

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA: A TOOL FOR RANCHERS



2019 REPRINT

GRASSLANDS CONSERVATION COUNCIL OF BRITISH COLUMBIA



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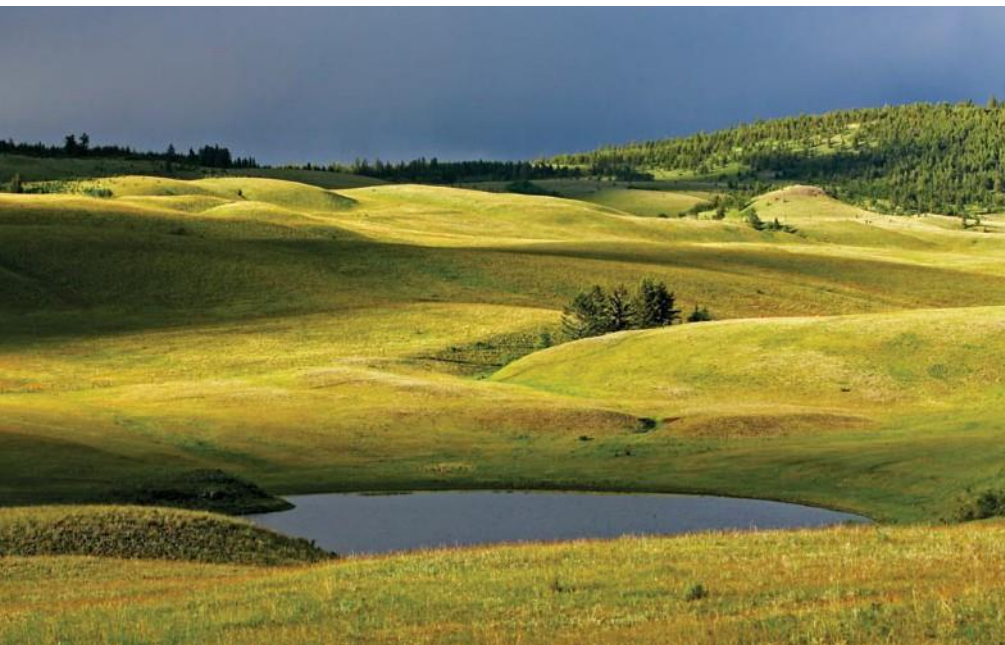


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FOREWORD

The Grasslands Monitoring Manual remains as relevant today as it was when first published in 2009. Since that time it has been used successfully by ranchers throughout BC's grassland regions, and serves as an education tool at Thompson Rivers University and elsewhere, and at workshops hosted by the Grasslands Conservation Council.

The manual continues to be a tool that enables ranchers and range managers to manage grasslands in a pro-active and adaptive manner. As in 2009, the purpose remains to help ranchers and tenure holders recognize and adopt the monitoring process set out in the manual as a useful mechanism for improving stewardship practices and outcomes, for promoting productivity, and for enhancing the viability of ranching businesses. The monitoring manual provides ranchers with information and practices that can enable them to have productive dialogue and decision making on an equal basis with government that improves outcomes for both the grasslands ecosystem and cattle.

Mark Hornell
Chair, Grasslands Conservation Council of British Columbia

PERSPECTIVE

As range specialist, Alf Bawtree (June 14 1930 - December 21 2018), once said: "Sound range management should be adapted to the site, meet specified management objectives, fall within bounds of practicality and management expertise, and be economically sound. Range management is rarely a simple matter of following a set plan for grazing the available forage. A good deal of science is involved, along with experience, flexibility, general knowledge and practical economics." (1979)

Monitoring provides the tool for a rancher to address the range condition of this valuable ecosystem and maintain a resource that is used by various interest groups and educational institutions as well as the rancher. It is of paramount importance that science be a key component to maintain good stewardship practices on this valuable resource. It is demanded by society today that we maintain 'healthy grasslands'

Agnes Jackson
Rancher, Napier Lake Rancher
Director, Grasslands Conservation Council of British Columbia

Monitoring is key to sustainable management of BC grasslands. The Ministry of Forests, Lands, Natural Resource Operations and Rural Development was a proud partner in the development of Grassland Monitoring Manual for British Columbia, and supports its use by ranchers to monitor the impacts of their grazing management decisions on these critical ecosystems.

Perry Grilz
Director, Range Branch
Ministry of Forests, Lands, Natural Resource Operations & Rural Development

INTRODUCTION

The Grasslands of British Columbia

Consider the grassland that you are managing—it is a rare landscape in British Columbia. Our grasslands, though small and scarce, are significant. They provide important forage for the ranching industry as well as habitat for a wide variety of plants and animals. More than 30% of BC's Species at Risk depend on grasslands for their survival.

Most of the province's grasslands are found in central and southern BC. They are usually the hottest and driest parts of main valleys and adjacent benches dissected by the Kootenay, Kettle, Okanagan, Similkameen, Thompson, Nicola, Chilcotin and Fraser Rivers. The remaining grassland area is found in the Georgia Basin and to the north of Prince George. These grasslands are not covered in this manual but will be added in a later version.

Grassland is land dominated by grasses. Tree cover is low or absent due to a combination of temperature, precipitation, and physical factors that create sites too dry for forests. But grasslands also include other grass-like plants, forbs (broad-leaved herbs), and shrubs. Across the province, grassland plant communities vary considerably depending on latitude, elevation, climate, and soils. These communities can change significantly from pasture to pasture, or even within a pasture, depending upon whether the site is a north-facing slope (wetter), a south-facing slope (drier), or flat. Such variability is challenging to ranchers.

Several different grassland communities exist across the province, and each community influences the way you manage. You can determine your grassland community by using the regional maps and descriptions found in Chapter 3 of this manual.

Grasslands occupy less than 1% of the province's total area, covering approximately 698,417 hectares. Central and southern BC contain 92% of BC's total grassland area, covering 645,068 hectares. The Georgia Basin north of Prince George represent 8% of BC's total grassland area, covering 53,349 hectares.



Big Sagebrush, Bluebunch Wheatgrass grasslands typically found at low elevations on drier sites. PHOTO BRIAN WIKEEM



High elevation Rough Fescue grasslands of the Nicola Basin near Quilchena. PHOTO BRIAN WIKEEM

Changes in Plant Communities from Lower to Upper Grasslands

Valley Bottom

LOWER GRASSLAND

<600 m

Dominant Grasses and Shrubs

- Big sagebrush
- Common rabbit brush
- Bluebunch wheatgrass

MIDDLE GRASSLAND

600 m to 900 m

Dominant Grasses and Shrubs

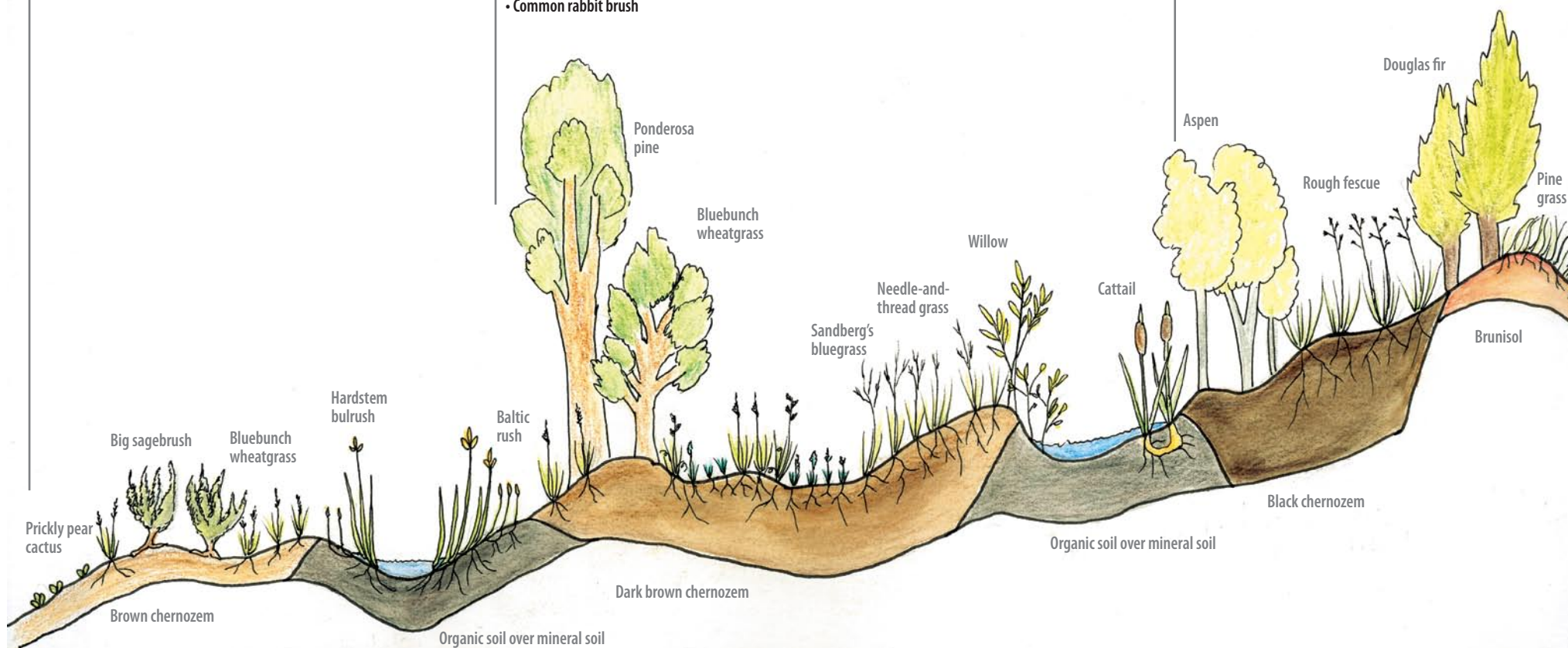
- Bluebunch wheatgrass
- Needle-and-thread grass
- Sandberg's bluegrass
- Willow
- Prickly rose
- Common rabbit brush

UPPER GRASSLAND

900 m to 1200 m

Dominant Grasses and Shrubs

- Rough fescue
- Silky lupine
- Arrowleaf balsam root
- Prickly rose
- Common rabbit brush



HOT/DRY

COOL/WET

Elevation gradients for Lower, Middle and Upper Grasslands are general guides only. There are regional and local variations due to climate, soils and other factors that may influence the type of grasslands you are managing. Field verification is very important.

Ecology of Grasslands

Grasslands are an important resource to the cattle industry. As you plan for and manage your grassland, you want to make the best use of the resource while maintaining the ecological integrity of your grassland. Grassland ecosystems encompass certain attributes and perform certain functions, including:

- productivity
- site stability
- water capture, storage, and release
- nutrient cycling
- species diversity

Maintaining these basic attributes and functions will ensure that the integrity of the ecosystem is maintained over time. The table below summarizes the importance of these attributes and functions.

Attributes and Functions of Healthy Grasslands

Productivity	<ul style="list-style-type: none">• Grasslands efficiently use solar energy to convert carbon dioxide into above-ground biomass and store carbon in the soil through root growth.• Grasslands provide forage for livestock and wildlife, including micro-organisms, insects, and small and large mammals.• Grasslands support stable, long-term plant communities and biomass production.
Site Stability	<ul style="list-style-type: none">• Grasslands lower the chance of soil erosion. Their layers of litter and living plants protect soils that have taken centuries to develop.• Greater site stability ensures greater availability of nutrients for plant growth.
Water Capture, Storage and Release	<ul style="list-style-type: none">• Grasslands soils, which are adequately covered with living plants and litter, absorb precipitation.• Water is stored in the soil and is slowly released from the site.• Greater percolation of water into the soil and less runoff means:<ul style="list-style-type: none">– more moisture available for plant growth and other organisms,– reduced evaporation losses from the soil surface, and– greater environmental stability during drought.
Nutrient Cycling	<ul style="list-style-type: none">• Nutrients are released and incorporated into grassland soils when grass leaves, stems, and roots die and decompose.• Grazing animals recycle nutrients by eating and digesting forages that return to the soil as manure.• Healthy grasslands promote sustainable levels of soil nutrients that optimize plant growth.
Species Diversity	<ul style="list-style-type: none">• Grasslands support and maintain a wide diversity of grasses, forbs, mosses, lichens, and shrubs.• Structure and composition of plant communities provide cover and food for large and small mammals, birds, reptiles and amphibians, and insects.



Grassland Status, Assessment and Monitoring

In this manual, grassland status is used to describe the ecological condition of your grassland at a particular point in time. Status is based on a visual estimate of five key indicators, each of which describes a specific attribute or function.

- 1 Plant Community Composition
- 2 Plant Community Structure
- 3 Nutrient and Hydrological Cycling (litter and biological crusts)
- 4 Site Stability (existing or potential erosion)
- 5 Invasive Plants

The information collected from these indicators is used to evaluate the site's overall condition. By answering questions based on these indicators, you are assessing the status of your grassland. When you collect this information over a period of years, you are then monitoring your grassland. Grassland monitoring allows you to detect changes in status over time.

Both assessment and monitoring are fundamental for making informed management decisions, and help determine if your management programs are achieving their goals.

Why Use This Manual as a Monitoring Tool?

Maintaining healthy, reliable grass from year to year while dealing with fluctuating climatic changes and shifting operational needs can be challenging. Whether on crown or private lands, monitoring is a useful way to measure change on your grassland. As a monitoring

Grassland landscapes are a mosaic of open grasslands with associated riparian areas, aspen stands, conifer patches, wetlands and rock outcrops. The diversity and richness of grasslands throughout the province provide a wide range of ecological values and functions. PHOTO RAY COUPE

The manual is a monitoring tool that will assist you to collect and record information from one assessment period to another. It encourages you to complete assessments by collecting field data and using photography to effectively monitor changes in your grassland over time.

