marsh reed grass	N	Y	Y	-	-
rough fescue	N	Y	Y	-	-
hairy wild rye	N	Y	Y	-	-
wheat grasses	N	Y	Y	-	-
June grass	N	Y	-	Y	-
needle and thread	N	Y	Y	-	-
Canada bluegrass	N	Y	-	Y	-
peavine, vetch	N	Y	Y	-	-
pussy-toes (everlasting)	N	N	-	-	Y
strawberry	N	N	-	-	Y
yarrow	N	N	-	-	Y
prickly pear cactus	N	N	-	-	Y

Question 2.0 Plant Species Composition Shift

Are there changes in the type of plants that are growing in the tame or modified tame pasture? Evaluate this question in two parts: forage species shift in 2.1 and weedy or disturbance induced species shift in 2.2.

Introduced and native forage plants may respond differently to a particular grazing regime. Tame or modified tame pastures are most often maintained at moderate stocking levels. When the grazing regime increases to heavy (i.e., continuous heavy grazing without effective rest), plant species changes occur. Under this regime, grazing resistant plants thrive better than plants less resistant to grazing and become dominant in the pasture. Alfalfa and taller, potentially more productive grasses with high growing points are replaced by grasses and legumes with low growing points or other characteristics such as growth form that make them more resistant to grazing (e.g., Kentucky bluegrass, creeping red fescue, and white clover). These plants are considered grazing-induced species. (Note: In areas where moisture is not limited, Kentucky bluegrass and creeping red fescue can produce a significant amount of forage. Most often, however, moisture is limited and their productivity is severely reduced or sporadic.)

Good range management maintains taller, more productive forage species, which are often better able to withstand drought conditions, provide a more stable forage supply and permit more flexibility in grazing options. Pastures dominated by shorter and shallow rooted species, particularly when or where moisture is limited, provide fewer grazing management options and usually have reduced stocking rates.

Question 2.1 Forage Species Shift

To score this question, the observer must first determine the cover of the **taller, more productive species (both introduced and native) relative to the total cover of all forage species**.

Q2.1 Scoring:

14 75% or greater of the forage cover (relative) is from tall, productive, introduced and native forage species. Minor amounts of grazing-induced species present.

7 40 to 74% of the forage cover (relative) is from tall, productive, introduced and native forage species. Plants may be declining in health and vigor. Grazing-induced species may be replacing the taller, more productive species. Shift may be due to grazing or other causes.

0 less than 40% of the forage cover (relative) is from tall, productive, introduced and native forage species. Plants may be weak and have reduced vigor. Taller, more productive species may have been largely replaced by grazing-induced species. Shift in composition may be due to grazing or other causes.

Q2.1 Scoring Notes:

- When estimating relative cover, you are determining the % cover that part of a group (tall, productive, introduced and native forage species) has relative to the % cover of the whole group (live forage plants - do not include weedy and disturbance- induced species, non-forage plants, noxious weeds and woody regrowth).
- Do not include bare soil or litter in your % cover estimates
- See Table 4 (2.1) for a list of species commonly found in tame pastures.

Question 2.2 Weedy and Disturbance-Induced Species Shift

This question considers the abundance of undesirable species such as dandelion, strawberry, yarrow, everlasting and other disturbance-induced species that increase with grazing pressure and as the competitiveness of seeded forages or desirable native species declines. As the cover of weedy and disturbance-induced species increases, a corresponding and serious decline in forage production occurs.

In this question, the % cover being estimated is absolute cover, not relative cover as was used in the previous questions. In this case, you are estimating the actual percent of the area that is covered by weedy and disturbance-induced species.

Q2.2 Scoring:

14 25% or less cover (absolute) from weedy and disturbance induced species

7 26 to 49% cover (absolute) from weedy or disturbance induced species

0 50% or greater cover (absolute) from weedy or disturbance induced species

Q2.2 Scoring Notes:

- See Table 4 (2.2) for examples of weedy and disturbance induced species commonly found in tame pastures.
- When estimating the absolute cover of nuisance weeds such as dandelion and strawberry, consider and record the time of year. Dandelion and strawberry are more noticeable early in the grazing season and tend to shrivel and die off later in the season. Try to time your assessment so that the cover of these species is accurately captured. If this is not possible, look carefully for dried leaves and estimate how much area they would have covered before they dried up.
- Include nuisance weeds but not noxious weeds. Further information regarding noxious weeds is found in the Reference section.

Question 3.0 Hydrologic Function and Nutrient Cycling

Is there adequate litter present to retain moisture?

Litter is linked to rangeland health because it performs several important functions that are vital to the maintenance of resource values for livestock, wildlife, and watershed protection. Litter's light-tan color will tend to reflect the sun's rays, insulating the soil surface thereby slowing the loss of moisture and minimizing temperature fluctuations. It also acts as a kind of latticework at the soil surface

that promotes infiltration of water. Litter, along with other live plant material, slows runoff and creates a pathway for water to flow into the soil. By improving the retention and percolation of water, soil erosion is greatly reduced. Litter will also reduce wind erosion, the same way that a good stand of stubble will in a grain field, by causing the wind to be deflected upward and by capturing any airborne soil particles. Litter forms a type of barrier that reduces soil exposure. This limits opportunities for weed seedlings to establish and for insects like grasshoppers to lay eggs. As soil micro-organisms break down the litter to humus, nutrients are recycled to support plant vigor and growth, thereby reducing the need for costly applications of inorganic fertilizer.

Litter is of particular importance on tame pastures found in the drier parts of the province (e.g., Dry Mixedgrass, Mixedgrass, Central Parkland and Dry Mixedwood natural subregions). Litter includes any plant residue from previous years' growth (standing or fallen stems or leaf material) as well as partially decomposed fragments of plant material lying on the surface (See Figure 18). Litter can be distinguished from the current year's growth by its color, integrity (i.e., brittleness, pliability, etc) and sometimes its position. Current year's growth will have a green to yellowish tinge, will be somewhat flexible and will usually be firmly connected to the plant.

Is it possible to have too much litter? Yes and no. Climate and plant characteristics cause litter to accumulate and break down at different rates. Where local climate conditions restrict plant growth and increase the rate of litter loss and/or break down, it may not be possible to accumulate too much litter. In tame pastures where moisture is less restricted and wind is not a factor, it maybe possible with very light or nonuse of forage to accumulate too much litter. In this case forage production will

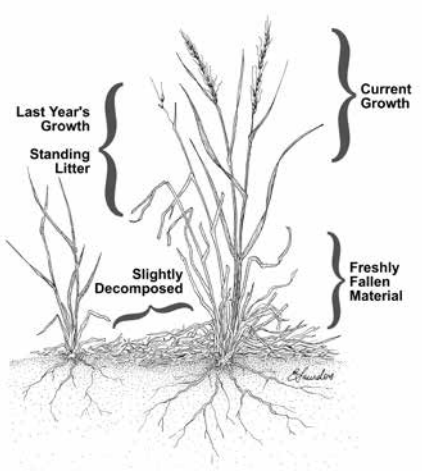


Figure 18
Types of litter associated with tame pastures.

likely be temporarily reduced due to shading. Overall, the benefits of litter retention far outweigh any potential risk of forage production loss.

The amount of litter present on a site is used to evaluate hydrological function and nutrient cycling. The litter thresholds provided are based on averaging litter amounts found on a variety of grazed tame pastures across the province (see scoring criteria and Figure 19). The amount of litter required to contribute to a healthy and functional rangeland may vary according to climate, soil and mix of species. Further studies will help us better define litter thresholds in tame pastures.

A quick estimate of litter levels can be based on the average amount of larger litter fragments that can be readily raked up by hand within several sample plots (1/4m^2 plot; 50 cm by 50 cm). The observer can then compare the average amount to the examples shown in Figure 19. This method of rapidly estimating litter (i.e., hand raking), does not collect some of the smaller litter fragments.

The health assessment must be repeatable (i.e., answers do not widely vary among observers) and as objective as possible. In order to achieve this, assessment methods must be standardized and observers instructed on how to deal with complicated factors. Manure is one of these factors. Manure (cow pies) and urine contribute to the nutrient cycle much the same as plant litter does; however, they lack some of the qualities important to the hydrological cycle, such as creating pathways for water to flow into the soil. When sampling litter, including cow pies has the potential to skew the average amount of litter that is used to score the site, particularly when the pieces are large and/or fresh. Therefore, when estimating litter amounts, avoid sample plots that have large or fresh cow pies. To maintain consistency from observation to observation, and pasture to pasture, only include decomposed pieces of cow pie smaller than about the size of a deer pellet in your estimates.

Q3 Scoring:

25 A distinct litter layer is visible. Litter has a uniform distribution across the pasture. Litter cover is reduced on < 5% of the site. Average litter yield is about 1 handful (≥450 lb/ac).

16 A distinct litter layer is visible, but litter cover is reduced and is no longer uniform. 5-25% of the site has inadequate litter. Average litter yield is 1/2 - 1 handful (≈250 - 450 lb/ac)

8 A thin litter layer is present throughout the pasture or acceptable litter cover may exist only in small scattered patches with the rest of the pasture having little or no litter. 25-67% of the site has inadequate litter. Average litter yield is 1/4 - 1/2 handful (≈125-250 lb/ac)

0 Litter is sparse or absent for the majority of the site (> 67%). Average litter yields are < 1/4 handful of litter (< 125 lb/ac).