PHOTO BRUNO DELESALLE



tool, this manual helps you detect any problems that may occur. Addressing these problems at an early stage helps you manage your grasslands with due diligence and assists you in maintaining healthy, productive grasslands.

This manual provides a strong systematic approach for recording what is happening on your grassland—both the changes you currently see on the land base, and the changes you might expect based on your management practices.

A healthy, productive grassland will yield better returns to your operation.

Due diligence is an important concept in grassland management. When you are diligent, you are managing responsibly and sustainably. This monitoring tool provides a framework for due diligence. Consistent monitoring, recording, and reporting are important components in managing your grassland resource and enable you to anticipate and address problems that may arise.

2. HOW TO USE THIS MANUAL

2 How to
Use This Manual



PHOTO BRUNO DELESALLE

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HOW TO USE THIS MANUAL

Grassland Assessment Procedure

Only the basics of grassland ecology are needed to use the procedures in this manual. Originally developed with the help of ranchers, this manual is a practical tool for assessing grassland status and monitoring trends over time.

This manual is designed to be practical and easy to use. During the initial visual assessment of your site, five questions will be answered and three photos taken. The site is then revisited periodically over the years in order to monitor trends.

The overview presented in this section discusses the following questions:

- What type of grassland do I have?
- What is Reference Condition?
- How is grassland status assessed?
- What are grassland indicators?
- What is a threshold?
- When should I monitor?
- How long does it take?
- How do I select a monitoring site?
- What equipment do I need?

Later in the manual, Chapter 5 will detail a step-by-step procedure on how to complete your assessment once you have identified your grassland community and selected a monitoring site.

What type of grassland do I have?

Chapter 3 will help you determine your grassland community. There you will find regional maps and brief descriptions of the major grassland communities found across the Central and Southern Interior of British Columbia. From the maps, you will be able to identify the grassland communities most applicable to your ranching operation.

Once you have determined your grassland community, Chapters 4 through 7 will take you through the procedure to assess the status of your grasslands.

Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.

What is Reference Condition?

Reference Condition, essential to the assessment of grassland status, is the condition of a grassland when little or no disturbance has occurred. It reflects the influence of climate, soils, and topography on a combination of grassland indicators (see “What are Grassland Indicators?” on page 10). As you assess your grassland, you will be comparing your site to the Reference Condition.

For each region, Reference Condition descriptions were developed by collecting information from a number of exclosures, lightly grazed sites, and minimally disturbed sites that shared similar site potential. The Reference Condition approximates the state of your grassland plant community had it not been grazed or disturbed. By comparing the Reference Condition to the actual condition of your grassland, you will be able to score and assess the status of your site. The plant community will be rated as:

- Reference Condition (not altered)
- Slightly Altered
- Moderately Altered
- Greatly Altered

How is grassland status assessed?

Grassland status is the state of your grassland at a particular point in time. It is measured relative to the Reference Condition by visually estimating and scoring the five key indicators discussed next. The present condition of each indicator is measured, and the information collected from all indicators provides an overall assessment of the site's status.

These same indicators can be used to assess a trend in grassland status change, provided that repeated observations are taken on the same site at the same time of the year, using the same procedures. Interpreting grassland status and trend is based on the collective assessment and score of all indicators combined.

Changes in the indicators over time may suggest a trend, either for a specific indicator, such as plant community composition, or as a total ecosystem score based on all indicators.

The most important indicator of change is a decline in cover of the dominant bunchgrasses and an associated increase in the cover of small grasses, forbs, and sometimes shrubs. Low-growing bunchgrasses and forbs, such as Sandberg's bluegrass and pussytoes, are often more abundant as disturbance increases.

Reference Condition is the combination of biological and physical factors used as the “reference” for comparison with a grassland community. The Reference Condition does not represent a single site, but is based on observations from numerous sites to capture the range of variability within a native grassland community.

Trends in Grassland Status



PHOTOS BRIAN WIKEEM

TREND

What are grassland indicators?

Grassland status is measured by visually estimating and scoring five key indicators, each of which describes a specific ecological attribute or function. Assess the status of your grassland by answering the following five questions based on the indicators:

1 Plant Community Composition

What is the cover of bunchgrasses?

2 Plant Community Structure

Do you have the expected plant layers?

3 Nutrient and Hydrological Cycling

How much litter and/or biological crust do you have on site?

4 Site Stability

Is there existing or potential erosion on site?

5 Invasive Plants

Are invasive plants a problem on this site?

The questions will assist you in visually estimating and scoring each indicator. Although each indicator individually provides important information, it is their cumulative score that will determine the status of your grassland. You need to interpret this information relative to your management objectives and your current management practices on site.

1. Plant Community Composition:

What is the cover of bunchgrasses?

Plant species composition affects both the structure and productivity of grasslands, and is one of the most important indicators of grassland status. Large bunchgrasses are the principal species dominating sites in Reference Condition on all grasslands in southern BC, and they account for more than 60% of the ground cover and 80% of the forage produced.

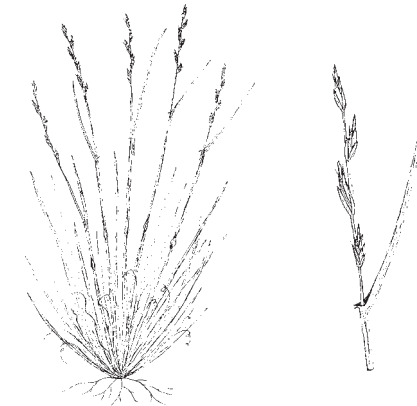
Plant composition responds to significant disturbances such as continuous heavy grazing, frequent fire, prolonged periods of drought, above-normal precipitation, invasion by non-native species, or excessive recreational use. These changes are most predictable for plant species grazed by cattle. The large, perennial species most palatable to cattle, such as bluebunch wheatgrass, often decline with continuous heavy grazing.

Tuning your Eye —
The monitoring tool
will assist you to “tune
your eye” to identify key
grassland indicators and
thus will help you collect
reliable and consistent
grassland information
which is essential for
any range management
program.

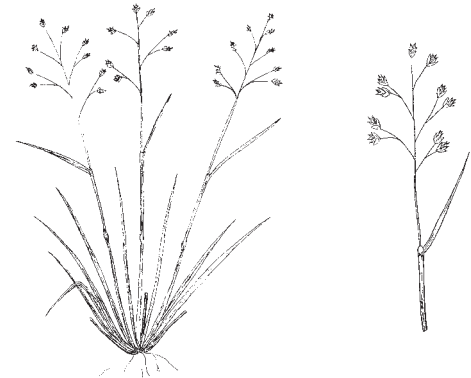
Key Bunchgrasses Found in BC's Grasslands



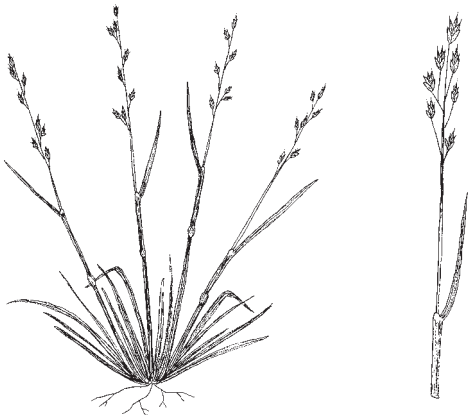
Bluebunch Wheatgrass



Rough Fescue



Idaho Fescue



The Upper Grasslands of the Cariboo are dominated by short-awned porcupine grass and spreading needlegrass. PHOTOS BRIAN WIKEEM

The cover of smaller, less palatable species (such as pussytoes, yarrow, Sandberg's bluegrass, junegrass, and needle-and-thread grass) often increases when environmental conditions become more favourable. Non-native species, such as common dandelion, diffuse and spotted knapweed, Dalmatian toadflax, and sulphur cinquefoil, can invade heavily disturbed sites where native plant species have been eliminated or their cover reduced.

Grasslands in all stages of successional development have value for some organisms. However on many sites, range management aims

to maintain or promote communities similar to or slightly altered from the Reference Condition. Reference Condition sites generally show the highest potential productivity and usually provide the most consistent source of nutritional forage for livestock. They are more stable in terms of plant communities, soils, litter, and water cycling than significantly altered sites. Reference Condition sites are also prime wildlife habitat for grassland animals, and have abundant litter that protects the soil against erosion, retains soil moisture, and promotes nutrient cycling.

Successional Development of Grasslands

Bare Soil and Rocks

- No organic matter
- Active erosion

Greatly Altered

- Few or no bunchgrasses
- Little or no litter
- Invasive plants abundant
- Shallow roots
- Structure greatly altered (see Structure, page 14)

Moderately to Slightly Altered

- Increased abundance of bunchgrasses
- Increasing litter and organic matter
- Stable soil
- Deeper roots
- Increasing structure

Reference Condition

- Bunchgrass cover greater than 50%
- All structural layers present
- Abundant litter and organic matter
- Deep, well established rooting system
- Stable soil
- Biological crusts well established



2. Plant Community Structure

Do you have the expected plant layers?

The structure of your plant community is another vegetation feature that indicates grassland status. Vegetation structure is described by categorizing plants into layers based on height.

Most grasslands in BC have four or five plant layers:

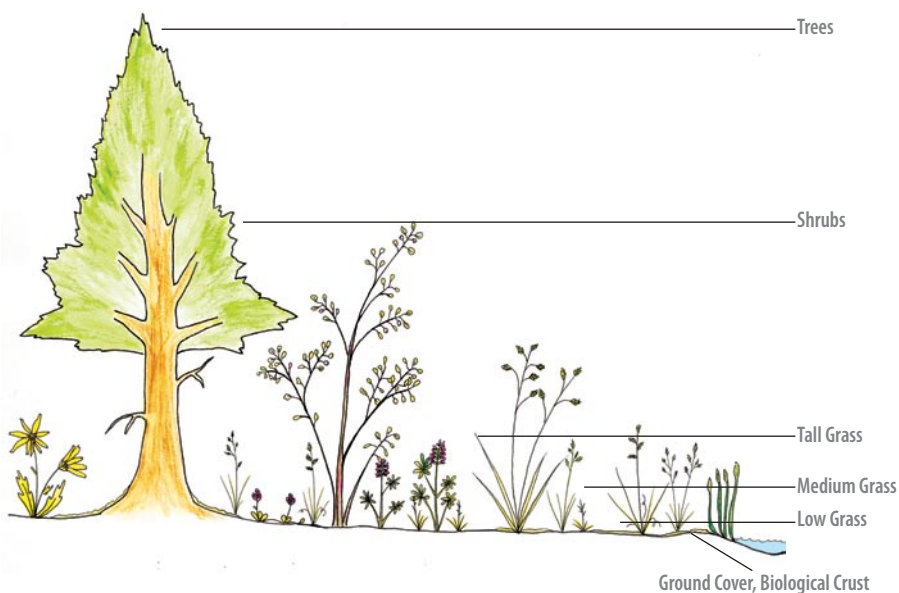
- 1 Shrubs
- 2 Tall Grasses and Forbs
- 3 Medium Grasses and Forbs
- 4 Low Grasses and Forbs (including sedges and rushes)
- 5 Biological Crusts (mosses, lichens, and algae)

Although all these layers may be present in grasslands, their relative cover can vary considerably from one grassland community to another. For example in the Southern Interior, big sagebrush is a common shrub in Lower Grasslands but is generally absent in the Upper Grasslands. The shrub layer of the Upper Grasslands is usually sparse and may contain prickly rose and common rabbit-brush.

Like plant community composition, community structure is easily modified by disturbance. Changes in community structure affect the distribution of light, water, and nutrients available to plants. In turn, these changes affect the potential of the grassland community to support wildlife and livestock. Disturbance also increases the

Trees are considered to be a sixth layer as long as they cover less than 10% of the grassland canopy. Above 10%, a site is considered to be an open forest.

Plant Structural Layers



potential for wind and water erosion. Across the landscape, a diversity of habitats with different structures provides the greatest variety of opportunities for both plants and animals.

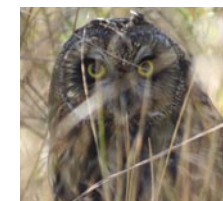
3. Nutrient and Hydrologic Cycles

How much litter and/or biological crust do you have on site?

Litter is the key indicator for nutrient cycling and hydrological function. Both the cover and distribution of living and dead plant material promote nutrient cycling and moisture retention in grasslands.

As litter decomposes on the soil surface, it contributes organic matter and mineral nutrients to the soil. Heavy snowfalls, rain, and trampling by animals press standing dead plant material against the soil surface, which promotes decay. Decaying litter releases nutrients for plant growth and provides habitat and food for decomposers.

In addition, by insulating the soil surface from the heat of the sun, litter reduces evaporation and retains scarce soil moisture. Litter also slows water movement over the soil surface, and allows the water to infiltrate and penetrate deep into the soil profile. Studies have demonstrated that litter removal can reduce forage yields by about 50% on bluebunch wheatgrass and rough fescue dominated grasslands.



Litter provides habitat for numerous insects, small mammals and birds. PHOTO BRIAN WIKKEEM

Similar to litter, biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and ensuring soil stability.



The cover and distribution of litter stabilizes the soil by intercepting rainfall and reducing raindrop splash on the soil surface. A dense mat of litter slows runoff and reduces movement of soil particles by water. Litter also acts as a physical barrier between the soil surface and the air above the plant canopy, which reduces soil erosion from wind.

4. Site Stability

Is there existing or potential erosion on site?

Some level of erosion naturally occurs in all plant communities. The natural rate of erosion that is expected in plant communities protected by live plants and litter is called geological erosion. When the rate of soil loss exceeds the geological rate, sites become unstable; this process is called accelerated erosion.

Soil losses resulting from wind and water erosion usually remove the finer particles on the soil surface such as clays, silts, and organic matter. These particles are important in maintaining soil fertility and moisture holding capacity. In addition, high levels of fine particles can negatively affect water quality when they enter the fish-spawning habitats of adjoining streams and rivers. Poor management of upland grassland environments can accelerate erosion and thus impact site stability and water quality. Good management strives to prevent this situation.

Grasslands in Reference Condition have stable soils and adequate vegetative cover to prevent soil erosion. Disturbed sites with reduced vegetative cover and increased areas of bare soil are susceptible to erosion.

5. Invasive Plants

Are invasive plants present on this site?

Most invasive plants on grasslands are introduced, non-native species. These species are usually most prevalent in early succession communities, but can establish on locally disturbed sites in all grasslands. Any disturbance can create conditions suitable for their establishment. Invasive plants impact grasslands by:

- limiting soil moisture and nutrients for native plant species, reducing their ability to recover, re-establish, or attain Reference Condition
- resulting in a decline in forage production for livestock and wildlife
- reducing biological diversity
- impairing the aesthetic value and recreational opportunities

Grassland management aims to maintain native plant vigour and cover of both living vegetation and litter to minimize establishment of invasive plants.

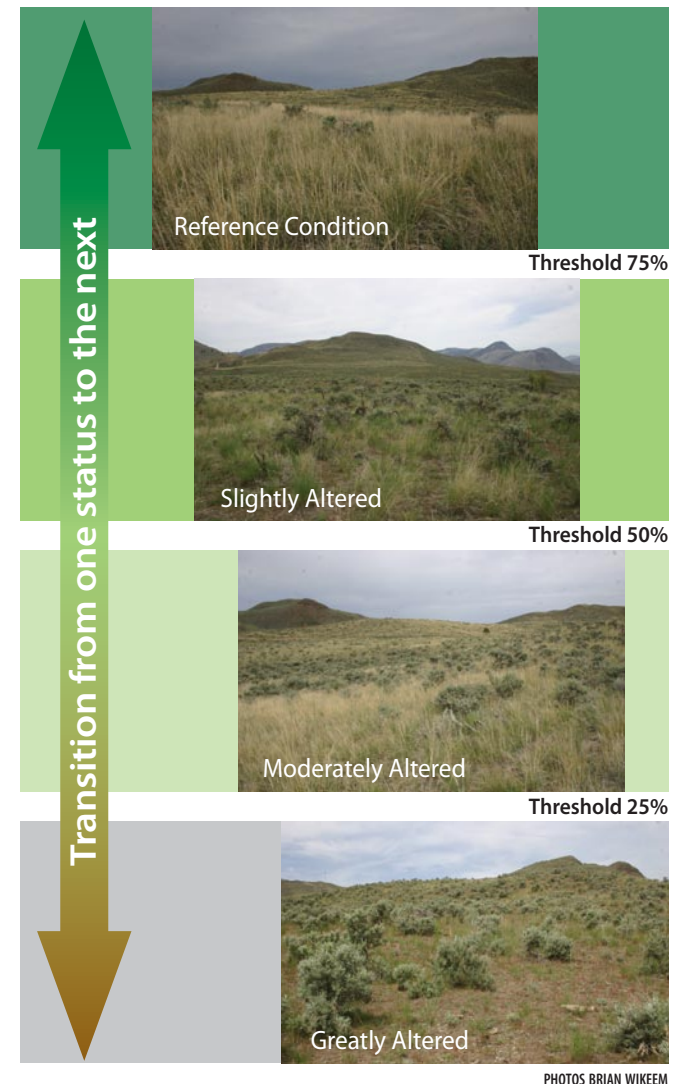
What is a threshold?

A threshold is the transition point between one status and another (as listed under "What is Reference Condition?" on page 8). A change in status is usually directly related to disturbance or a significant weather event, such as drought, or it may be related to recovery

after a weather event or disturbance. The transition from one status to another can be seen by changes in such indicators as: plant community composition and structure, litter, and site stability.

Often, the shifting of a plant community from one status to another is reversible, however, the site and the degree of disturbance will impact the ability of a grassland to recover. In some cases, reversing a shift in the plant community or status can take a significant length of time. In extreme cases, a grassland may require 20 to 50 years of rest or careful management to fully recover to Reference Condition.

Threshold and Transition from One Status to the Next



Yellow toadflax (*Linaria vulgaris*) PHOTO BRIAN WIKEEM

Assessing Grassland Status

The status of your grassland at a particular time relative to the Reference Condition is determined by a visual estimate attained by scoring the five indicators outlined on page 10.

Reference Condition



Slightly Altered



Moderately Altered



Greatly Altered



PHOTOS BRIAN WIKEEM

Reference Condition: Status Value 76–100%

The site surveyed is essentially the same as the Reference Condition.

The composition of the plant community, community structure, soil integrity, nutrient cycling, and hydrological process are effectively stable. Productivity will be relatively stable compared to other altered conditions. Susceptibility to weed invasion is low.

Slightly Altered: Status Value 51–75%

At least two of the five indicators evaluated have been rated below the Reference Condition.

Changes in plant community composition, plant community structure, and litter weight are the most likely reasons for the difference between the present site and the Reference Condition. Total production and site stability, as well as susceptibility to weed invasion, are likely similar to the Reference Condition.

Moderately Altered: Status Value 26–50%

At least three of the five indicators evaluated have been rated below Reference Condition.

Most likely, the cover of the dominant bunchgrasses is much lower than the Reference Condition, and at least two structural layers have been altered. In addition, litter weight and distribution are probably insufficient to adequately protect the soil surface. Bare soil may be increasing, and soil erosion is more likely than in the Reference Condition. These sites are generally more susceptible to weed invasion. Productivity can vary depending upon species composition and annual weather patterns.

Greatly Altered: Status Value 0–25%

At least four of the five indicators evaluated have been rated below the Reference Condition.

Species composition and plant community structure are significantly altered. If the dominant bunchgrasses remain, they contribute very little to ground cover and provide little forage for livestock and wildlife. Generally, the dominant species have been eliminated and replaced by low-growing, shallow-rooted, unpalatable native species; or by invasive plants of low forage value. Deep-rooted shrubs may have been established in dense, persistent stands. Litter weight and distribution are usually insufficient to protect the soil against wind and water erosion, and evaporation losses are high. Active erosion is often evident. These sites are susceptible to weed invasion, and invasive plants may be the dominant species on some sites. Productivity is usually lower than the Reference Condition and, throughout the years, can be highly variable depending on species composition and annual weather patterns.

When should I monitor?

Grassland assessments and photo-point monitoring should be done when plants are most easily identified and before grazing begins on the site. In the Southern Interior, grassland plants flower between mid-May and early August. Low-elevation grasslands generally begin flowering earlier, and high-elevation sites flower later. Wetter or drier years often extend or shorten the flowering period in all grasslands, and sudden hot, dry spells can end the growing period quickly.

Repeated grassland assessments and photo-point monitoring over several years should be conducted at similar times during the growing season and under similar grazing conditions.

Suitable Monitoring Season

Grassland Type	Monitoring Season
LOWER GRASSLANDS Big Sagebrush, Bluebunch Wheatgrass Antelope-brush, Bluebunch Wheatgrass	May
MIDDLE GRASSLANDS Bluebunch Wheatgrass	mid-May to mid-June
UPPER GRASSLANDS Rough Fescue (Thompson, Okanagan, Kootenay) Porcupine Grass, Bluebunch Wheatgrass and Spreading Needlegrass (Cariboo) Rough Fescue, Antelope-brush	June

How long does monitoring take?

Once you have some experience with the procedures, a grassland status assessment can generally be completed in 15 to 20 minutes. However, while you are learning, anticipate spending at least an hour in the field. You will quickly build experience and confidence in using this monitoring tool.

The procedure of taking three photos of your monitoring site is called photo-point monitoring and is an important part of the assessment process (see Chapter 6). It will add an additional 10 to 15 minutes to your time in the field. Photos are highly recommended and should be taken every time you complete an assessment. As you build experience and establish clear photo-points, taking your photos will become quick and easy.

How do I select a monitoring site?

Selecting a site for grassland assessment and photo-point monitoring is an important step. Chapter 4 will take you through the process. Because the selection of your monitoring sites will depend on your objective(s), you must first consider the purpose of your monitoring.

What equipment do I need?

Checklist

- ☐ Identify clear management plan and monitoring objectives
- ☐ Identify grassland community(s) to monitor
- ☐ Select time frame for monitoring
- ☐ Select potential sites for monitoring on your map—you may not be able to select site until out on site
- ☐ Gather equipment, manual, and score sheets

Ziplock bags are handy for storing litter samples. Prepare litter bags ahead of time for easy reference in the field.

Suggested Equipment for the Field

Equipment for Assessment	Set-up	Re-visit
Grassland Monitoring booklet from this manual	•	•
Grassland Assessment Score Sheets	•	•
Maps of the area	•	
Pencils and eraser	•	•
Ziplock bags for litter	•	•
Compass	•	
Global Positioning System (GPS) if possible	•	•
1/4 m ² frame (50x50 cm) for litter collection	•	•
Large plastic or paper bags to store litter samples	•	•
30 m transect tape measure	•	•
Rebar pins, 34" long and 3/8" diameter to permanently mark transect	•	
Small sledge hammer	•	
Carpenter's tape 8 or 10 meters long or range pole (stadia rod)	•	•
Equipment for Photo-point Monitoring		
Photo ID Card and Photo Information Sheets	•	•
Camera with a zoom or 50 mm lens (film or digital)	•	•
Carpenter's tape measure, 8 or 10 meters long	•	•
Rebar pins, 34" long and 3/8" diameter	•	•
Small sledge hammer	•	
Global Positioning System (GPS) if available	•	•

Using a combination of grassland assessment and photo-point monitoring will give you a better idea of the state of your grassland under current management practices. When used over a few years, these procedures will yield important trend information. Total time required to monitor a site will be about 30 minutes with experience.

3. IDENTIFYING YOUR GRASSLAND COMMUNITY



PHOTO MIKE DUFFY

IDENTIFYING YOUR GRASSLAND COMMUNITY

Before going into the field to start your assessment, you need to identify the grassland plant community you are managing. The site's dominant species will dictate how you assess your grassland and will affect the interpretation of your results.

Each grassland community is described in a separate booklet accompanied by details describing how they are to be assessed and scored. Identifying your grassland community is a three step process:

Step1 Select your region on the BC map

- See the map on page 25, Grassland Regions of Southern British Columbia
- Five regions are discussed in this manual:
 - 1 Thompson–Nicola Region
 - 2 Okanagan–Similkameen Region
 - 3 Boundary Region
 - 4 East Kootenay Region
 - 5 Cariboo–Chilcotin Region

The Peace River and northern grasslands are not included in this version of the manual.

Step 2 Identify your grassland community(s)

Select the fold-out map of your region that shows grassland community delineations. Here you will be able to identify the grassland communities relevant to your operation. In most cases, you will not have more than two grassland communities.

A total of seven grassland communities are identified:

- Big Sagebrush, Bluebunch Wheatgrass Grasslands (Lower Grassland)
- Antelope-brush, Bluebunch Wheatgrass Grasslands (Lower Grassland)
- Bluebunch Wheatgrass Grasslands (Middle Grassland)
- Rough Fescue Grasslands (Upper Grassland)
- Rough Fescue, Antelope-brush Grasslands (Upper Grassland)
- Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass Grasslands (Upper Grassland)

Step 3 Choose the monitoring booklet(s) that correspond to the grassland community(s) identified on your map

Each grassland community is colour-coded. Turn to the correspondingly coloured booklet in Chapter 5 of the manual. The booklet will take you through a step-by-step process for completing your assessment. There are five booklets:

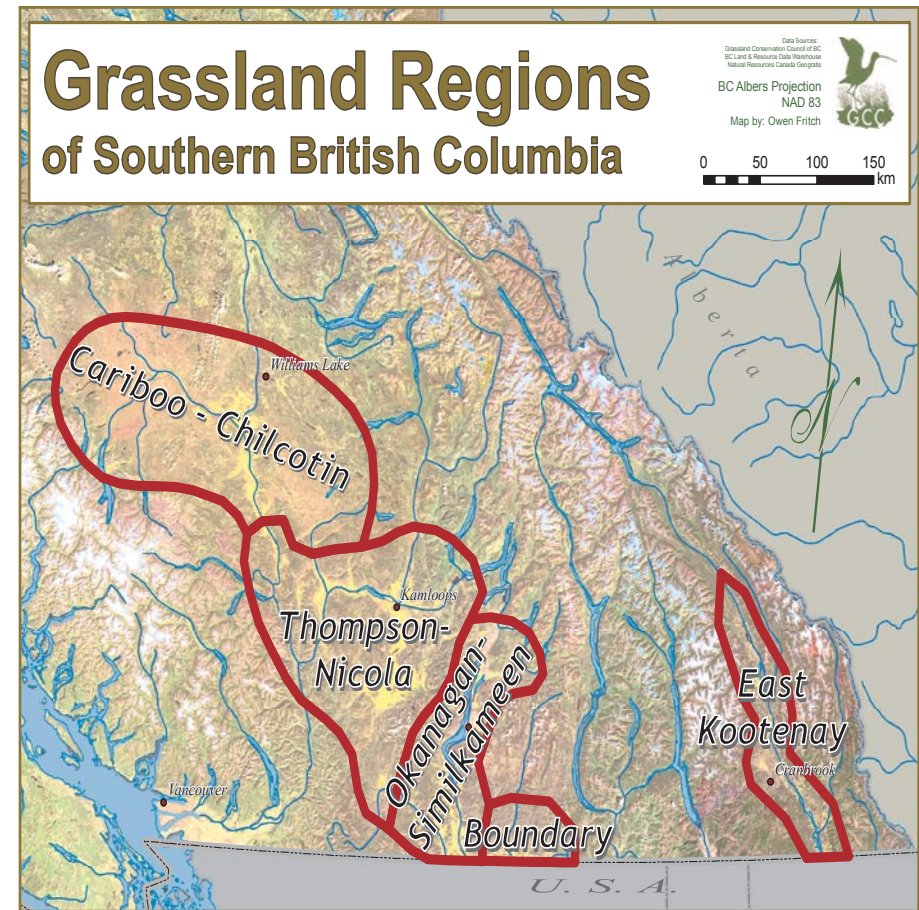
-  1) Big Sagebrush, Bluebunch Wheatgrass Grasslands and Antelope-Brush, Bluebunch Wheatgrass Grasslands
-  2) Bluebunch Wheatgrass Grasslands
-  3) Rough Fescue Grasslands
-  4) Rough Fescue, Antelope-Brush Grasslands
-  5) Porcupinegrass, Bluebunch Wheatgrass Grasslands and Spreading Needlegrass Grasslands

Ensure you have identified and field-checked your grassland community carefully, as the maps in this manual are a general guide and may not distinguish variations in plant communities based on topography and climate. In other words, ensure you are scoring the right plant community!