Q3 Scoring Notes:

- The scoring of litter considers litter amounts and distribution (spread and cover). To award a particular score, the amount and distribution must be satisfied. For example, a pasture that has 450 lbs/ac of hand raked litter but patchy litter distribution would score 16 points (not 25 points).
- In areas that are classified as exceedingly stony and/or have rocky outcrops, the amount and distribution of litter can be affected by surface rock. Large rocks (e.g., > 6 inches in diameter) can contribute to moisture retention and soil protection. Record the % of rock cover in your comments and score the litter as your see it, regardless of rock cover. This method is recommended to maintain consistency of assessments from observer to observer over time and among pastures. Consider the influence of rock cover when making management decisions. For example, if rock is negatively affecting site litter cover, you may decide to: 1) take no management action to increase litter cover (assuming that non-rocky areas have enough litter); or 2) reconsider plans to develop tame pasture on sites with similar rock cover.

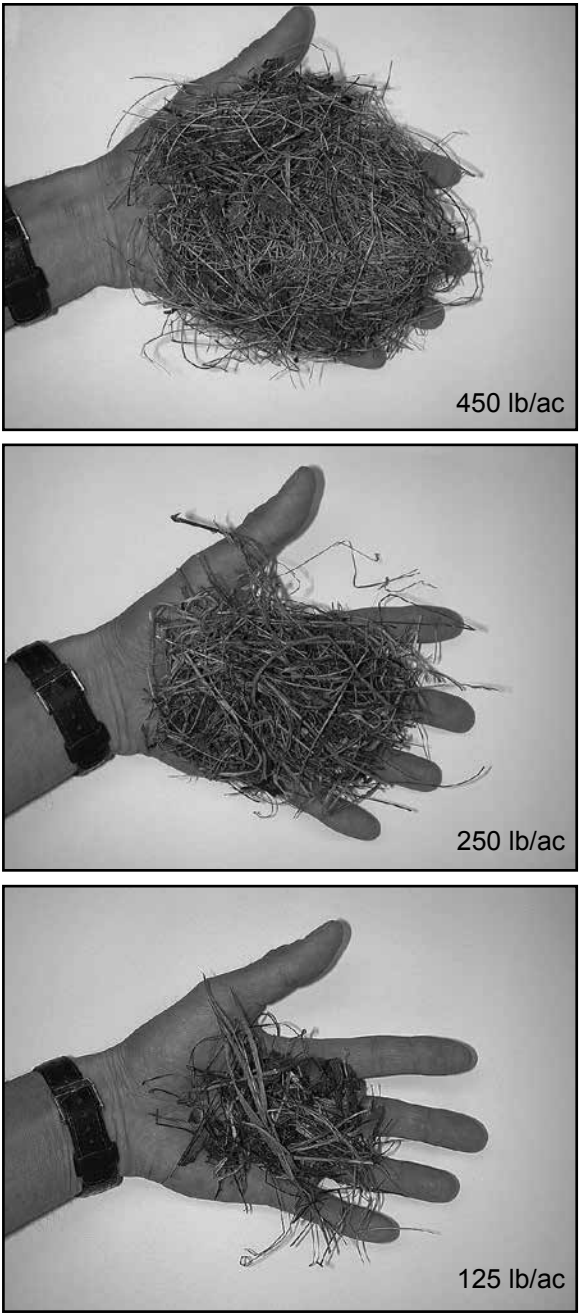


Figure 19
Examples of tame pasture litter thresholds used to score question three.

Question 4.0 Site Stability

4.1 Is the site subject to accelerated erosion?
4.2 Is there human-caused bare ground?

Site stability is evaluated in two parts (4.1 and 4.2) by comparing erosion and bare soil to expected (natural) levels for the site. Recognizing the process of human-caused erosion on tame and modified pastures is very important. Erosion can cause serious reductions in the long-term ability of the site to produce forage and provide other values. Early stages of soil erosion indicate the need for immediate changes in management before soil loss becomes serious and costly. See Figure 20 for examples of what erosion can look like.

Human-caused bare soil will alert you to the need for changes in management. Human-caused bare soil can result from the direct impacts of pasture establishment methods, grazing, equipment use or indirectly where rodent burrowing is in response to weedy and disturbance species in the pasture. Bare soil is an obvious indicator of loss of forage production and the many other values found in a well-vegetated tame pasture.

To estimate human-caused bare soil, first determine the percentage of bare ground on the site (use Figure 21 to assist you). Decide which subregion the tame pasture is located in, then use Table 5 to determine the percentage of naturally occurring bare soil in that natural subregion. Subtract the amount of naturally occurring bare soil from the observed amount. The result is an estimate of human-caused bare soil used to answer this question. (See examples 1 and 2 below.)

Example 1 for Boreal Mixedwood: total observed bare soil is 20% minus 5% naturally occurring = 15% human-caused bare soil
Example 2 for Dry Mixedgrass, Blowout site type: total observed bare soil is 50% minus 15% natural occurring = 35% human-caused bare soil.

Noting if the site is normally stable or normally susceptible to erosion is important to interpreting observations (scoring) correctly. Be sure to check the appropriate box on the score sheet before answering question 4.1 and 4.2 (see Score Sheet section)

Table 5
Natural Variation of Bare Soil found in Alberta

Natural Subregion (soil zone)	Percent naturally occurring bare soil on native range site types
Boreal	5 (0 to 5)
Foothills Fescue, Foothills Parkland, and Montane	Loamy sites 5 (1 to 5)
Central Parkland	Loamy sites 5 (1 to 5)
Mixedgrass (Dark Brown)	Loamy sites 7 (3 to 7) Sandy sites 6 (4 to 6) Blowout sites 12 (6 to 12)
Dry Mixedgrass (Brown)	Loamy sites 10 (1 to 10) Sandy sites 12 (5 to 12) Blowout sites 15 (5 to15)

Question 4.1 Evidence of Accelerated Erosion

Q4.1 Scoring: (see Figure 20)

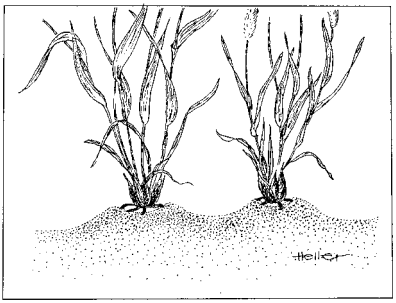
10 No erosion beyond the natural extent for the site.

7 Some micro evidence. Old erosion features may be stable and vegetated or show short and shallow flow patterns on the site.

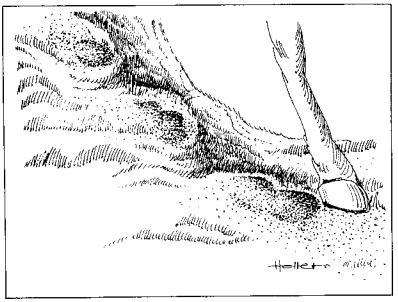
4 Macro and micro evidence of moderate amounts of soil movement or deposition. Erosion features are active but there is no off-site movement of material. Flow patterns have well-defined branches.

0 Macro and micro evidence of extreme soil movement with most material being carried off site. Erosion features are active and unvegetated. Soil erosion has uncovered rocks or caused pedestalled plants with exposed roots.

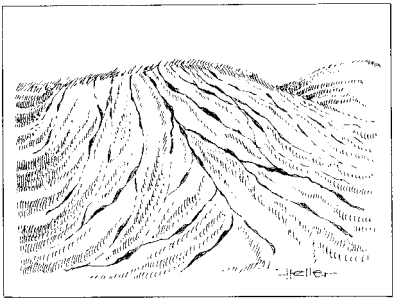
a) Pedastalling (Micro)



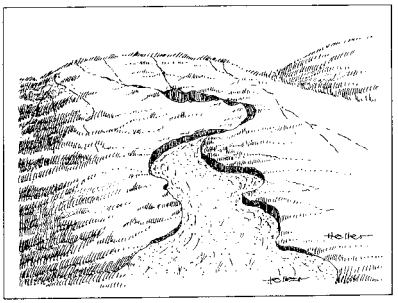
b) Hoof Shearing (Micro)



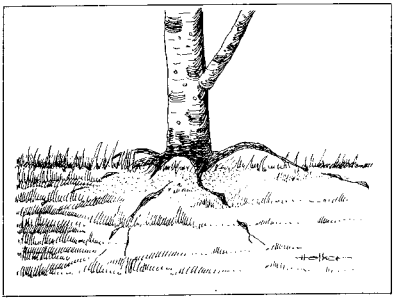
c) Rill Erosion (Macro)



d) Gully Erosion (Macro)



e) Root Exposure (Macro)



g) Trailing (Macro)

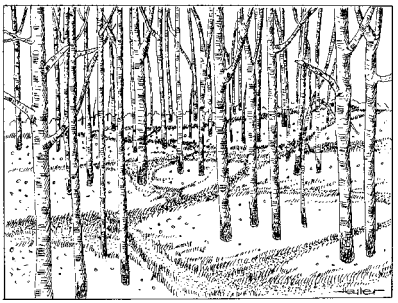


Figure 20
Examples of soil erosion

Q4.1 Scoring Notes:

- Look for human-caused erosion above normal or geologic (natural) rates expected for the site.
- To observe early signs of erosion, you may need to get very close to the ground, looking in and around plants at ground level. Look for micro evidence such as dishing (small depressions) or exposed/remnant coarse soil fragments (sand) caused by wind erosion, hoof shear, and pedestalling.

Question 4.2 Human-Caused Bare Soil

Use your estimate of human-caused bare ground to answer the appropriate question below. Answer Question 4.2A if the pasture is in the Mixedgrass or Dry Mixedgrass subregion; or answer 4.2B for any other subregion.