The number of sites you assess depends on the number of pastures and plant communities you want to assess. If you want to assess one large pasture that contains two community types, you will need to complete two different assessments, one for each community.

Grassland Regions of Southern British Columbia

Select the map of your region from the following fold-out maps.



Thompson–Nicola Region Map	pages 27-28
Okanagan–Similkameen Region Map	29-30
Boundary Region Map	31-32
East Kootenay Region Map	33-34
Cariboo–Chilcotin Region Map	35-36

Grassland Communities by Region

<i>Region</i>	<i>Lower Grassland</i>	<i>Middle Grassland</i>	<i>Upper Grassland</i>
Thompson–Nicola	Big Sagebrush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands
Okanagan–Similkameen	Big Sagebrush, Bluebunch Wheatgrass Grasslands OR Antelope-brush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands
Boundary		Bluebunch Wheatgrass Grasslands (limited)	Rough Fescue Grasslands
East Kootenay		Bluebunch Wheatgrass Grasslands (limited – not mapped)	Rough Fescue Grasslands OR Rough Fescue, Antelope-brush Grasslands
Cariboo–Chilcotin	Big Sagebrush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Porcupinegrass, Bluebunch Wheatgrass Grasslands AND Spreading Needlegrass Grasslands

Regional Map

THOMPSON-NICOLA REGION

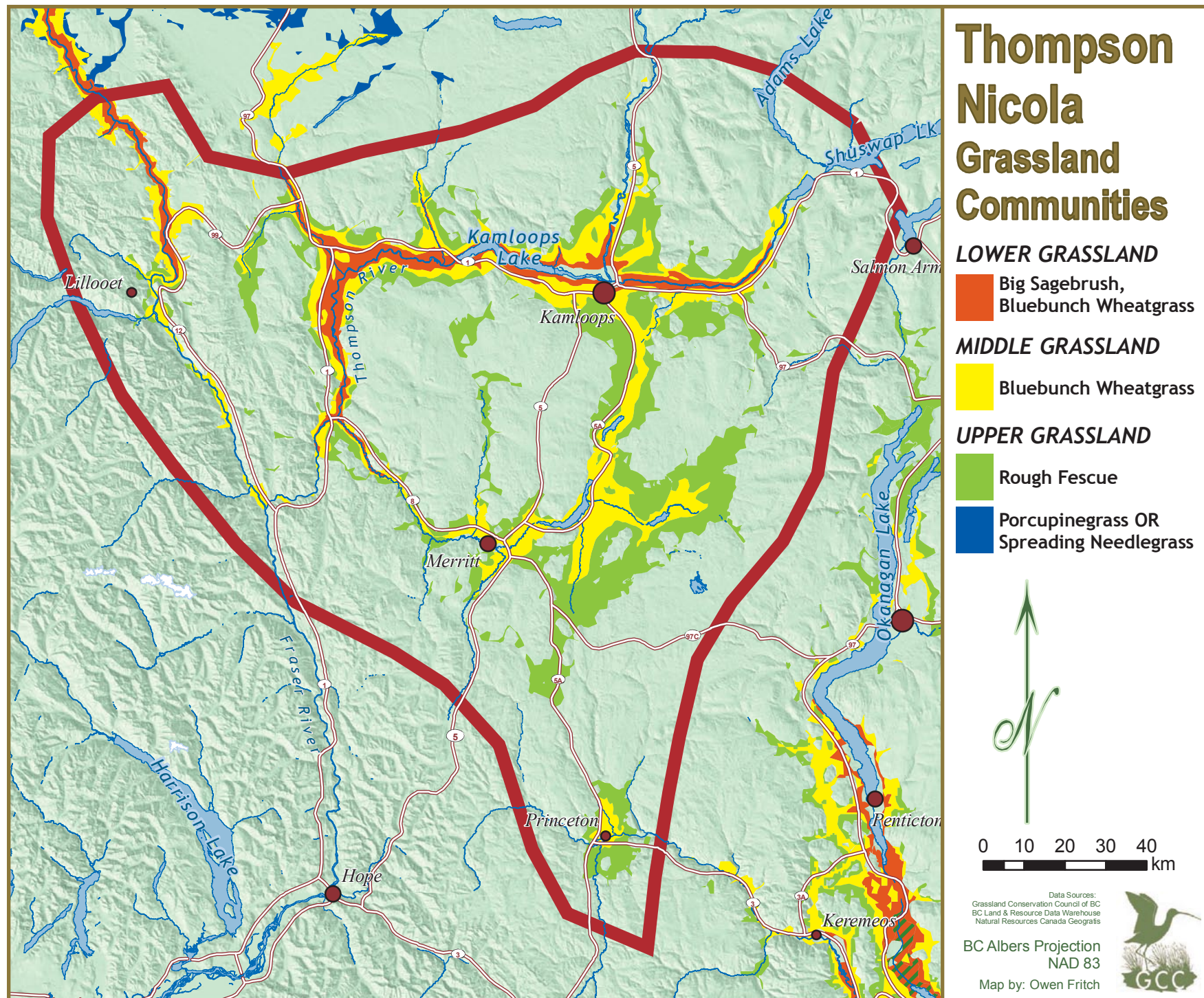
Identify your grassland community or communities (you may have more than one). Turn to the corresponding booklet. Each grassland community is colour-coded. The booklet will take you through a step-by-step process for completing your assessment.

Region	Lower Grassland	Middle Grassland	Upper Grassland
Thompson–Nicola	Big Sagebrush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands



Prickly Pear Cactus
PHOTO Bruce Gordon

THOMPSON-NICOLA



Regional Map

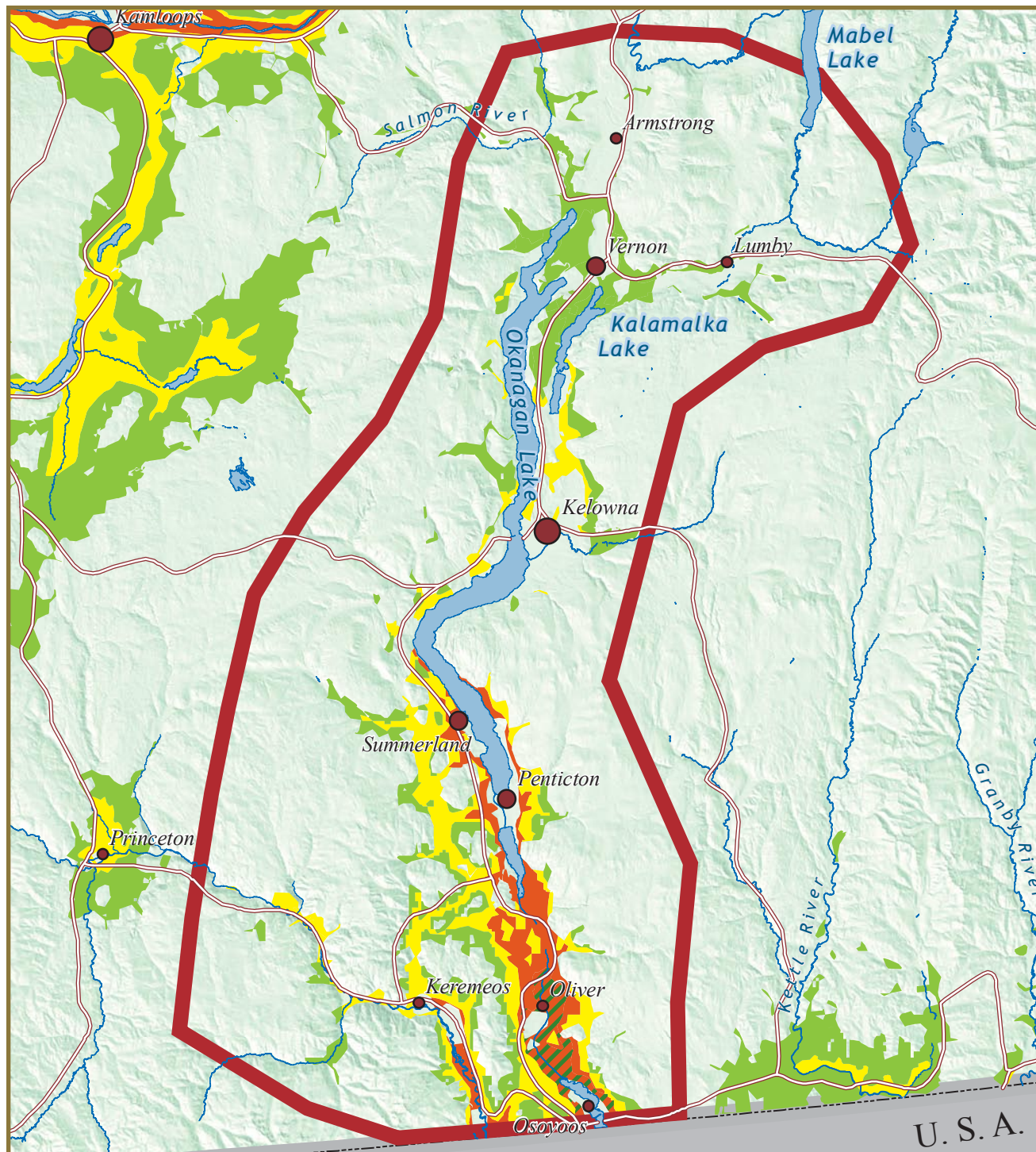
OKANAGAN-SIMILKAMEEN REGION

Identify your grassland community or communities (you may have more than one). Turn to the corresponding booklet. Each grassland community is colour-coded. The booklet will take you through a step-by-step process for completing your assessment.

Region	Lower Grassland	Middle Grassland	Upper Grassland
Okanagan–Similkameen	Big Sagebrush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands
	OR		
	Antelope-Brush, Bluebunch Wheatgrass Grasslands		



Mule Deer
PHOTO Peter Sulzle



Okanagan Similkameen Grassland Communities

LOWER GRASSLAND

 Big Sagebrush,
Bluebunch Wheatgrass

 Antelope-Brush,
Bluebunch Wheatgrass

MIDDLE GRASSLAND

 Bluebunch Wheatgrass

UPPER GRASSLAND

 Rough Fescue



0 10 20 30 40
km

Data Sources:
Grassland Conservation Council of BC
BC Land & Resource Data Warehouse
Natural Resources Canada Geogratis

BC Albers Projection
NAD 83

Map by: Owen Fritch



Regional Map

BOUNDARY REGION

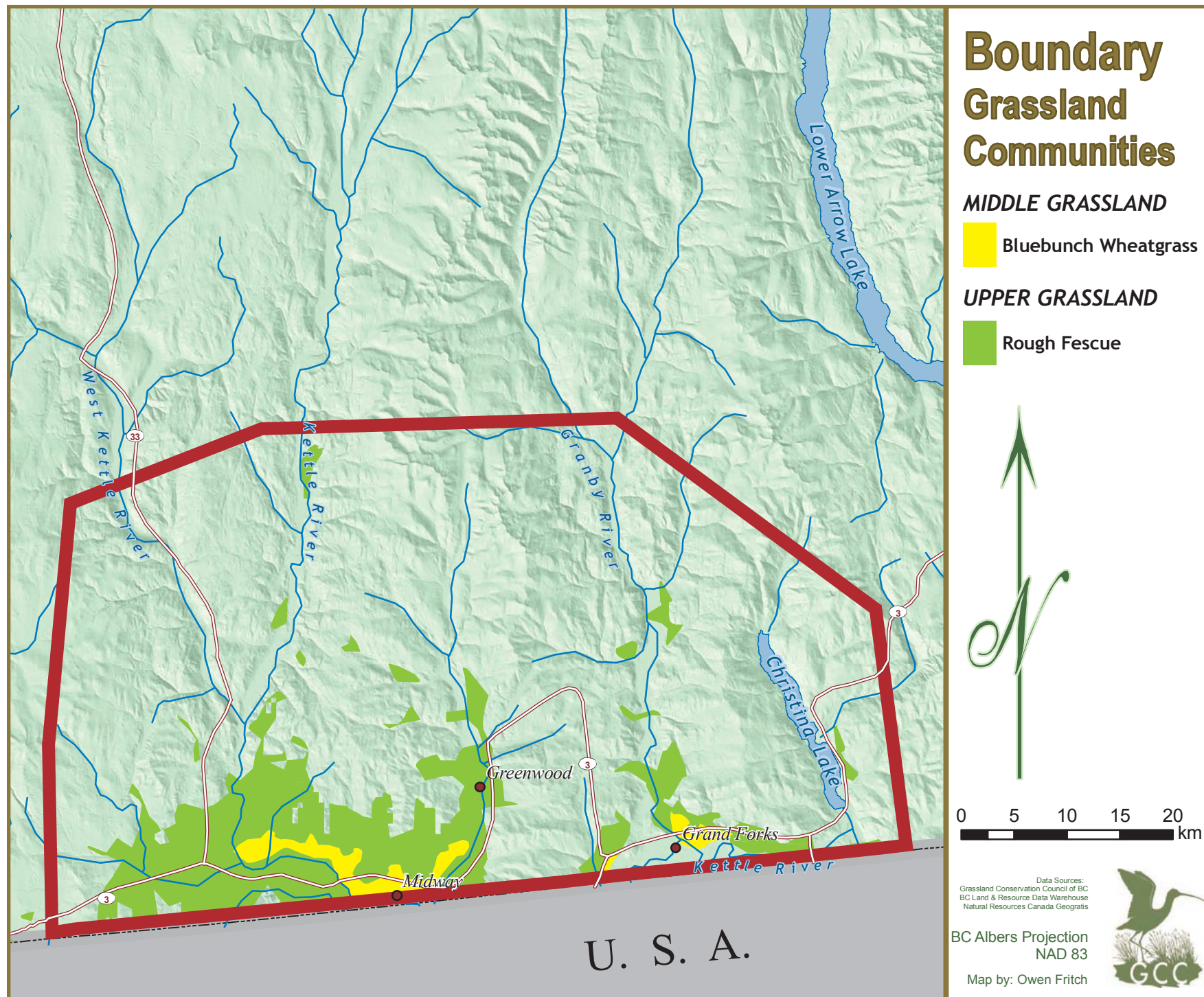
Identify your grassland community or communities (you may have more than one). Turn to the corresponding booklet. Each grassland community is colour-coded. The booklet will take you through a step-by-step process for completing your assessment.

Region	Lower Grassland	Middle Grassland	Upper Grassland
Boundary		Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands



Balsam Root
PHOTO Richard Doucette

BOUNDARY REGION



Regional Map

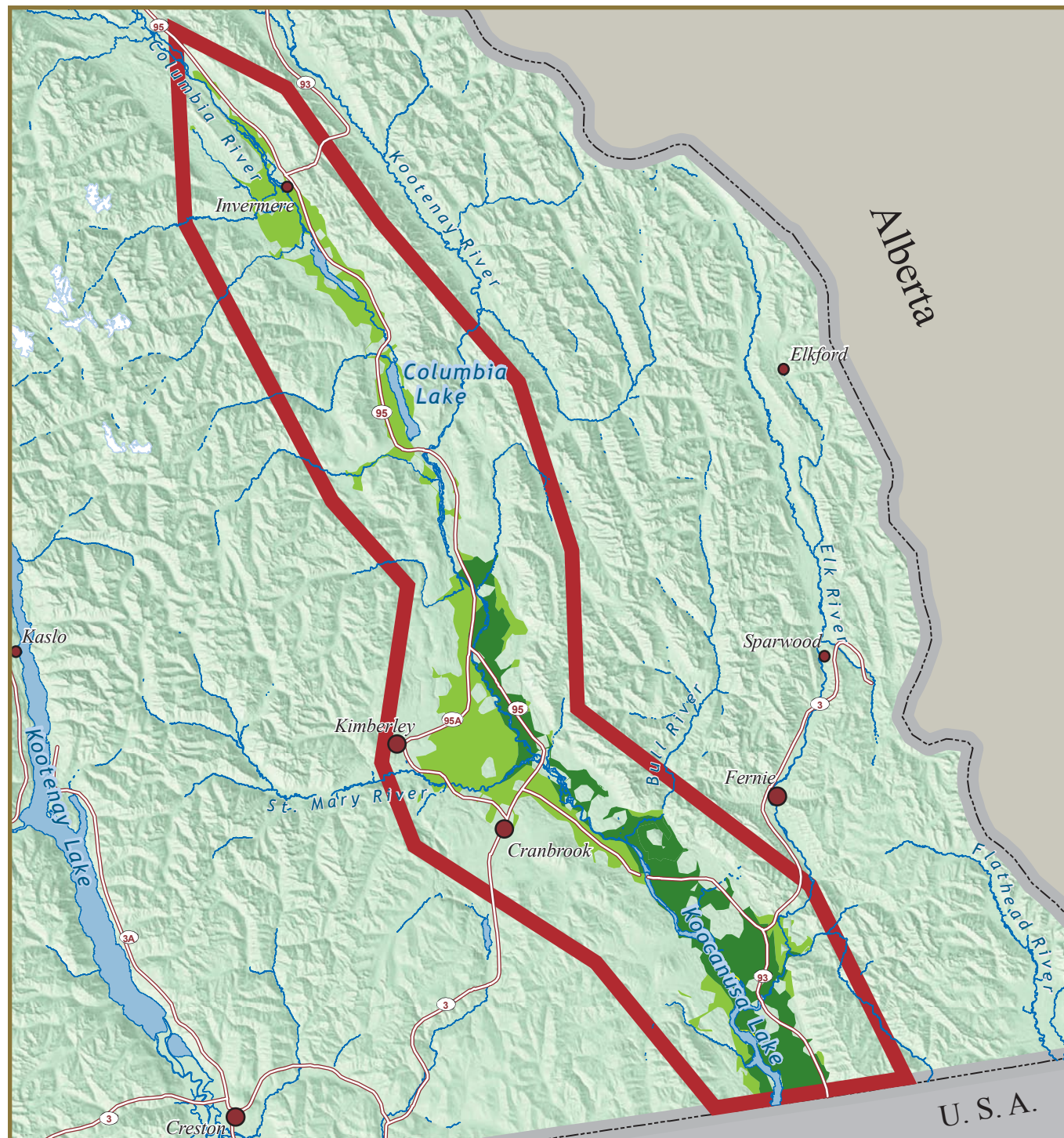
EAST KOOTENAY REGION

Identify your grassland community or communities (you may have more than one). Turn to the corresponding booklet. Each grassland community is colour-coded. The booklet will take you through a step-by-step process for completing your assessment.

Region	Lower Grassland	Middle Grassland	Upper Grassland
East Kootenay		Bluebunch Wheatgrass Grasslands	Rough Fescue Grasslands OR Rough Fescue, Antelope-brush Grasslands



EAST KOOTENAY



East Kootenay Grassland Communities

UPPER GRASSLAND

- Rough Fescue
- Rough Fescue, Antelope-Brush



Data Sources:
Grassland Conservation Council of BC
BC Land & Resource Data Warehouse
Natural Resources Canada Geogratis

BC Albers Projection
NAD 83

Map by: Owen Fritch



Regional Map

CARIBOO-CHILCOTIN REGION

Identify your grassland community or communities (you may have more than one). Turn to the corresponding booklet. Each grassland community is colour-coded. The booklet will take you through a step-by-step process for completing your assessment.

Region	Lower Grassland	Middle Grassland	Upper Grassland
Cariboo–Chilcotin	Big Sagebrush, Bluebunch Wheatgrass Grasslands	Bluebunch Wheatgrass Grasslands	Porcupinegrass Grasslands, Bluebunch Wheatgrass AND Spreading Needlegrass Grasslands



Bluebird
PHOTO Peter Sulzle

CARIBOO-CHILCOTIN

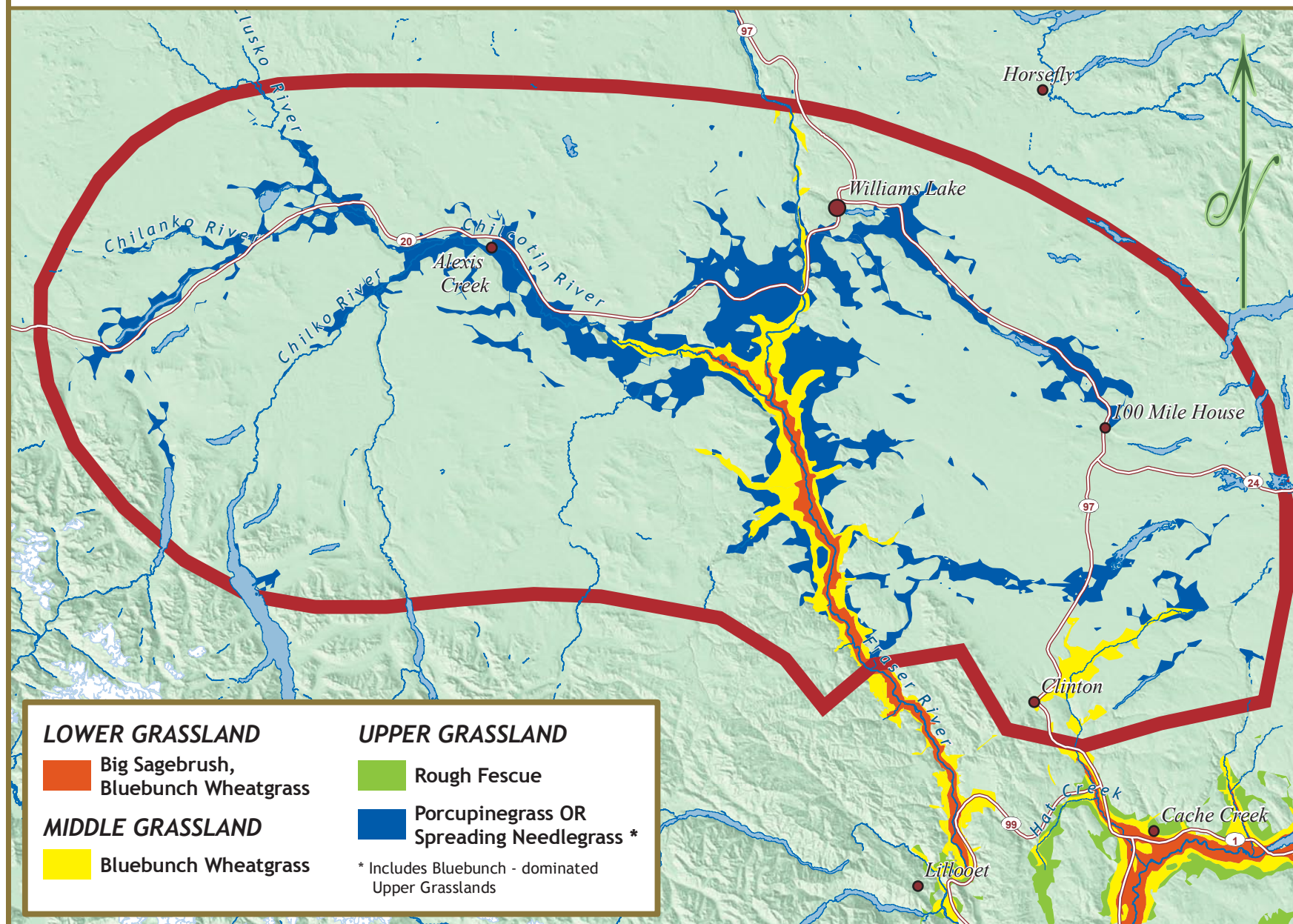
Cariboo - Chilcotin Grassland Communities



Data Sources:
Grassland Conservation Council of BC
BC Land & Resource Data Warehouse
Natural Resources Canada Geogratis

BC Albers Projection
NAD 83

Map by: Owen Fritch



4. SELECTING A MONITORING SITE



PHOTO ROBERT SCHEER

SELECTING A MONITORING SITE

Selecting an appropriate grassland site is essential for accurate and relevant monitoring. This section will assist you in selecting your monitoring site.

Key Considerations

- **Be clear about the purpose of your monitoring.** In other words, what are your management objectives? Your objectives will help determine an appropriate site for monitoring. For example, do you want to select a site that is representative of the average status of your grazing unit, or do you want to select a problem site that concerns you? You may want to monitor this site over time to determine its trend. Distribution of livestock often results in zones of different uses and impacts. If you want to assess each of these zones, you will need at least one monitoring site per zone.
- **Know your grassland.** What type of grassland communities are you monitoring? If you are unsure, return to Chapter 3 and select a grassland community type.
- **Be sure that the selected site is representative of the dominant grassland community.** Avoid sampling across different vegetation types. Do not cross from native grassland to areas seeded to domestic forage, or from upland sites to riparian areas.
- **Be sure that the selected site or sites are representative of a grazing or management unit.**
- **Avoid areas where animals congregate such as gates, fence corners, and salting areas,** unless these sites are the subjects of your monitoring.

LOWER LEFT

Reference Condition sites should be monitored if you are considering a change in management. A baseline or first assessment is important, as you will compare future results to your first assessment. Over time, trends will become evident. PHOTO BRUNO DELESALLE

LOWER RIGHT

The fence line clearly shows contrast with a Greatly Altered site. If your management objective is to restore or improve the condition of the pasture on the right, monitoring and a change in management regime will be required. Although changes may take several years, particularly on drier sites, monitoring is an essential component to achieving success and to understanding grassland condition and trend.

PHOTO BRIAN WIKEEM



Selecting Your Site

Once you have determined the purpose of your monitoring (based on your management objectives), and you know the grassland communities you will be assessing, follow the steps below.

Large Pastures or Grazing Units

Step 1

Traverse the pasture or grazing unit before you start. Complete a visual scan of the pasture.

Step 2

Confirm or determine the dominant grassland vegetation type in your pasture and assess the variability within your pasture or grazing unit.

Step 3

Select a site that is representative of both the dominant grassland community and your pasture or grazing unit. In other words, find a site that represents the average condition of your grassland. It should have the same site potential as the Reference Condition for that plant community.

- Avoid sampling across different vegetation communities if possible.
- If you have native grassland next to an area seeded to domestic forage, place your monitoring well within the grassland area.
- Avoid areas where animals congregate such as gates, fence corners, and salting areas (unless these are sites you want to monitor).