Q4.2 Scoring:

4.2A Dry Mixedgrass or Mixedgrass:

5 10% or less human-caused bare soil
3 11 to 20% human-caused bare soil
1 21 to 49% human-caused bare soil
0 50% or greater human-caused bare soil

4.2B Foothills Fescue, Foothills and Central Parkland, Montane, Boreal Mixedwood:

5 5% or less human-caused bare soil
3 6 to 10% human-caused bare soil
1 11 to 15% human-caused bare soil
0 16% or greater human-caused bare soil

Q4.1 and 4.2 Scoring Notes:

- Bare soil may be present in the early stages of tame pasture establishment before plant density and vegetation canopy increases to normal levels for the site. Be sure to note if the pasture is still in the forage establishment phase (e.g., 1 to 3 years, depending on climate and site potential). Alternatively, you may wish to consider delaying the assessment until forage has been established.
- If forage seeding practices such as wide row spacing, (prevalent with crested wheat grass) have contributed to the human-caused bare soil, record this information in the comments, but score it as you see it. Review these comments when considering the overall health of the tame pasture and when making management decisions. For example, you may decide to reject sites prone to soil erosion as potential tame pasture sites, or you may decide to adjust establishment methods to reduce the short and long term risks of soil exposure and erosion.
- Consider the amount of bare soil in livestock trails to be part of human-caused bare soil.
- On heavily grazed sites, a significant portion of the bare soil from rodent burrows should be considered human-caused bare soil. Burrowing rodent populations tend to increase on pastures where there is an abundance of weedy taprooted species and less vegetation to obstruct the rodent's view of predators.
- High ungulate use may lead to site instability. Preferred ranges and wintering sites may be especially prone to erosion and increased bare soil. When wildlife impacts cause site instability, treat it as human-caused and note the source of the impact in the comments section.

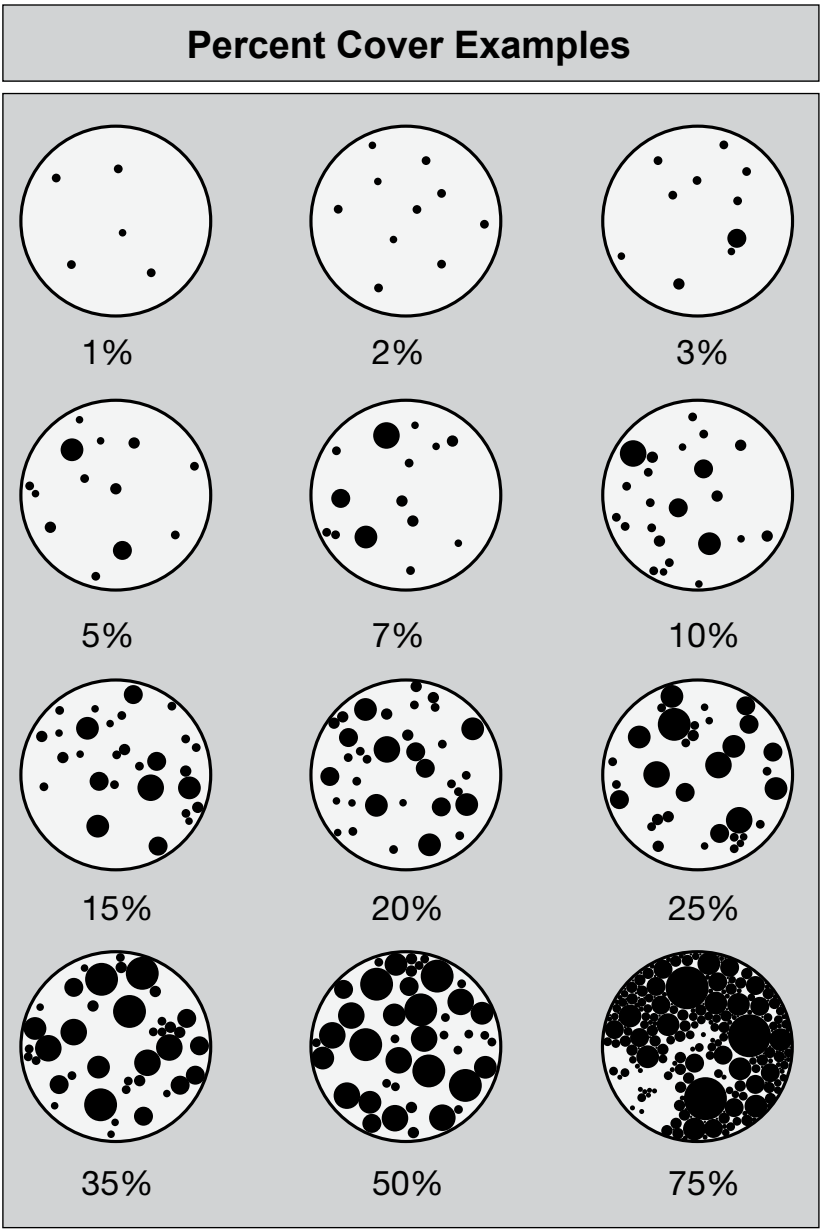


Figure 21
This graphic helps to develop a mental picture of the percent cover of bare soil or vegetation.

5.1 Are probhibited noxious weeds or noxious weeds present on the site?
5.2 Density and distribution of noxious weeds.

The presence of noxious weeds (i.e., both prohibited noxious and noxious) can provide clues as to the health and function of the site. Noxious weeds commonly establish where excessive disturbance has caused an increase in bare ground, available moisture and/or nutrients. When present, they can have a negative impact on forage production and the many other values of tame pastures. Early detection of noxious weeds is required to limit their spread and reduce control costs.

This two part question, (5.1 and 5.2), which evaluates the degree of noxious weed infestation on the site. Noxious weed foliar cover, density and distribution (patchiness or evenness) are considered. Include any weeds listed as prohibited noxious and noxious in the Alberta *Weed Control Act*, or any problem weeds elevated by the local government (e.g., Municipal District). The Reference section has a list of prohibited and noxious weeds for Alberta.

Use the score sheet to record detailed information for each noxious weed species observed and any control treatments applied. This data helps assess the risk of further weed expansion and guides weed control programs. Depending on the size of the infestation and invasive potential of the weed species present, this data may also trigger the need to complete an Invasive Plant Form (see Reference section)

In question 5.1, the percent cover being estimated is **absolute** cover, not relative cover as was used questions 1 and 2.1. In this case, use your plot, polygon or frame to represent 100% of the sample area. Then determine the actual percent of this area that is covered by noxious weeds. Make sure your estimate is representative of the entire assessment area (e.g., management unit, pasture or polygon).

In order to score both 5.1 and 5.2, the observer must consider all noxious weeds collectively. To score 5.1 use the cumulative cover of all noxious weeds (e.g., 10% Canada thistle + 5% downy brome = 15% cover of noxious weeds). To score 5.2 use the cumulative

density and distribution for all noxious weeds. You may wish to comment on the total area (e.g., acres, m^2) of the management unit affected by the combination of noxious weeds in addition to what was recorded for individual species.

Question 5.1 What is the cumulative cover (absolute) of noxious weeds?

Q5.1 Scoring: (Use Figure 21)

5	No noxious weeds
3	< 1%
1	1 to 15%
0	>15%

Question 5.2 What is the cumulative density distribution (DD) class of noxious weeds?

Q5.2 Scoring: (Use Figure 22)

5	No noxious weeds
3	A low level infestation (DD class 1, 2 or 3)
1	A moderate infestation (DD class 4, 5, 6 or 7)
0	A heavy infestation (DD class 8, 9, 10, 11, 12 or 13)

Q5.1 and 5.2 Scoring Notes:

- If you add weeds from a local weed control list, record this in your comments.
- Do not include nuisance weeds or disturbance species for this question (e.g., dandelion, strawberry, plantain, yarrow).
- The density and distribution of dots in Figure 22 represents the density and distribution of weeds in the sampling area. The scores shown decline as infestation increases.
- Variations in weed infestation can be averaged across the site.
- If the assessment site has a significant but uneven distribution of weeds, you may want to consider dividing it into two smaller assessment areas.

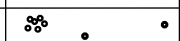
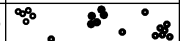
Density Distribution				
Class	**Description of abundance in polygon**	**Distribution**	**Weeds Score**	**Regrowth Score**
0	None		5	4
1	Rare		3	
2	A few sporadically occurring individual plants			
3	A single patch			
4	A single patch plus a few sporadically occurring plants		1	2
5	Several sporadically occurring plants			
6	A single patch plus several sporadically occurring plants			
7	A few patches			
8	A few patches plus several sporadically occurring plants		0	0
9	Several well spaced patches			
10	Continuous uniform occurrences of well spaced plants			
11	Continuous occurrence of plants with a few gaps in the distribution			
12	Continuous dense occurrence of plants			
13	Continuous occurrence of plants with a distinct linear edge in the polygon			

Figure 22
Density distribution guide for rating weed infestation and woody regrowth.

Question 6.0 Woody Regrowth

6.1 What is the cumulative cover of woody species?
6.2 What is the cumulative density distribution of woody species?

In order to determine if woody regrowth is a problem, it is evaluated in two parts (6.1 percent cover and 6.2 density and distribution). The kinds, proportions and amounts of woody species that grow in tame or modified tame pasture depend on many factors including:

- site conditions (rocks, soil, natural vegetation type [forest, parkland or grassland])
- range improvement method used

- grazing management practices
- age of pasture

Depending on the cover, density and species of plants, woody regrowth may act as complementary forage or compete with seeded forage plants. You may choose to maintain some woody regrowth to support resource goals like timber production or maintaining wildlife habitat and riparian area values. In some cases, woody plants may be beneficial to the pasture. For example, they may increase site moisture through snow trapping; they may be important for wildlife or other values; and they might be important to the health and function of the site (e.g., riparian areas).

Riparian areas (those green strips of vegetation that are found around ponds, lakes, sloughs, and along creeks, rivers and streams) are very important to the health and function of the watershed. It is desirable to have woody cover in riparian areas that may be found within a tame pasture. These woody plants should not be considered undesirable woody regrowth. Woody plants in riparian areas should be maintained to help meet the health and function needs of riparian areas, and to that end, pasture managers should proceed with caution in any brush control considerations. Riparian areas should be maintained and managed in their natural state to maximize watershed values and riparian health. For additional information, refer to the Cows and Fish website (www.cowsandfish.org).

In the Dry Mixedgrass Natural Subregion, sagebrush is an important woody plant for the endangered species Sage-Grouse. To help protect Sage-Grouse habitat, sage brush should not be considered a woody regrowth problem, and should not be removed from pastures. For further information see Beneficial Grazing Management Practices for Sage-Grouse (Centrocercus urophasianus) and Ecology of Silver Sagebrush (Artemisia cana Pursh subsp. cana) in Southeastern Alberta (Adams et al. 2004).

In northern Alberta tame pastures, poplar species, willow, rose and buckbrush may be a problem if their cover and density distribution is too high. In the Parkland, buckbrush and rose can sometimes become a problem. In the Mixedgrass and Dry Mixedgrass subregions, woody plants are generally not considered a problem. Shrubs are an important source of structure in prairie grasslands

with particular value for wildlife species and they can also enhance site moisture by trapping snow. Any potential advantages that may occur through removal of woody species from these sites should be carefully weighed against the benefits that woody species provide. In these drier regions, if the integrated benefits of retaining woody species outweigh the potential loss of forage production, or if **woody vegetation does not grow in the area, you may decide not to score this question**. If you do not score the question, remember that you need to adjust the total score so that the % range health is representative of the questions that you answered. In the grassland natural region, refer to the range plant community guides for additional information and range health scoring guidelines for woody species like silver sagebrush and forbs like prickly pear cactus.

The health assessment must be repeatable (i.e., answers do not widely vary among observers) and as objective as possible. In order to achieve this, assessment methods must be standardized and observers instructed on how to deal with complicated factors. Woody plants are one of these factors. Record, on the score sheet, the cover and density distribution of the 3 dominant woody species. **While scoring 6.1 and 6.2, do not include areas that were left as native vegetation (e.g., riparian areas, knolls and slopes, rocky areas, buffer strips, patches of forested cover, etc)**. If a woody species is to be excluded in the estimation of woody cover and density distribution, comments to that effect must be recorded.

Question 6.1 Cumulative cover (absolute) of included woody regrowth.

Q6.1 Scoring: (use Figure 21):

6	< 5% woody regrowth cover
3	5 - 15%
0	>15%
N/A	not scored

Question 6.2 Cumulative density distribution of included woody regrowth.

Q6.2 Scoring: (use Figure 22):

4 A low density of woody regrowth (density distribution class 0, 1, 2 or 3)

2 A moderate density of woody regrowth (density distribution class 4, 5, 6 or 7)

0 A high density of woody regrowth (density distribution class 8, 9, 10, 11, 12 or 13)

N/A not scored

Q6.1 and 6.2 Scoring Notes:

- Indicate in the comments any areas that were not included in the assessment.
- In order to maintain consistency of assessments, do not attempt to compensate for multiple values of woody regrowth when estimating cover. Score what you see. Consider multiple benefits of woody regrowth when evaluating the overall health of the pasture and when making management decisions regarding brush control.
- The density and distribution of dots in Figure 22 represents the density and distribution of woody regrowth in the assessment area. The scores for each density distribution class are indicated in the figure's right column. If the pasture has a significant, uneven distribution of woody regrowth, you may want to divide it into different polygons.
- In the comments section, record your observations on the average height of the woody regrowth. This will assist you in assessing the need for brush control measures.
- If woody regrowth is a problem, provide specific comments on the need for control measures like biological, chemical or mechanical treatments.

Determining the Scale of Observation

The field workbook has been designed to assess range health of grassland, forest and tame pasture at a variety of scales (plant community, field or pasture, management unit, or polygon – the observation assessment area). The scale you choose depends on your specific needs and constraints.

- Consider the purpose of the assessment – what do you want to accomplish? Is the sample site an area of concern or is it broadly representative of the pasture as a whole? You may want to know the cover and density of specific weed species in addition to the cumulative measurements for the health indicators. Tame pasture can be assessed on a field basis but areas where woody re-growth is highly variable will normally require more detailed sampling.
- Determine the amount of time, money and labor you can apply to conduct the range health assessment. Once you have started to measure range health, future assessments allow you to establish trend; upward or downward in response to ongoing management practices.
- Sample “like-with-like”. This increases the confidence that observations are representative and accurate. For example, always sample within the same management unit, and if you have time, consider sampling the dominant plant communities. The complexity of the rangeland and the number of intermixed plant communities, will determine the number of samples required.

How Many Points Do I Sample Within a Plant Community, Management Unit or Polygon?

We suggest you pace off a representative distance of the landscape or crisscross the plant community, management unit, or polygon to get a thorough impression of key health indicators. Consider a minimum of three observation points, making mental notes of variability before you complete the questions. It’s a good idea

to record information in pencil and refine as you gather more information.

In some cases, you may wish to complete measurements representative of the polygon and break down individual questions into more specific details. In the case of noxious weeds (question 5) or woody regrowth (tame pastures- question 6), the score sheet allows you to identify specific species in the comments section.

What Sampling Equipment Do I Need?

- This field workbook, a pencil and eraser,
- For grassland and tame pasture, a quarter meter frame (50 x 50 cm) for estimating litter amounts. Alternatively you can use a measuring tape and spikes to mark off a quarter meter square or perhaps you can use your feet (boot size),
- For forest, a pencil, knife and/or a shovel and a tape or ruler to measure the LFH.
- Many of the questions ask about vegetation cover. You can use a plotless method, visually estimating cover within the sample area, be it a plant community, management unit, or polygon. A more accurate method uses a plot frame to focus your eye and reduce bias when estimating cover. Plots can be placed randomly or along a transect crossing the assessment area. The frame can be a 20 cm by 50 cm (open on one of the 20 cm sides). For forest, the frame can be 50 by 50 cm (open on one of four sides). Larger plots are used for estimating the cover of woody plants.

Estimating Vegetation Cover and Soil Exposure

The ability to estimate the cover of plant species and the extent of soil exposure is a valuable skill for accurate range health assessment. Usually cover is defined as the vertical projection of the crown or shoot area of a plant species to the ground surface, expressed as a percent of the area of reference (e.g., a plot frame). Cover can be estimated for an individual plant species, groups of plants, dead vegetation (i.e., litter) or bare soil. When the cover of all individual plant species are added up, the total cover may exceed 100% because of overlapping foliage from multiple species. Bare

soil is the percent of the area of reference where mineral soil is not covered by live or dead vegetation or rocks (greater than 6 cm or 2.5 in) and would be vulnerable to erosion from wind, mechanical movement [e.g., hoof shear], raindrop impact or overland flow of water.

Estimating vegetation cover requires training and experience to achieve repeatable observations. Most people start out with the basic concept of **canopy** cover as illustrated on the left in Figure 23 below, where a line is drawn about the leaf tips of the undisturbed canopies with this line projected onto the ground, much like an umbrella. However, with experience, the normal progression is to use foliar cover as illustrated in Figure 23 on the right side. Foliar cover is where vegetation canopy is estimated with a similar projection of the canopy onto the ground below, but the spaces within the vegetation canopy are subtracted from the estimate. In range inventories, research studies, plant community guides and this workbook the Alberta Rangeland Section uses the foliar concept when assessing vegetation cover. The score sheets have space to record cover estimates for four grasses and grass-likes, forbs, shrubs and trees to help you establish the major components of the plant community under evaluation.

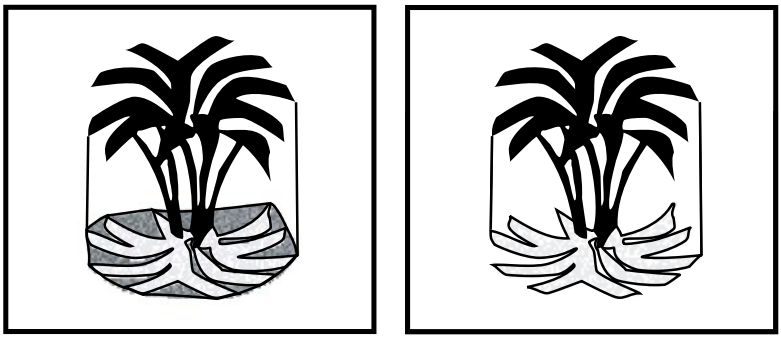


Figure 23
Two different approaches to estimating vegetation cover are canopy (left) and foliar cover (right).

Photographs and Record Keeping

As always, it is important to keep good records and keep them organized. In addition to range health, please consider keeping pasture management and livestock rotation records (see the Grazing Record Booklet Lawrence et al. 2003).