Step 4

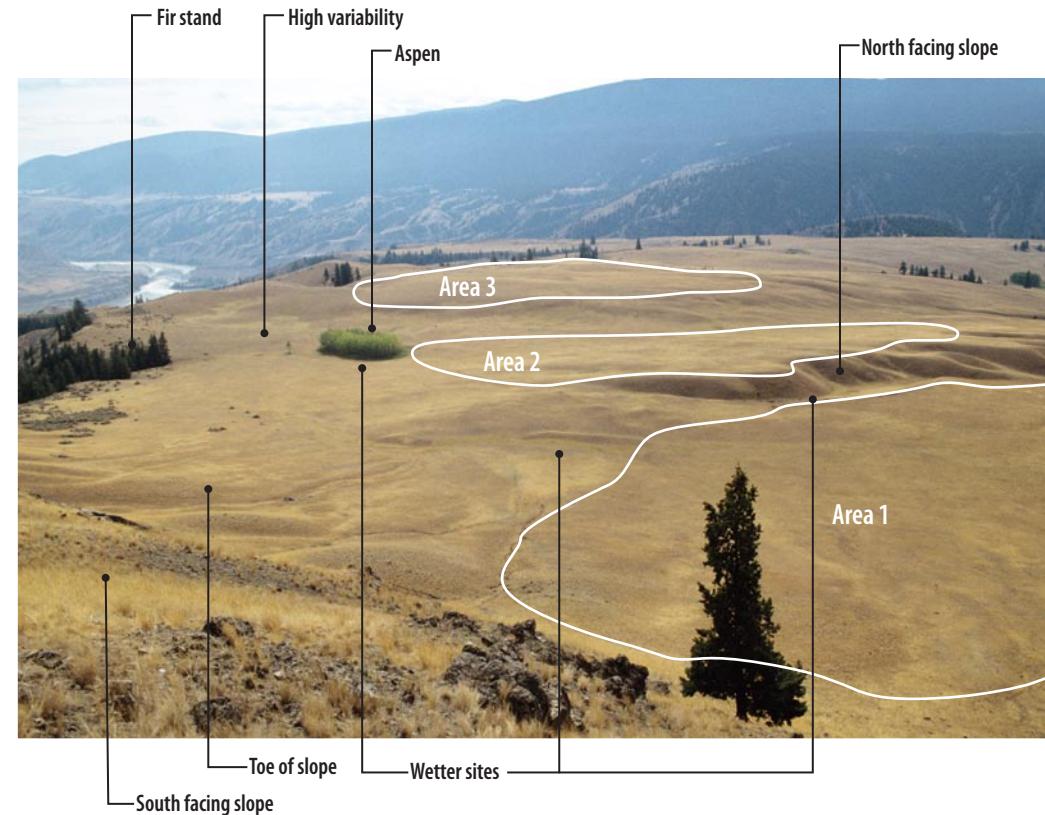
In a large variable pasture, divide the pasture into smaller sample areas and assess each site individually (see next page). Start by selecting an area approximately 5 to 10 m square. The key is to select a site that represents the dominant grassland community or area you wish to monitor.

Variable topography, climatic conditions, and other factors result in different grasslands. Your monitoring site should be as uniform as possible. It should represent the reference plant community that you wish to monitor and be representative of a management regime/grazing unit.

The most important aspect of monitoring is to be consistent with where, how and when you monitor. Repeat your assessment at the same location and at the same time of year. If you have a rotational grazing system, be sure to assess your site before grazing rather than after grazing as this may influence your results. Always be consistent.

A common management goal is to provide sufficient forage for livestock while having a small but acceptable impact on the environment. Because having mixed grassland status is inevitable, you should aim for having none in a Greatly Altered condition. If you have a mosaic of grassland states, such as a few Moderately Altered, many Slightly Altered, and some in the Reference Condition, you are likely managing appropriately.

Typical Large Grassland Pasture with Variable Terrain



Vegetation will be different in swales, depressions, gullies or at the toe of a hill. This is mainly due to higher moisture availability. Conversely, ridges, rocky outcrops and south facing slopes will be drier. The plant community found on a wet site will differ from the community found on a dry site. Therefore, in variable terrain, take the time to find representative sites that you wish to monitor within your pasture. A monitoring site in areas 1, 2 or 3 will provide a more uniform grassland plant community than the adjacent variable terrain. PHOTO KRISTY ROBBINS

The most important aspect of monitoring is to be consistent in where, how and when you monitor.

Avoid sampling in areas where animals congregate such as gates, fence corners, and salting areas unless these are sites you want to monitor. PHOTO BRIAN WIKHEEM



Step 5

Your monitoring site should be marked with permanent markers or pegs. Coloured metal pegs pounded into the ground are highly visible and are preferred. They will be easy to find in the next assessment period, which may be in 3 to 5 years, unless you have a reason to assess a site more regularly.

Small Pastures, Unique Grassland Communities, and Problem Areas

Use a similar method to the one outlined above, but apply it to the smaller area. Variability should not be a problem, however, determining the dominant vegetation type may be more difficult. Use the dominant plant community in an adjacent or similar pasture (one that has a similar aspect, slope, soil, etc.), to help you determine the plant community. If you are unable to easily determine the grassland community, request assistance from an agrologist. Remember, this is a learning process.

Once the dominant vegetation type is determined, proceed to the assessment process.

As with a larger pasture, your monitoring site should be clearly marked. If a fence delineates your monitoring site, mark a post for future reference or use a metal peg pounded into the ground.

If possible, all monitoring sites should be identified and recorded with a GPS. This will assist greatly in finding your peg or post in future years.

Assessing Your Grassland Community

The following section contains five different booklets to guide you in your assessment.

Choose from the following booklets:

- 1 Big Sagebrush, Bluebunch Wheatgrass Grasslands and Antelope-brush, Bluebunch Wheatgrass Grasslands (Lower Grasslands)
- 2 Bluebunch Wheatgrass Grasslands (Middle Grasslands)
- 3 Rough Fescue Grasslands (Upper Grasslands)
- 4 Rough Fescue, Antelope-brush Grasslands (Upper Grasslands)
- 5 Porcupinegrass, Bluebunch Wheatgrass Grasslands and Spreading Needlegrass Grasslands (Upper Grasslands)

Grassland communities found in alpine areas, northern regions, and riparian communities (around wetlands, lakes and along streams) are not covered in this manual. Many riparian plant communities occupy saline soils and are dominated by alkali saltgrass and other species adapted to saline conditions and are currently outside the scope of this manual.



Driving cattle in Lac du Bois.
PHOTO ROBERT SCHEER

5. ASSESSING YOUR GRASSLAND COMMUNITY



PHOTO BRUNO DELESALLE

GRASSLANDS CONSERVATION COUNCIL OF BRITISH COLUMBIA

Big Sagebrush, Bluebunch Wheatgrass Grasslands (LOWER GRASSLANDS)

and

Antelope-brush, Bluebunch Wheatgrass Grasslands (LOWER GRASSLANDS)



Big Sagebrush, Bluebunch Wheatgrass Grasslands and Antelope-brush, Bluebunch Wheatgrass Grasslands

Due to the similarities of these two grassland communities, they are both scored using this booklet.

Big Sagebrush, Bluebunch Wheatgrass Grasslands

Big Sagebrush, Bluebunch Wheatgrass grasslands are common throughout the Southern Interior at low elevations. They are mainly found in the Bunchgrass, and Ponderosa Pine biogeoclimatic zones, but can occasionally be found in the Interior Douglas-fir zone. They occur from the valley bottom to 600 m elevation and are found throughout the Okanagan–Similkameen, Thompson–Nicola, Boundary, and Cariboo–Chilcotin Regions.



Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.

Typical Big Sagebrush, Bluebunch Wheatgrass grassland community.

PHOTO BRIAN WIKHEEM

This grassland community is dominated by bluebunch wheatgrass. On north-facing slopes, this species may be mixed with rough fescue. On relatively cooler, moister sites, Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass. Note that Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys. Big sagebrush and other shrubs, such as threetip sagebrush and common rabbit-brush, account for less than 20% of the plant cover. Biological crusts are widespread and perform an important ecological function.

Big Sagebrush, Bluebunch Wheatgrass grasslands typically have five structural layers, including shrubs, tall grasses and forbs, medium grasses and forbs, low grasses and forbs (rarely exceeding 5 cm in height), and biological crusts (mosses, lichens, and algae).



Biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and ensuring soil stability. In Lower Grasslands, biological crust cover increases significantly where bunchgrass plants are more widely spaced and where litter cover is lower. Biological crusts may increase where site disturbance causes a reduction in bunchgrass and other plant cover, as well as a reduction in litter. This trend may serve as an early warning or indicator of over-grazing by wildlife or livestock. PHOTO BRIAN WIKHEEM

Antelope-brush, Bluebunch Wheatgrass Grasslands



Typical Antelope-brush, Bluebunch Wheatgrass grassland community.

PHOTO BRIAN WIKHEEM

Although very similar to the Sagebrush, Bluebunch Wheatgrass grasslands, the Antelope-brush, Bluebunch Wheatgrass community has some differences.

Antelope-brush, Bluebunch Wheatgrass grasslands are mainly found in the very hot, dry Bunchgrass and Ponderosa Pine biogeoclimatic zones in the South Okanagan—Similkameen region and to a very limited extent in the East Kootenay region. Antelope-brush and common rabbit-brush are the most common shrubs on the driest sites in the South Okanagan. Big sagebrush replaces antelope-brush in slightly moister and cooler conditions. Antelope-brush and other shrubs account for less than 20% of the plant cover. Biological crusts (mosses, lichens, and algae) are widespread and perform an important ecological function, particularly in dry, semi-desert conditions where the spaces between bunchgrasses are significant.

Similar to Big Sagebrush, Bluebunch Wheatgrass grasslands, these grasslands have five structural layers, including shrubs, tall grasses and forbs, medium grasses and forbs, low grasses and forbs (not exceeding 5 cm in height), and biological crusts.

Scoring These Grassland Communities

This section takes you through the process of scoring your Big Sagebrush, Bluebunch Wheatgrass or Antelope-brush, Bluebunch Wheatgrass grassland based on the five key indicators:

- plant community composition
- plant community structure
- nutrient and hydrological cycling (litter and biological crusts)
- site stability (existing or potential erosion)
- invasive plants

The Grassland Assessment Score Sheet

The grassland assessment score sheet enables you to collect information in a consistent manner from one monitoring site to another and from one assessment period to another. Be sure to complete all information on the form.

Space is provided to record the site name, date, and exact location of your assessment (including GPS coordinates) **A**. Include information such as slope, aspect, and elevation. This information is important for relocating the monitoring site in the future and is helpful when comparing results from one management area to another.

Lines for comments are located near the top right of the score sheet **B** and below the work table on page 2 of the score sheet. Use these spaces to add information that may help you interpret what you are seeing. Also record any information that is not included in the questions, but may help you make management decisions in the future.

Sometimes a question may not seem to apply to your assessment area, or the answer may not agree with your experience or other observations. Record the answer as best you can, but elaborate with comments to explain why your response does not seem to work.

Before You Start

- 1 Select a monitoring site (see Chapter 4).
- 2 Mark or stake your site for future reference.
- 3 Select a blank score sheet (see Tab 8).
- 4 Fill in the top portion of your score sheet **A**.
- 5 Walk around the entire site. Tune your eye to the site and observe your grassland community.
- 6 Begin filling in your score sheet. The following sections explain how to score each indicator.

Top Portion of the Score Sheet

- Take time to fill in all information
What are your objectives?

Grassland Assessment Score Sheet ...PAGE 1 **A**

Date May 15, 2009 Site Pasture B Observer(s) Bill Ranger

Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350

Description 25 ha, fairly uniform, mainly Bluebunch & shrub

Slope relatively flat Aspect slight south Elevation 500m

Current Uses (circle): Livestock Recreation Wildlife Other

Management Objective(s) Increase Bluebunch cover and litter.
General increase in productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4

Grassland Type Big Sagebrush, Bluebunch Wheatgrass grassland

Comments (weather, management changes) **B**
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%						
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%						
Assessed Cover Value	<u>36</u> %	Points	40	<u>25</u>	10	0
						= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<u><20</u> %	<u>13</u> %	YES <u>NO</u>
Tall Grasses and Forbs	<u>>40</u> %	<u>37</u> %	<u>YES</u> NO
	<u>1-20</u> %	<u>15</u> %	YES <u>NO</u>

Reference Condition

Big Sagebrush, Bluebunch Wheatgrass Grasslands and Antelope-brush, Bluebunch Wheatgrass Grasslands

- Key bunchgrasses are widely spaced and cover more than 50% of the site.
 - Site is dominated by bluebunch wheatgrass.
 - Rough fescue may be mixed with bluebunch wheatgrass on north-facing slopes.
 - Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass on relatively cooler, moister sites.
 - Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys.
- Big sagebrush or antelope-brush, and other shrubs such as threetip sagebrush and common rabbit-brush account for less than 20% cover.
- Structural layers are unaltered from the Reference Condition and include:
 - 1 shrubs
 - 2 tall grasses and forbs
 - 3 medium grasses and forbs
 - 4 low grasses and forbs not exceeding 5 cm
 - 5 biological crusts

- Biological crusts (mosses, lichens and algae) are abundant and make up 15% to 40% of the ground cover. Biological crusts play an important ecological function. When site disturbance intensifies, bunchgrass, other plants and litter cover decrease, and may result in increased biological crusts.
- Litter weight is greater than 600 kg/ha and litter cover is 75% or more of the ground surface.
- Stable soils show limited bare soil and soil disturbance. Erosion features and/or bare soil account for less than 10% of the ground surface.
- Invasive plants are not present or account for less than 1% cover on the site.