Consider taking photographs that represent the assessed site. Better yet, find a permanent location for taking pictures each time you repeat the health assessment. Over time you will have a visual record to go along with your written information. We recommend taking a planned series of photographs that support your written observations. Note the date, direction of view and location of where you took the picture. Here are a few simple steps for taking reference photos:

- Mark the name or number of the assessment or sample plot on a piece of paper with felt pen. Place this marker on the ground at your feet along with a plot frame or some other object to provide scale. Take photo 1, looking as close to straight down as possible.
- Turn 180 degrees on your heel, take four paces away from the spot marked on the ground and turn back towards your first photo plot.
- In grassland sites, sit on the ground or in forested sites stand to get a good view of plant community layers/structure. Point your camera back towards photo plot 1, frame the first site so there is only a thin sliver of horizon in the top of your field of view. Take picture number 2.
- These photos can be captured with a digital camera and then transferred to your home computer. Depending on your camera's capabilities, you maybe able to imprint the date and GPS location.
- A simple graphics program can be used to combine photos with the health score and provide a powerful monitoring record.

How to Use the Score Sheets

Blank score sheets are provided on the following pages and examples of completed score sheets are found near the end of the Health Scores section. Because the range health questions differ slightly depending on type of range, select the appropriate assessment protocol and score sheet for either grasslands, forest or tame pasture.

Take time to fill out the top of each score sheet. This information (i.e., date, location, plant community, etc.) will be important when you are summarizing all your observations and deciding on management actions. A good set of records will allow you to look back over many years and determine if the grazing management practices are in balance and maintaining a healthy and functioning rangeland. Basic questions can be answered from these records: Has a site with a "healthy with problems" rating recovered to "healthy"? What indicators have responded (litter, species composition, structure, reduced bare soil)?

Note the species table that is found immediately before the health questions. This is a place to record your best estimate of the dominant plant species and the plant community.

Each health question (five each on the grassland and forest forms, six questions on the tame pasture form) requires you to select the best-fit score for that scoring criteria. We recommend that you select only the scores provided; don't try to score values between the numbers provided. Call it as you see it. Provide comments that explain extraordinary observations and the selected score.

In addition to the health questions you have the opportunity to note associated factors, such as utilization and trend.

We encourage you to answer all questions. However, in some unique situations you may find one of the questions not applicable. You may want to think it over and ask questions. If you decide to not answer a question, remember that you need to adjust the total score so that the % range health is representative of the questions you answered.

When you have completed the questions, tally up the scores for all the questions and calculate the percentage range health based on the actual score divided by the total possible score.

Is it healthy, healthy with problems or unhealthy? Read the Health Scores section to better understand what the scores mean.

Abridged Range Health Forms

We have also developed a condensed version for each of the three health assessment protocols (i.e., grassland, forest and tame pasture). These abridged range health forms provide a brief discussion of range health concepts and include the scoring criteria. Copies of these folded 11 X 17 forms can be obtained from local Rangeland offices. The abridged health forms can also be downloaded from the Alberta Government website (search for rangeland health).

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

1A	40	27	20	15	0	Comments	**Score (1A or 1B)**
1B			15	8	0		

2. Are the expected plant layers present?

	10	7	3	0	Comments **Score**

3. Does the site retain mositure? Is the expected amount of plant litter present?

	25	13	0	Comments **Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2

4.1 Erosion Evidence	10	7	3	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle) Human-caused bare soil (%) _____ Moss and lichen (%) _____	

5. Are prohibited noxious and/or noxious weeds pr esent? Answer both 5.1 and 5.2.

5.1 Cover (%)		Species	%	DD	Infestation			**Score (5.1+5.2)**
					Size	Unit	Treated	
5 3 1 0						ha, ac, m^2	UNK, no, yes	
						ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)						ha, ac, m^2	UNK, no, yes	
5 3 1 0		Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

						Comments	**Score (1A or 1B)**
1A	40	27	20	15	0		
1B			15	8	0		

2. Are the expected plant layers present?

					Comments	**Score**
10	7	3	0			

3. Does the site retain mositure? Is the expected amount of plant litter present?

				Comments	**Score**
25	13	0			

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2

					Comments	**Score (4.1+4.2)**
4.1 Erosion Evidence						
10	7	3	0			
4.2 Bare Soil					Site is normally stable / unstable (circle)	
5	3	1	0		Human-caused bare soil (%) _____ Moss and lichen (%) _____	

5. Are prohibited noxious and/or noxious weeds pr esent? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H	**Total**
Observed Utilization _____%	
Trend (apparent; circle): Upward Downward Stable Unknown	

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

1A	40	27	20	15	0	Comments	**Score (1A or 1B)**
1B			15	8	0		

2. Are the expected plant layers present?

	10	7	3	0	Comments **Score**

3. Does the site retain mositure? Is the expected amount of plant litter present?

	25	13	0	Comments **Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2

4.1 Erosion Evidence	10	7	3	0	Comments **Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle) Human-caused bare soil (%) _____ Moss and lichen (%) _____

5. Are prohibited noxious and/or noxious weeds pr esent? Answer both 5.1 and 5.2.

5.1 Cover (%)		Species	%	DD	Infestation			**Score (5.1+5.2)**
					Size	Unit	Treated	
5 3 1 0						ha, ac, m^2	UNK, no, yes	
						ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)						ha, ac, m^2	UNK, no, yes	
5 3 1 0		Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

						Comments	**Score (1A or 1B)**
1A	40	27	20	15	0		
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2. Are the expected plant layers present?

					Comments	**Score**
10	7	3	0			

3. Does the site retain mositure? Is the expected amount of plant litter present?

				Comments	**Score**
25	13	0			

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					Comments	**Score (4.1+4.2)**
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10	7	3	0			
4.2 Bare Soil					Site is normally stable / unstable (circle)	
5	3	1	0		Human-caused bare soil (%) _____ Moss and lichen (%) _____	

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5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H	**Total**
Observed Utilization _____%	
Trend (apparent; circle): Upward Downward Stable Unknown	

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

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Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

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4.1 Erosion Evidence						
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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

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Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

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Grassland Range Health Assessment - SCORE SHEET

Alberta Government

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Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

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Grassland Range Health Assessment - SCORE SHEET

Alberta Government

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Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
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Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H	**Total**
Observed Utilization _____%	
Trend (apparent; circle): Upward Downward Stable Unknown	

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

25 20 15 10 5 0	Comments	**Score**

2. Are there any changes in forest plant community structure?

35 27 18 9 0	Comments	**Score**

3. Are there changes to the surface organic layer (LFH thickness and compaction)?

20 14 8 0	Comments	**Score**

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
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Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

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Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle):** **yes** or **no;** **if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

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Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle):** **yes** or **no;** **if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

0%---------- **50%** ---------- **75%** ---------- **100%**

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

25 20 15 10 5 0	Comments	**Score**

2. Are there any changes in forest plant community structure?

35 27 18 9 0	Comments	**Score**

3. Are there changes to the surface organic layer (LFH thickness and compaction)?

20 14 8 0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence 5 3 1 0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil 5 3 1 0	Site is normally stable / unstable (circle) Human-caused bare soil (%) _____ Moss and lichen cover (%) _____	

5. Are prohibited noxious and/or noxious weeds pr esent? Answer both 5.1 and 5.2.

5.1 Cover (%) 5 3 1 0	Species	%	DD	Infestation Size	Infestation Unit	Infestation Treated	**Score (5.1+5.2)**
					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD) 5 3 1 0					ha, ac, m^2	UNK, no, yes	
	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle):** **yes** or **no;** **if yes,** was a level 1 assessment completed? **yes** or **no**

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Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
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LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

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Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

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5.2 Density Distribution (DD) 5 3 1 0					ha, ac, m^2	UNK, no, yes	
	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle):** **yes** or **no;** **if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

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5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

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Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

25 20 15 10 5 0	Comments	**Score**

2. Are there any changes in forest plant community structure?

35 27 18 9 0	Comments	**Score**

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5. Are prohibited noxious and/or noxious weeds pr esent? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; ci rcle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknow n	**Total**

0%---------- **50%** ---------- **75%** ---------- **100%**

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture	12	9	5	Comments	**Score (1A or 1B)**
1B Modified Tame Pasture	9	5	0		

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

2.1 Tame/desirable native	14	7	0	Comments	**Score (2.1+2.2)**
2.2 Weedy/disturbance	14	7	0		

3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total** _____**of** _____ = _____%

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture	12	9	5	Comments	**Score (1A or 1B)**
1B Modified Tame Pasture	9	5	0		

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

2.1 Tame/desirable native	14	7	0	Comments	**Score (2.1+2.2)**
2.2 Weedy/disturbance	14	7	0		

3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
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5 3 1 0					ha, ac, m^2	UNK, no, yes	
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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H

Observed Utilization _____%

Trend (apparent; circle): Upward Downward Stable Unknown

Total _____**of** _____ = _____%

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Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

			Score (1A or 1B)
1A Tame Pasture 12 9 5	Comments		
1B Modified Tame Pasture 9 5 0			

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

		Score (2.1+2.2)
2.1 Tame/desirable native 14 7 0	Comments	
2.2 Weedy/disturbance 14 7 0		

3. Is the site covered by litter?

		Score
Cover & distribution 25 16 8 0	Comments	

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

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4.1 Erosion Evidence 10 7 4 0	Comments	
4.2 Bare Soil 5 3 1 0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total** _____of _____ = _____%

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Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

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3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

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4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

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Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H

Observed Utilization _____%

Trend (apparent; circle): Upward Downward Stable Unknown

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Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

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Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

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		Score
Cover & distribution 25 16 8 0	Comments	

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Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
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LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture 12 9 5	Comments		**Score (1A or 1B)**
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2.1 Tame/desirable native 14 7 0	Comments	**Score (2.1+2.2)**
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4.1 Erosion Evidence 10 7 4 0	Comments	**Score (4.1+4.2)**
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					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

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6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
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4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total** _____**of** _____ = _____%

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Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

			Score (1A or 1B)
1A Tame Pasture	12 9 5	Comments	
1B Modified Tame Pasture	9 5 0		

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

			Score (2.1+2.2)
2.1 Tame/desirable native	14 7 0	Comments	
2.2 Weedy/disturbance	14 7 0		

3. Is the site covered by litter?

			Score
Cover & distribution	25 16 8 0	Comments	

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

			Score (4.1+4.2)
4.1 Erosion Evidence	10 7 4 0	Comments	
4.2 Bare Soil	5 3 1 0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total** _____of _____ = _____%

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture	12	9	5	Comments	**Score (1A or 1B)**
1B Modified Tame Pasture	9	5	0		

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

2.1 Tame/desirable native	14	7	0	Comments	**Score (2.1+2.2)**
2.2 Weedy/disturbance	14	7	0		

3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H

Observed Utilization _____%

Trend (apparent; circle): Upward Downward Stable Unknown

Total _____**of** _____ = _____%

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

			Score (1A or 1B)
1A Tame Pasture 12 9 5	Comments		
1B Modified Tame Pasture 9 5 0			

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

		Score (2.1+2.2)
2.1 Tame/desirable native 14 7 0	Comments	
2.2 Weedy/disturbance 14 7 0		

3. Is the site covered by litter?

		Score
Cover & distribution 25 16 8 0	Comments	

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

		Score (4.1+4.2)
4.1 Erosion Evidence 10 7 4 0	Comments	
4.2 Bare Soil 5 3 1 0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			Score (5.1+5.2)
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	Score (6.1+6.2)
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____% **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total** _____of _____ = _____%

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE	M	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management _____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture	12	9	5	Comments	**Score (1A or 1B)**
1B Modified Tame Pasture	9	5	0		

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

2.1 Tame/desirable native	14	7	0	Comments	**Score (2.1+2.2)**
2.2 Weedy/disturbance	14	7	0		

3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H

Observed Utilization _____%

Trend (apparent; circle): Upward Downward Stable Unknown

Total _____of _____

= _____%

0%---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Range Health Categories

The range health score is a cumulative measure of the health and function observed and measured in your sample area. It is a rapid assessment tool and provides a snapshot of the health of the site and possible impacts of disturbance and management. Range health monitoring alerts livestock producers and users to potential issues and problems on rangelands so that management changes can be made. First, consider the health categories and what they mean.

Healthy:

A health score between 75 to 100 %. All of the key functions of health rangeland are being performed. This rating provides a positive message about your current management practices. It may tell you that current stocking levels, distribution and grazing practices are maintaining range health. Optimum grazing opportunities for livestock are possible.

Healthy with Problems:

A health score of 50 to 74%. Most, but not all of the key functions of healthy range are being performed. Sites in this category should be on the “watch list” requiring further monitoring. This score is an early warning of the need for minor to major adjustments to management. There may be a reduction in livestock grazing opportunities. Recovery to a healthy class can normally be accomplished within a few years. In rough fescue grasslands invaded by agronomic grasses like Kentucky bluegrass, smooth brome or timothy, recovery potential may be very limited and a health score of healthy with problems may be the maximum attainable given current knowledge.

Unhealthy:

A health score of less than 50%. Few of the functions of healthy range are being performed. An unhealthy rating means urgent action is required. Significant management changes are essential and it may take years to regain a healthy class. Livestock grazing opportunities are seriously reduced.

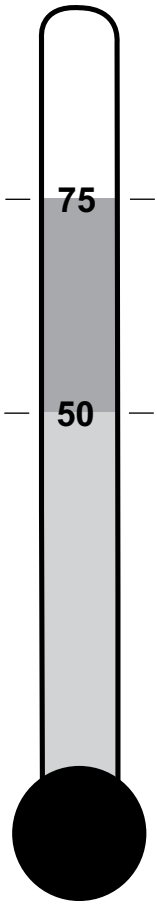
RANGE HEALTH HINTS
What do the health scores mean?

Range Health Categories

Healthy
A health score of 75 to 100%. All of the key functions of healthy rangeland are being performed.

Healthy with Problems
A health score of 50 to 74%. Most but not all key functions of healthy range are being performed.

Unhealthy
A health score of less than 50%. Few of the functions of healthy range are being performed.



Healthy
Good job!

Healthy with problems
Minor to major change in grazing practices required

Unhealthy
Major change in grazing practices required

What Do the Scores of Individual Health Questions Tell You?

Individual health question scores allow you to take a closer look at the specific indicators of range health. The scores for individual health questions or combinations of questions can help you formulate management objectives. Consider the possible score for each question; this tells you the relative importance of the question to the overall rating. For example:

- In grasslands - plant community integrity and in forests - plant community structure, are most important. High scores here will contribute most to establishing a healthy rating. Low scores indicate a large negative impact on the function of the site.
- In tame pastures, species shifts to disturbance induced or weedy species will be of greatest concern as they replace the more productive forage plants.
- In modified grassland and tame pasture retaining palatable and productive species and litter will be of greatest concern. Low scores indicate a large negative impact on the function of the site.

Litter and LFH

In grasslands and tame pasture, litter scores provide insight into moisture retention functions of the site. High scores mean moisture is being retained and that conditions are favorable for water to infiltrate into the soil. Medium scores mean that moisture retention is being measurably reduced. Lighter stocking, longer and more effective rest periods and improved rotational grazing can usually restore litter levels in a number of years. Low litter ratings mean that little moisture is being retained and the stage may be set for increased soil erosion from the site. Other impacts may come into play, for example the invasion of weeds. In native grassland litter also provides insight into the nutrient cycle. High scores indicate that enough plant residue is being left after grazing to maintain the natural cycle of nutrients. A low score may indicate that too much of the seasonal production is being removed by grazing (disturbance) and the benefits provided by litter are greatly reduced.

Comparability, in forests a low score in the LFH indicates loss of moisture retention and nutrient cycling processes. Many years of effective rest may be required to restore plant community structure and LFH thickness and sponginess.

Soil Erosion and Bare Soil

Any human-caused erosion and bare soil puts management on "high alert" status and requires immediate attention and correction. Similar to a domino effect, allowing erosion processes to accelerate will have drastic impacts to the health and function of the plant community and site.

Noxious Weeds

Noxious weed species are another one of those key early warning signs that the system may be under stress and that both weed control measures and management changes are required. Management that maintains the desired plant community also limits invasion opportunities. Balancing utilization with production potential and providing adequate rest, will set off a beneficial chain of events. Plant vigor will increase, improving the reproduction of desirable plants leading to more vegetation cover which in turn adds more litter to the site and reduces bare soil. The outcome will be less space for weeds to establish.

Woody Regrowth In Tame Pastures

Woody regrowth levels are often a function of a combination of site, tame pasture development method, and grazing management practices. Forest regeneration after pasture development is a natural occurence just like after a wildfire. At low densities woody regrowth may serve as a complementary forage as livestock browse woody plants. If tame pasture reverts back to forest cover, woody regrowth competes with tame forages. As the density, height and stem diameter of shrubs and trees increase, so does shading of seeded forages. Estimating the cover and density of woody species can help determine if control measures are required.

Rotational grazing systems that maintain healthy and productive stands of seeded grasses and legumes often do not have serious woody regrowth problems since control is provided by livestock. In contrast, ineffective grazing systems may facilitate woody regrowth.

Evaluation of Combined Questions

When the health assessment indicates problems, think about the questions as they relate to each other. This reduces chances of changes in practice dealing with the symptoms instead of correcting the problem. For example, the tame pasture health score may indicate woody regrowth, disturbance-induced and weedy species problems as well as low litter reserves. It won't be possible to heal one problem without addressing the others.

Natural, Human-caused or Both?

A number of natural events and processes may affect a health rating. Events such as drought, wildfire, insect damage, flood, disease and extreme wind events can also effect range health. Maintaining historical records, particularly on moisture, disturbance and disease, and carrying out range health assessments periodically, can help you determine which impacts are natural and which are human-caused. We want to focus on any grazing management problems and correct them.

RANGE HEALTH HINTS

Range Health Assessment - A Tool for Adaptive Range Management

Repeated range health assessments can ensure livestock stocking rates are sustainable. Range plant community guides give you recommended or initial ecologically sustainable stocking rates for each plant community. Range health assessment allows you to fine tune your management. These tools along with livestock grazing records, weather records and photographs, can help you manage through drought cycles and identify early signs of declining pasture health.

Assessment and Management Scenarios and Accompanying Score Sheets

Scenario 1-Healthy Category

A native grassland site rates as healthy but the score of 76% falls at the low end of the range. The reduced health score is due to low litter values. A review of management practices suggests that stocking rates may not have been reduced sufficiently during recent dry years. A recent increase in cow size also contributed to increased forage demands on the pasture. Plans are made to reduce stocking slightly balancing the increased forage demand with the long term average production potential and to defer grazing in spring.

Scenario 2 - Healthy with Problems

A forest health assessment has scored 56% and has plant community composition and structure problems. Corrective management includes deferred entry until mid June and only one grazing period per growing season. The stocking rate is further adjusted by recognizing that unpalatable shrubs (e.g., alder) should not be included as forage.

Scenario 3 - Unhealthy

A tame pasture has a range health score of 28% indicating species, litter, erosion, noxious weed and woody regrowth problems. Years of overgrazing has reduced forage production and limited the ability of the pasture to withstand the recent dry conditions. A review of management practices suggests that the stocking rate should be reduced and extended rest periods are required to rebuild litter levels. Weed control and/or pasture rejuvenation may be required depending on cost/benefit analysis.