SCORE SHEET QUESTION 1

Accounts for 40%
of total score

SCORING KEY BUNCHGRASS COVER

What is the composition of your plant community?

The cover of key bunchgrasses provides an index of plant species composition and will help you assess the status of your grassland.

What to expect on your site in the Reference Condition:

Key bunchgrasses are widely spaced and cover more than 50% of the site.

- Site is dominated by bluebunch wheatgrass.
- Rough fescue may be mixed with bluebunch wheatgrass on north-facing slopes.
- Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass on relatively cooler, moister sites.
- Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys.

Step 1

List known bunchgrasses

List known bunchgrasses on the work table on page 2 of the score sheet **A**. If possible, document other plant species that occur on the site as well. This will save you time during the scoring procedure. This is especially important when the dominant bunchgrasses are limited or not present.

If some species are unfamiliar to you, collect a few specimens for later identification. See Appendix 2: *Collecting Plant Specimens for Later Identification*.

Identification Aid for Key Bunchgrasses



PHOTOS BRIAN WIKKEEM

Bluebunch Wheatgrass	Idaho Fescue	Rough Fescue
Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass
Stems erect, 30–100 cm tall	Stems erect, 30–100 cm tall, visible nodes	Stems erect, 40–90 cm tall, no visible nodes
Leaves flat, branched, green to bluish green	Leaves rough, fine, densely tufted, basal 15–25 cm high, light green to bluish green, brownish at base	Leaves rough, flat or folded, basal 10–60 cm high, dark green, purplish at base
Flowers a spike 8–16 mm long, usually without awns	Flowers an open panicle 7–25 cm long, awns greater than 1.5 mm	Flowers an open panicle 5–18 cm long, slightly purplish, awns less than 1.5 mm
Standing litter curled at top	Standing litter not curled	Standing litter not curled

Work Table on Page 2 of the Score Sheet

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Big sagebrush	12 %
Common Rabbit Brush	1 %
	%
	%
Total Cover (All Shrubs Combined)	13 %
Tall Grasses & Forbs	
Bluebunch Wheatgrass	} 36 %
Rough Fescue A	
Balsam Root	
	1 %
	%

Step 2

Determine the cover of key bunchgrasses

There are two ways to determine the cover of key bunchgrasses. You can list each bunchgrass in the work table **A**. Once you have identified your two or three key bunchgrasses, write down the percent cover of each in the work table **B**. Alternatively, you can estimate the total cover for all of the key bunchgrasses together and write that value in the grey "Total Cover" box **C**.

Use the grassland status photos opposite to assist you with the cover rating. Compare what you see to these photos and to the vegetation cover diagrams on the last page of this booklet.

	Total Cover (All Shrubs Combined)	13	%
Tall Grasses & Forbs			
Bluebunch Wheatgrass	B	36	%
Rough Fescue			%
Balsam Root			1 %
			%
	Total Cover (All Tall Grasses and Forbs Combined)	37	C
Medium Grasses & Forbs			
June Grass			%
Pasture Sage			%

Step 3

Score plant community composition based on the cover of key bunchgrasses

First check the appropriate Reference Condition box (a. or b.) on your score sheet **D**. For this plant community check box a., as the Reference Condition is greater than 50% bunchgrass cover.

Next, write your assessed bunchgrass cover value on the score sheet **E**. Remember, your cover value should be representative of the entire assessment site. If you are using a 10 square meter area, or a pasture, ensure that you assess the average cover for the entire site. It is sometimes easier to assess a one square meter area and take several samples around the site or pasture. You would then average all your values and insert the average value on the score sheet.

Your assessed cover value will place you in one of the four categories listed opposite.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

D ☒ Booklet 1, 2, 5: Reference Condition >50% Assessed Cover Value >50% **E** 35-50% 20-34% <20% SCORE

☐ Booklet 3 or 4: Reference Condition >60% Assessed Cover Value >60% 40-60% 20-39% <20%

Assessed Cover Value **E** 36 % Points 40 25 10 0 = 25

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<20 %	13 %	YES NO
Tall Grasses and Forbs	>40 %	37 %	YES NO

Comparison of Grassland Status and Bunchgrass Cover



Reference Condition Landscape



Reference Condition Plot



Slightly Altered Landscape



Slightly Altered Plot



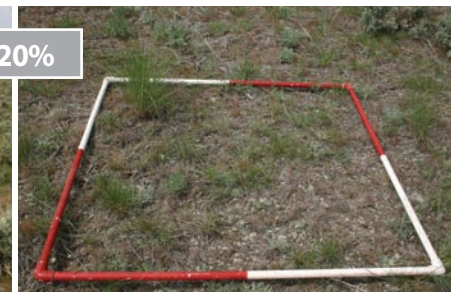
Moderately Altered Landscape



Moderately Altered Plot



Greatly Altered Landscape



Greatly Altered Plot

PHOTOS BRIAN WIKHEM

Assessed Cover Values and Status

Category	Description	Bunchgrass Cover	Score
Reference Condition	The existing plant community closely resembles the Reference Condition. Evidence of disturbance is minimal.	> 50%	40
Slightly Altered	The existing plant community has been slightly altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs may be more abundant. Non-native species may be present but are infrequent.	35–50%	25
Moderately Altered	The existing community has been moderately altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs usually are more abundant. Non-native plant species may be common but native species are still present.	20–34%	10
Greatly Altered	The existing community has been significantly altered compared to the Reference Condition. Non-native species, native annuals, and low-growing native plants dominate the community.	< 20%	0

If your measurement falls on a threshold between two categories or is close to a threshold and you are finding it difficult to make a decision, always err on the side of caution: score to the lower category and record comment.

Select Your Cover Value

Your Assessed Bunchgrass Cover	> 50%	35–50%	20–34%	< 20%
Score	40	25	10	0

Step 4 Determine and enter the appropriate score on the score sheet

Based on your assessed bunchgrass cover value **A**, circle and record your score on the score sheet **B**.

...overall increase in productivity and forage.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.					
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35–50% A	34%	<20%
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40–60%	20–39%	<20%
Assessed Cover Value	36 %	Points	40	25	10
					Score = 25 B
2. Plant Community Structure (Booklets page 11)					

Step 5 Write comments for future reference

- Write any additional comments on the work table for future reference. The most important indicators of change are:
- A decline in cover of the dominant bunchgrasses.
 - An increase in cover of low grasses, forbs, and sometimes shrubs: low-growing bunchgrasses and forbs, such as Sandberg's bluegrass and pussytoes are often more abundant as disturbance increases.
 - An increase in the shrub layer—big sagebrush and common rabbit-brush—may indicate disturbance or the lack of fire. In the Reference Condition, shrubs should account for less than 20% of the plant cover.

SCORING PLANT COMMUNITY STRUCTURE

Do you have the expected plant layers?

This question focuses on the physical structure of the plant layers found in the Big Sagebrush, Bluebunch Wheatgrass and Antelope-brush, Bluebunch Wheatgrass grasslands. Changes are determined by comparing the structure of the existing plant community to the Reference Condition.

What to expect on your site in the Reference Condition:

- Big sagebrush or antelope-brush, and other shrubs such as threetip sagebrush and common rabbit-brush, account for less than 20% cover.
- Five structural layers (see illustration next page) are present:
 - shrubs
 - tall grasses and forbs
 - medium grasses and forbs
 - low grasses and forbs not exceeding 5 cm
 - biological crusts
- Biological crusts (mosses, lichens, and algae) are widespread and make up 15% to 40% of the ground cover. Biological crusts may vary significantly depending on plant and litter cover. As you move into Middle Grasslands, biological crusts may decrease where bunchgrass plants are more tightly spaced and where litter cover is high.

When site disturbance increases, bunchgrass and other plant cover, as well as litter content, decrease. The result may be an increase in biological crusts.

SCORE SHEET QUESTION 2

Accounts for 10% of total score

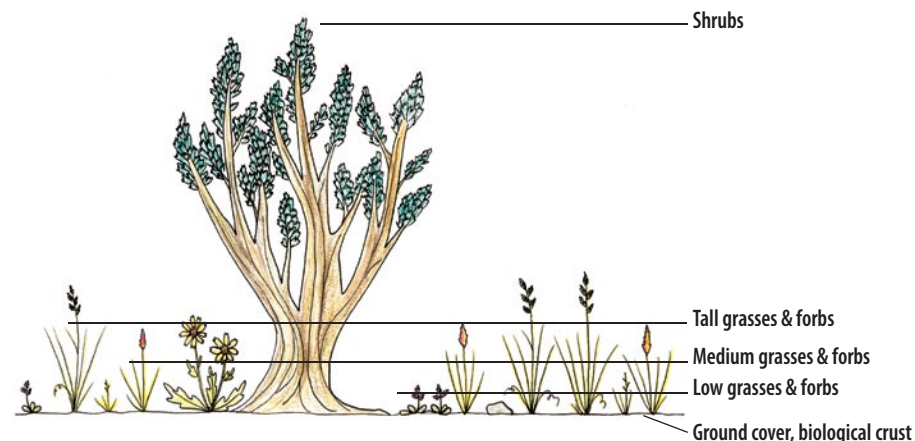
Above ground structure protects the soil against wind, rain and heat from the sun, and supplies habitat for wildlife.

Commonly Occurring Species

Big Sagebrush, Bluebunch Wheatgrass and Antelope-brush, Bluebunch Wheatgrass grassland communities

	Plant Layer	Plant Species
	Shrubs	<ul style="list-style-type: none"> • big sagebrush* • common rabbit-brush • threetip sagebrush • antelope-brush (in the southern portion of the Okanagan–Similkameen region on dry sites)
 	Tall Grasses and Forbs	<ul style="list-style-type: none"> • bluebunch wheatgrass* • arrowleaf balsamroot* • rough fescue • lemonweed • alfalfa (non-native species)
 	Medium Grasses and Forbs	<ul style="list-style-type: none"> • Idaho fescue* • junegrass • needle-and-thread grass • yarrow* • pasture sage • daisies and fleabanes • asters • milkvetches • red three-awn
 	Low Grasses and Forbs	<ul style="list-style-type: none"> • brittle prickly-pear cactus • Sandberg's bluegrass* • small-flowered blue-eyed Mary • pussytoes* • cheatgrass (invasive species) • common dandelion (non-native species) • common selaginella
 	Biological Crusts	mosses, lichens, and algae*
		* shown in photos

Structural Layers for Big Sagebrush, Bluebunch Wheatgrass and Antelope-brush, Bluebunch Wheatgrass Grasslands



Step 1

List species

Refer to your list of species on the work table on page 2 of the score sheet. Add any additional plants you observe within each layer. Refer to the list of commonly occurring species opposite.

Step 2

Assess structural layers

Using the work table, assess existing structural layers. Refer to the structural layer changes shown in the drawings on the next page, and to the cover diagrams on the last page of this booklet to determine a cover value for each layer.

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Big sagebrush	12 %
Common Rabbit Brush	1 %
	%
	%
Total Cover (All Shrubs Combined)	13 %
Tall Grasses & Forbs	
Bluebunch Wheatgrass	} 36 %
Rough Fescue	
Balsam Root	1 %
	%
Total Cover (All Tall Grasses and Forbs Combined)	37 %
Medium Grasses & Forbs	
June Grass	%
Bentgrass	%

Categories of Structural Layer Changes

1 Reference Condition:
All layers as expected are present

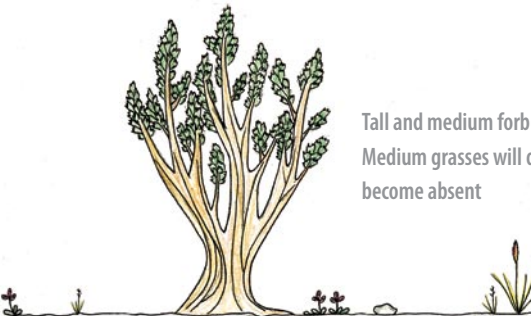


2 Slightly Altered:
One layer is absent or altered



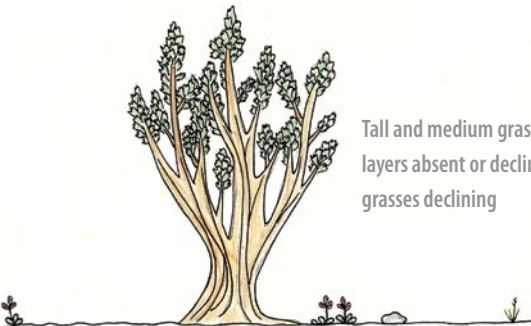
Tall grasses absent

3 Moderately Altered:
Two layers are absent or altered



Tall and medium grass layer absent
Medium grasses will decline then become absent

4 Greatly Altered:
Three layers are absent or altered



Tall and medium grass and forb layers absent or declining, low grasses declining

Expected Layers in the Reference Condition

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	infrequent	frequent–abundant	trace–infrequent	trace–infrequent	common
Reference Cover Value	< 20%	> 40%	1–20%	1–20%	15–40%

Step 3 Score plant community structure

Score plant community structure based on existing plant layers. Write in the Reference Condition for each layer on score sheet **A**.

- Shrubs = less than 20% cover
- Tall Grasses and Forbs = greater than 40%
- Medium Grasses and Forbs = 1 to 20%
- Low Grasses and Forbs = 1 to 20%
- Biological Crusts = 15 to 40%

Enter your assessed cover value for each layer on the score sheet **B**.