Scenario 1: Completed Grassland Score Sheet

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date: October 6, 2016	Observer: Jenn Richman	Disposition/Project: Scope	Plot: 1978
Field Unit: Kipps' pasture		Polygon: 13	Decile: 1
Latitude: 50.088259 (DD)		Longitude: -111.84339 (DD)	Elevation: 713 m

LSD: 12	QS: NW	SEC: 15	TWP: 13	RGE 14	M W4	Photo #: 6-7

Special Observations (e.g., climate, management) Recovering from previous drought. Normal precipitation this year. Stocking rates were not not reduced in the dry years.

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %
needle & thread	20	scarlet mallow	5	sagebrush	1	none	
western wheat grass	15	fringed sage	5				
sedges	10	golden aster	3				
northern wheat grass	5	buffalo bean	2				

Subregion/Plant Community (PC) or Conditional PC Name Dry mixedgrass / needle and thread - wheat grass (DMGA2)

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

1A	(40)	27	20	15	0	Comments There is a slight increase in sedges and reducation of needle and thread compared to the reference PC decription (DMGA2) but it still resembles it.	Score (1A or 1B) 40
1B			15	8	0		

2. Are the expected plant layers present?

	10	(7)	3	0	Comments Tall grass layer is reduced in stature	Score 7

3. Does the site retain moisture? Is the expected amount of plant litter present?

	25	(13)	0	Comments The litter is patchy. Average litter load is about 160 lbs/ac	Score 13

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2

4.1 Erosion Evidence	10	(7)	3	0	Comments There is some evidence of plant pedastalling due to wind erosion	Score (4.1+4.2) 10
4.2 Bare Soil	5	(3)	1	0	Site is normally (stable) / unstable (circle) Human-caused bare soil (%) 25 Moss and lichen (%) 40	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)					Species	%	DD	Infestation			Score (5.1+5.2)
								Size	Unit	Treated	
	5	(3)	1	0	Canada thistle	<1%	2	2	ha, ac, (m²)	UNK (no) yes	6
									ha, ac, m²	UNK, no, yes	
5.2 Density Distribution (DD)									ha, ac, m²	UNK, no, yes	
	5	(3)	1	0	Comments A couple of plants by the west gate.						

Grazing Intensity (estimated long term; circle) U U-L L-M (M) M-H H

Observed Utilization 65 %

Trend (apparent; circle): Upward (Downward) Stable Unknown

Total 76%

0% ---------- **50%** ---------- **75%** ---------- **100%**

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Scenario 2: Completed Forest Score Sheet

Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date: July 25, 2016	Observer: JY	Disposition/Project Lothian	Plot: 3
Field Unit: Saskatoon Pasture		Polygon: 1	Decile: 1
Latitude: 53.9098 (DD)		Longitude: -111.3210 (DD)	Elevation: 646 m

LSD:	QS:	SEC:	TWP:	RGE:	M	Photo #:
10	SW	7	57	9	W4	8-9

Special Observations (e.g., climate, management) Normal rainfall. Alder cover is significant and not palatable.

Dominant Species **Cutblock site (circle):** yes or (no;) **if yes,** was a level 1 assessment completed? yes or no

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %
marsh reed grass	5	bunchberry	10	alder	40	aspen	70
Kentucky Bluegrass	3	strawberry	5	rose	5	white birch	3
quack grass	2	dandelion	5	snowberry	5	white spruce	1
sedges	1	white clover	2	low-bush cranberry	2		

Subregion/Plant Community (PC) or Conditional PC Name (code) Dry mixedwood | aspen-alder (DMC6)

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

25	20	15	(10)	5	0	Comments Decreasers (e.g., low-bush cranberry and asters) reduced. Some patches of invaders.	Score 10

2. Are there any changes in forest plant community structure?

35	27	(18)	9	0	Comments Tall forb layer missing; low-bush cranberry heavily browsed and poor vigor	Score 18

3. Are there changes to the surface organic layer (LFH thickness and compaction)?

20	14	(8)	0	Comments LFH reduced and noticeably compacted.	Score 8

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	Comments	Score (4.1+4.2)
(5) 3 1 0		10
4.2 Bare Soil (5) 3 1 0	Site is normally (stable) / unstable (circle) Human-caused bare soil (%) 1 Moss and lichen cover (%) 20	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			Score (5.1+5.2)
				Size	Unit	Treated	
(5) 3 1 0					ha, ac, m^2	UNK, no, yes	10
	none			none	ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
(5) 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M (M) M-H H **Total** 56%

Observed Utilization 20 %

Trend (apparent; circle): Upward (Downward) Stable Unknown

0%---------- **50%** ---------- **75%** ---------- **100%**

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Scenario 3: Completed Tame Pasture Score Sheet

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date: Aug 25, 2016	Observer: D L	Disposition/Project: Stone	Plot: 1
Field Unit: Dogwood		Polygon: 1	Decile: 1
Latitude: 53.800 (DD)		Longitude: -111.314 (DD)	Elevation: 682m
LSD: 10	QS: NE	SEC: 15	TWP: 65	RGE 9	M W4	Photo #: 11-12

Special Observations (e.g., climate, weed or brush control, grazing management 15 yr old tame pasture. Normal mositure. No brush control since establishment.

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %
Kentucky Bluegrass	25	strawberry	10	rose	5	aspen	15
creeping red fescue	25	dandelion	10	snowberry	20		
quack grass	5	yarrow	5				
smooth brome	5	white clover	5				

Subregion/Plant Community (PC) or Conditional PC Name Dry mixedwood | grazing resistant species dominate with >15% woody regrowth. (DMF13R)

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

			Score (1A or 1B)
1A Tame Pasture 12 9 (5)	Comments Only a few smooth brome and meadow brome plants around		5
1B Modified Tame Pasture 9 5 0			

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

		Score (2.1+2.2)
2.1 Tame/desirable native 14 7 (0)	Comments about 35% cover of weedy and disturbance species	7
2.2 Weedy/disturbance 14 (7) 0		

3. Is the site covered by litter?

		Score
Cover & distribution 25 16 8 (0)	Comments Litter found in small isolated patches	0

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

		Score (4.1+4.2)
4.1 Erosion Evidence 10 (7) 4 0	Comments Some hoof shear visable	10
4.2 Bare Soil 5 (3) 1 0	Site is normally (stable) / unstable (circle); Human-caused bare soil (%) 10%	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			Score (5.1+5.2)
				Size	Unit	Treated	
5 (3) 1 0	tansy	<1	2	1	ha, ac, (m²)	UNK, (no), yes	6
					ha, ac, m²	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m²	UNK, no, yes	
5 (3) 1 0	Comments a couple of plants by brush pile						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	Score (6.1+6.2)
6 3 (0) N/A	snowberry	20	9	0
	aspen	15	13	
6.2 Density Distribution	rose	5	8	
4 2 (0) N/A	Comments aspen 12' tall			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H (H)

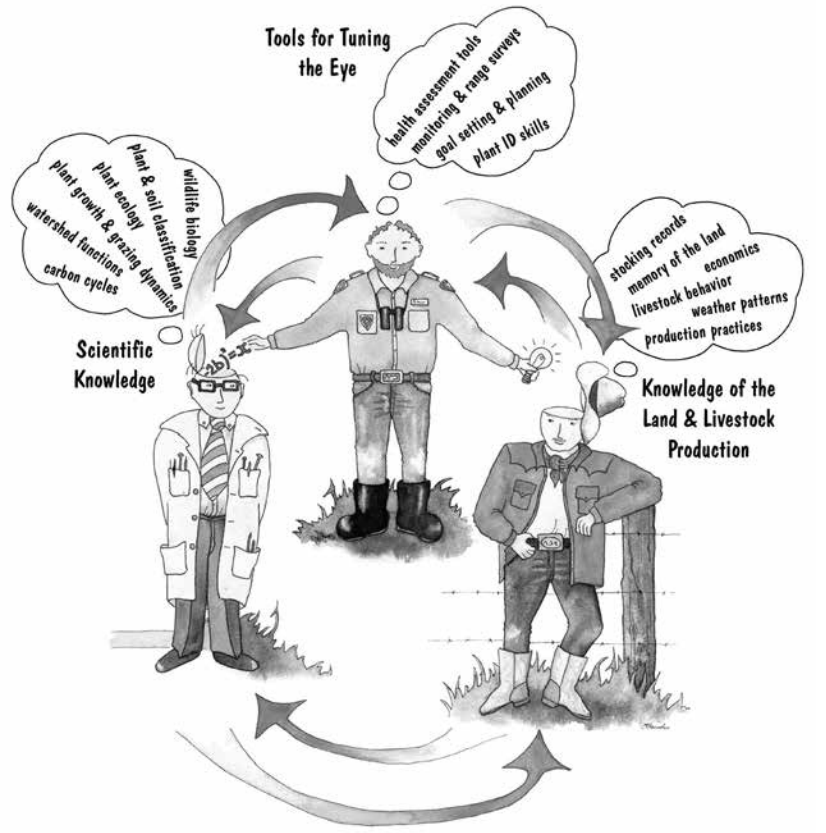
Observed Utilization 85 %

Trend (apparent; circle): Upward Downward (Stable) Unknown

Total 28 of 100 = 28%

0% ---------- 50% ---------- 75% ---------- 100%

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy



A wise person once said, "*No one is as smart as all of us*". That's the philosophy we like to foster with range health tools. Livestock producers possess tremendous wisdom, knowledge and experience on the land. Science can provide valuable insight into how ecosystems function. Range health tools help to link science and wisdom to improve range management, to make livestock production more sustainable and to help resolve or head off resource conflicts among resource users.

Credits

Cover design: Elizabeth Saunders, Sandpiper Ecological Research & Illustration, Monarch, AB

Cover photos: Elizabeth Saunders, Alan Robertson, Lorne Fitch, Colin Stone, Barry Adams, Mike Alexander

Workbook layout: Gwen Edge, GOA, Edmonton

Figures: 4, 7, 13, 14 (original edited), 15, 20 by Eva Heller
1, 2, 5, 18 and page 112 by Elizabeth Saunders
8, 11, 14 by Gwen Edge
3, 10, 11, 12, 17, 20 by Darlene Moisey
6 by Richard Ehlert
9, 12, 16, 19, 21 by Colin Stone

Quotation: page 112, the wise person is Lorne Fitch, Lethbridge

Early editions printed by: Graphcom Printers Ltd., Lethbridge, AB
Fifth edition printed by: Elite Lithographers, Edmonton, AB

First Edition: May 2003
Second Edition: April 2005
Third Edition: April 2009
Fourth Edition: August 2010
Fifth Edition: March 2016

Reference Materials for Range Health Assessment

Background References

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Reference List for Weed Species

Weeds regulated in Alberta

Range health assessments use the plants listed in the Alberta *Weed Control Act* and regulations. The regulated category in Table 6 refers to the designation given weeds (prohibited noxious or noxious) under the Alberta *Weed Control Act*, regulations. In Table 6:

- Prohibited noxious weed species are indicated by '1'
- Noxious weeds are indicated by '2'

Prohibited noxious and noxious weeds can have substantial negative environmental, economic, or social impact. Both weed categories are synonymous from a range health perspective.

The following table is an adaptation from the 2010 Weed Control Regulation. Refer to the current *Weed Control Act* for an up to date noxious weed list. Also, under the *Weed Control Act* local governments (e.g., counties municipal districts) can designate any weed as noxious pending ministry approval. Be aware of weeds that are of concern locally and record information as you would for the provincially listed weeds.

Table 6 has species codes that refers to the seven letter code used to record the Latin (scientific) name of a species during range health assessments. The first four letters are usually composed of the beginning of the genus, while the last three letters of the code are the start of the species name. If the genus is only three letters, then four letters are taken from the species portion. If only the genus is known, then the code is derived from the first six letters of the genus name. These codes are used for consistency and speed of data collection. If you are unfamiliar with the codes or scientific name, ensure that whatever common name you use is verified with a scientific name at a later date, since common names tend to be more variable (and less common) than you might think.

Table 6
Prohibited noxious and noxious weeds regulated in Alberta (2010).

Species	Latin Name	Common Name	Regulated
AEGICYL	*Aegilops cylindrica*	jointed goatgrass	1
ALLIPET	*Alliaria petiolata*	garlic mustard	1
ARCTLAP	*Arctium lappa*	great burdock	2
ARCTMIN	*Arctium minus*	common burdock	2
ARCTTOM	*Arctium tomentosum*	woolly burdock	2
BERBVUL	*Berberis vulgaris*	common barberry	1
BERTINC	*Berteroa incana*	hoary alyssum	1
BROMJAP	*Bromus japonicus*	Japanese brome	2
BROMTEC	*Bromus tectorum*	downy chess/ brome	2
BUTOUMB	*Butomus umbellatus*	flowering rush	1
CAMPRAP	*Campanula rapunculoides*	creeping bellflower	2
CARDACA	*Carduus acanthoides*	plumeless thistle	1
CARDNUT	*Carduus nutans*	nodding thistle	1
CENTMON	*Centaurea × moncktonii*	meadow knapweed	1
CENTPSA	*Centaurea × psammogena*	hybrid knapweed	1
CENTDIF	*Centaurea diffusa*	diffuse knapweed	1
CENTJAC	*Centaurea jacea*	brown knapweed	1
CENTMAC	*Centaurea macrocephala*	bighead knapweed	1
CENTNIG	*Centaurea nigra*	black knapweed	1
CENTNIG	*Centaurea nigrescens*	Tyrol knapweed	1
CENTSOL	*Centaurea solstitialis*	yellow star thistle	1
CENTSTO	*Centaurea stoebe*	spotted knapweed	1
CENTVIR	*Centaurea virgata*	squarrose knapweed	1
CHONJUN	*Chondrilla juncea*	rush skeletonweed	1
CIRSARV	*Cirsium arvense*	Canada thistle	2
CIRSPAL	*Cirsium palustre*	marsh thistle	1
CLEMTAN	*Clematis tangutica*	yellow clematis	2
CONVARV	*Convolvulus arvensis*	field bindweed	2
CRUPVUL	*Crupina vulgaris*	common crupina	1
CYNOOFF	*Cynoglossum officinale*	hound's tongue	2
CYPEESC	*Cyperus esculentus*	yellow nutsedge	1
ECHIVUL	*Echium vulgare*	viper's-bugloss; blueweed	2

Species	Latin Name	Common Name	Regulated
ELAEUMB	*Elaeagnus umbellata*	autumn olive	1
EUPHESU	*Euphorbia esula*	leafy spurge	2
FALLBOH	*Fallopia × bohemica*	hybrid Japanese knotweed	1
FALLJAP	*Fallopia japonica*	Japanese knotweed	1
FALLSAC	*Fallopia sachalinensis*	giant knotweed	1
GYPSPAN	*Gypsophila paniculata*	common baby's-breath	2
HALOGLO	*Halogeton glomeratus*	saltlover	1
HERAMAN	*Heracleum mantegazzianum*	giant hogweed	1
HESPMAT	*Hesperis matronalis*	dame's rocket	2
HIERAUR	*Hieracium aurantiacum*	orange hawkweed	1
HIERCAE	*Hieracium caespitosum*	meadow hawkweed	1
HIERPIL	*Hieracium pilosella*	mouse-ear hawkweed	1
HYOSNIG	*Hyoscyamus niger*	black henbane	2
HYPEPER	*Hypericum perforatum*	common St John's-wort	1
IMPAGLA	*Impatiens glandulifera*	Himalayan balsam	1
IRISPSE	*Iris pseudacorus*	pale yellow iris	1
ISATTIN	*Isatis tinctoria*	dyer's woad	1
JACOVUL	*Jacobaea vulgaris*	tansy ragwort	1
KNAUARV	*Knautia arvensis*	blue buttons, field scabious	2
LEPIAPP	*Lepidium appelianum*	hoary cress, globe-podded	2
LEPICHA	*Lepidium chalepense*	hoary cress, lens-podded	2
LEPIDRA	*Lepidium draba*	hoary cress, heart-podded	2
LEPILAT	*Lepidium latifolium*	pepper-grass, broad-leaved	2
LEUCVUL	*Leucanthemum vulgare*	oxeye daisy	2
LINADAL	*Linaria dalmatica*	Dalmatian toadflax	2
LINAVUL	*Linaria vulgaris*	yellow toadflax	2
LYTHSAL	*Lythrum salicaria*	purple loosestrife	1
MYRISPI	*Myriophyllum spicatum*	Eurasian water milfoil	1
ODONVER	*Odontites vernus*	red bartsia	1

Species	Latin Name	Common Name	Regulated
POTEREC	*Potentilla recta*	sulfur cinquefoil	1
RANUACR	*Ranunculus acris*	tall buttercup	2
RHAMCAT	*Rhamnus cathartica*	common buckthorn	1
RHAPREP	*Rhaponticum repens*	Russian knapweed	1
SILELAT	*Silene latifolia*	white cockle	2
SONCARV	*Sonchus arvensis*	perennial sow thistle	2
TAENCAP	*Taeniatherum caput-medusae*	medusahead	1
TAMACHI	*Tamarix chinensis*	Chinese tamarisk	1
TAMAPAR	*Tamarix parviflora*	smallflower tamarisk	1
TAMARAM	*Tamarix ramosissima*	saltcedar	1
TANAVUL	*Tanacetum vulgare*	common tansy	2
TRIBTER	*Tribulus terrestris*	puncturevine	1
TRIPINO	*Tripleurospermum inodorum*	scentless chamomile	2
VERBTHA	*Verbascum thapsus*	common mullein	2

Invasive Plants Form

Date	Observer
Activity #	Land Type

Comments

GPS Coordinates (NAD 83)	Lat.	Long.

LSD:	QS:	SEC:	TWP:	RGE:	M:

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Contacts For Further Information on Rangeland Health Assessment

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Range Resource Stewardship Program
Land Policy Branch
Alberta Environment and Parks
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Foothills-Montane Ecosystem
Range Resource Stewardship Program
Land Policy Branch
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Range Resource Stewardship Program
Land Policy Branch
Alberta Environment and Parks
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Edmonton
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Boreal Ecosystem
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Range Resource Stewardship Program
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Notes

Notes

Density Distribution

Class	Description of abundance in polygon	Distribution	Weeds Score	Regrowth Score
0	None		5	4
1	Rare		3	
2	A few sporadically occurring individual plants			
3	A single patch			
4	A single patch plus a few sporadically occurring plants		1	2
5	Several sporadically occurring plants			
6	A single patch plus several sporadically occurring plants			
7	A few patches			
8	A few patches plus several sporadically occurring plants		0	0
9	Several well spaced patches			
10	Continuous uniform occurrences of well spaced plants			
11	Continuous occurrence of plants with a few gaps in the distribution			
12	Continuous dense occurrence of plants			
13	Continuous occurrence of plants with a distinct linear edge in the polygon			

Percent Cover Examples