Booklet 3 or 4: Reference Condition >60%		Assessed Cover value					
Assessed Cover Value	36 %	Points	40	25	10	0	= 25
2. Plant Community Structure (Booklets page 11)							
Layer	Reference Condition	Assessed Cover Value	Altered Layers				
Shrubs	A <20 %	B 13 %	YES	NO			
Tall Grasses and Forbs	>40 %	37 %	YES	NO			
Medium Grasses and Forbs	1–20 %	15 %	YES	NO			
Low Grasses and Forbs	1–20 %	15 %	YES	NO			
Biological Crust	15–40 %	30 %	YES	NO			
Total Number of Altered Layers	0	1	2	3	4 or 5		
Points	10	6	2	1	0	= 6 E	
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)							

Step 4 Assess whether layer is altered or not

For each layer, assess whether it is altered or not altered. Circle YES or NO on your score sheet **C**. Circle the number of altered layers in the appropriate box on the score sheet **D**.

Step 5 Enter score and additional comments

Score your plant community structure. The number of altered layers will determine your score. Enter the score in the grey box on the score sheet **E**. Write any additional comments on the work table on page 2 of the score sheet for future reference.

Structural plant layers in your plant community are compared to the Reference Condition. A structural layer is considered altered when its cover no longer falls within the expected range for the Reference Condition.

SCORE SHEET QUESTION 3

*Accounts for 24%
of total score*

SCORING NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

Litter is an important indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, promote infiltration into the soil, and regulate heat on the soil surface.

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down. When collecting litter, collect all litter found within your plot.

What to expect on your site in the Reference Condition:

- Bunchgrasses are widely spaced.
- Litter cover is uniform on the site.
- Decaying material can be found on the soil surface.
- Litter weight is greater than 600 kg/ha. Litter weight may vary from 600 to 1500 kg/ha.
- Litter covers 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil account for less than 10% of the ground surface.

Scoring in this section is divided into two components:

- Assessing litter weight
- Assessing the cover of litter and biological crusts

Both litter and biological crusts are measured together. An increase in litter weight and cover over a site often results in a decrease in crust cover as there is less open space for the crusts to establish.

The Importance of Litter

Litter is the key indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, and promote infiltration into the soil. It also regulates heat on and below the soil surface. It slows down soil heating and helps the soil to cool more quickly, reducing moisture loss.



Typical Reference Condition of Big Sagebrush, Bluebunch Wheatgrass Grassland community. PHOTO BRIAN WIKEEM



Typical Reference Condition of Antelope-Brush, Bluebunch Wheatgrass Grassland community. PHOTO BRIAN WIKEEM



Biological crusts play an important role in moisture retention and soil stability. PHOTO BRIAN WIKEEM

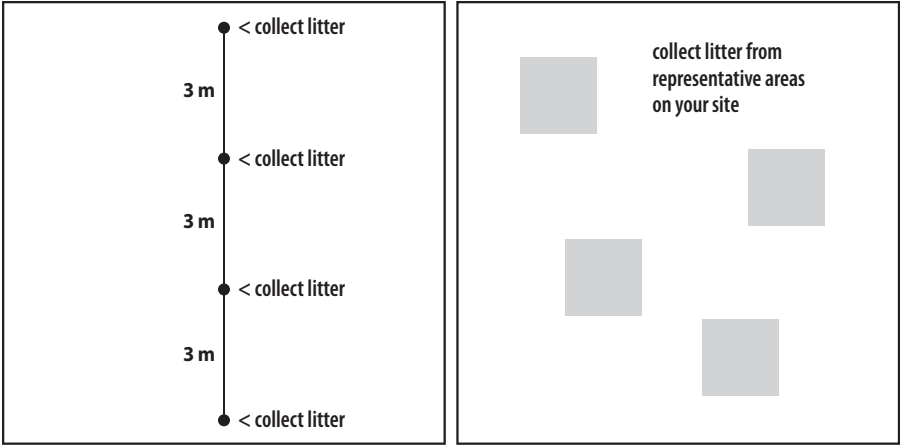
Step 1 Hand rake and assess litter

Litter weight is estimated by hand-raking litter from a 0.25 m² area or within a plot frame. The litter will be either weighed or compared to the photographs on page 19.

Collect three to five samples from representative areas on the site. Remember your site should be 5 to 10 m square. If you have a larger site you may require more samples.

If you installed transects, hand-rake litter from a 0.25 m² area or plot every 3 to 5 m along the transect.

Options for Collecting Litter



Ziplock bags are handy for storing individual litter samples. Prepare litter bags ahead of time for easy reference in the field. See Appendix 3.

Step 2
Compare your samples to the Reference Condition
Compare your samples to the thresholds shown on page 19. Determine which litter weight category most closely resembles your sample. List your samples in the work table on page 2 of the score sheet. Take an average of all samples on the site.

Step 3
Score litter weight
Write in the Reference Condition for litter weight on the score sheet. In this case it is greater than 600 kg/ha **A**.

Write in your assessed litter weight on the score sheet **B**.
Your litter weight will fall within one of the four categories shown on the chart opposite. The second column of the chart converts litter weight into a percent of the Reference Condition, and the third column shows the corresponding score.

Using this chart, determine your score and circle it on the score sheet **C**, then enter the score in box A to the right **D**.

The score sheet converts litter weights into values that are relative to the Reference Condition. This conversion was necessary to standardize the score sheet for all plant communities.

Total Number of Altered Layers	0	1	2	3	4	5	6	7	8	9	10
Points	10	6	2	1	0						
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)											
Litter Weight											
Reference Condition	A >600 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%					
Assessed Litter Weight	B 200 kg/ha	Points	14	8	C 2	0	A	D 2			
Litter Cover and Biological Crust Cover											
Assessed Litter Cover	20 %	≥75%	25-74%	25-74%	<25%	<25%					

Litter Weight Thresholds
Big Sagebrush, Bluebunch Wheatgrass grasslands and Antelope-brush, Bluebunch Wheatgrass grassland communities

Reference Condition is >600kg/ha	Your Assessed Litter Weight	Conversion to % of Reference Condition (relative values)	Score
	>600 kg/ha	>100%	15
	600 to 300 kg/ha	50–100%	8
	299 to 150 kg/ha	25–49%	2
	< 150 kg/ha	< 25%	0

If your assessment falls on or is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

Step 4

Assess litter and biological crust cover

First, make a visual estimate of litter cover. How much ground is covered by litter? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help estimate litter cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed litter cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Next, assess biological crust cover. Make a visual estimate of biological crust cover. How much ground is covered by biological crusts? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help you estimate biological crust cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed biological crust cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Biological crusts play an important role in moisture retention and soil stability. Biological crusts are not considered bare soil.

Points		10	8	6	4	2	0	=
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)								
Litter Weight								
Reference Condition	>600 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%		
Assessed Litter Weight	200 kg/ha	Points	14	8	2	0	A	2
Litter Cover and Biological Crust Cover								
Assessed Litter Cover	20 %	≥75%	25-74%	25-74%	<25%	<25%		
Assessed Biological Crust Cover	30 %	0-100%	>25%	<25%	<25%	<25%		
Points	10	8	4	2	0	B	2	C
Total A + B								4 D
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)								

Step 5

Score litter and biological crust cover

Both litter and biological crust cover are interrelated and thus are scored together. Check your assessment values carefully before scoring. See *Scoring Tip* below. Record your score on the score sheet **C**.

Add A and B to get total score **D**.

Write any additional comments on the work table for future reference.

Scoring Tip

Both litter and biological crusts are measured together. This is important. For example:

- If litter is high, greater than or equal to 75%, you will get full points, regardless of biological crust cover.
- If litter is moderate, 25 to 74% and biological crust cover is less

Points		10	8	6	4	2	0	=
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)								
Litter Weight								
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%	<25%		
Assessed Litter Weight	kg/ha	Points	14	8	2	0	A	
Litter Cover and Biological Crust Cover								
Assessed Litter Cover	%	≥75%	25-74%	25-74%	<25%	<25%		
Assessed Biological Crust Cover	%	0-100%	>25%	<25%	<25%	<25%		
Points	10	8	4	2	0	B		
Total A + B								
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)								

than 25%, your score will be 4 **A**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover less than 25% of your site.

- If litter is low, less than 25%, and biological crust cover is more than 25%, your score will be 2 **B**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover more than 25% of your site. This site may be recovering.
- If litter is low, less than 25%, and biological crust cover is low, less than 25%, your score will be 0 **C**. Litter is sparse, patchy, and decaying organic material is the main type of litter on the soil surface. Most of the existing litter is in the plant.

SCORING SITE STABILITY

Is there existing or potential erosion on site?

Site stability is determined by assessing the total amount of bare soil and erosion on the site caused by wind and water. Bare soil is defined as mineral soil—soil particles less than 5 mm—not covered by live plants, litter, or biological crusts. Particles greater than 5 mm, such as stones and bedrock, should not be included in the bare soil cover estimate. Erosion occurs when there is actual loss of soil particles from a site.

What to expect on your site in the Reference Condition:

- Bunchgrasses are widely spaced with uniform litter cover.
- A combination of litter and biological crusts cover 75% or more of the ground surface.
- Bare soil does not exceed 5% cover.
- Erosion features are limited and do not exceed 5% cover. (Together, erosion features and/or bare soil cover less than 10% of the ground surface.)

SCORE SHEET QUESTION 4

Accounts for 16%
of total score

Erosion



PHOTO BRIAN WIKEEM

If your score falls on a threshold or your assessment is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

This indicator is scored in two parts:

- Assess the cover of bare soil
- Assess the cover of erosion features

Step 1

Estimate area covered by bare soil

Estimate the percentage of the soil surface on your site that is covered by bare soil. Use the cover diagrams on the last page of this booklet to assist you in determining whether cover is greater or less than the threshold values.

The Reference Condition is already identified for you on the score sheet. Reference condition for bare soil is the same for all grasslands plant communities—less than 5%.

Write your assessed cover value for bare soil **A** and record your score on the score sheet **B**.

	Points	10	8	4	U	B	2
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						Total A + B	= 4
A Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%			
Assessed Bare Soil Cover 7 %	Points	8	6	3	0	A 6	B
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%			
Assessed Erosion Cover 2 %	Points	8	6	3	0	B 8	
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						Total A + B	= 14
Reference Condition 0%	0	<1%	1-10%	>10%			
Assessed Cover <1 %	Points	5	3	1	0	A 3	

Step 2

Estimate area covered by erosion features

Estimate the cover of the erosion features on site. Use the cover diagrams on the last page of this booklet to determine whether the cover is greater or less than the erosion threshold values listed.

The Reference Condition is already identified for you on the score sheet. Reference Condition for erosion features are the same for all grasslands plant communities—less than 5%.

Examples of Soil Disturbance and Erosion



Bare Soil



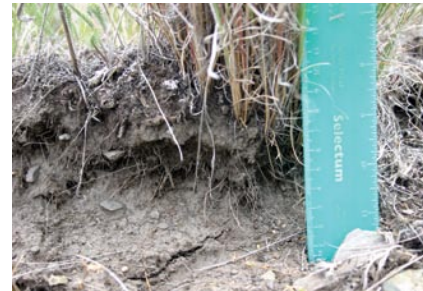
Soil Movement



Lichen Line



Erosion Pavement



Pedestal – Exposed Roots



Rills



Gully



Undercutting

PHOTOS BRIAN WIKEEM

Write your assessed cover value for erosion **A** and record your score on the score sheet **B**.

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						Total A + B = 4
Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%		
Assessed Bare Soil Cover 7 %	Points 8	6	3	0	A 6	
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%		
Assessed Erosion Cover 2 %	Points 8	6	3	0	B 8	
						Total A + B = 14

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						Total A + B = 14
Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 %	Points 5	3	1	0	A 3	

Step 3

Record total score for site stability **C**

Write any additional comments on the work table for future reference.

The following indicators suggest active or potential soil disturbance and increased susceptibility to erosion:

- Reduced litter cover and increased bare soil.
- Evidence of soil movement such as flow patterns on the surface, fan deposits, and rills.
- Evidence of soil loss such as pedestalled plants with exposed roots, exposed gravel on the soil surface, lichen lines on rocks, and wind scouring of exposed soil.
- Physical disturbance such as hoof shearing, trails, and compaction.

Look closely at the soil surface. Be aware that mosses and lichens are protecting the soil surface and should not be considered part of bare soil. Erosion features may be active or healing, and both types are included as erosion. Although numerous features signify erosion (see photos previous page), the combination of all features present on the site is collectively considered in scoring this indicator.

Most erosion and bare soil in the Reference Condition is restricted to areas with small mammal, bird or insect activity.

SCORING INVASIVE PLANTS

Are invasive plants present on this site?

The cover and distribution of invasive plants are indicators of the status of your grassland.

Invasive plants occupy grasslands because they out-compete native plants. Where disturbance has created available space and conditions for seed germination, invasive species thrive. Some species, such as diffuse and spotted knapweed, can dominate grasslands and persist for decades. As a result, forage values and species diversity on these sites are often much lower than would be expected in native plant communities.

SCORE SHEET QUESTION 5

Accounts for 10% of total score



Invasive plant, Dalmatian Toadflax.
PHOTO BRIAN WIKKEEM

The presence of invasive plants on grasslands is generally considered a risk even though the actual effects of some species are unknown. All invasive plants considered for this indicator are non-native species to British Columbia. Assessing this indicator requires some knowledge of the common invasive plants listed on page 27.

What to expect on your site in the Reference Condition

- Limited bare soil or soil disturbance.
- Few or no erosion features.
- No invasive plants present.

Document as many invasive plant species as possible. This is especially important when they are abundant. If a species is unfamiliar to you, collect a specimen for later identification. If possible, document their origin.

Step 1

Search the site for invasive plants

If invasive plants are widely dispersed on the site in numerous patches, divide the monitoring site into smaller areas to more accurately estimate total cover and distribution.

List all known invasive plant species in the work table **A**.

		%
Total Cover (All Low Grasses and Forbs Combined)		15 %
Biological Crust ✓		Total Biological Crust Cover 30
A	Invasive Plants	
	Knapweed - one patch	<1 %
		%
		%
		%

Step 2

Score invasive plant cover

Determine the combined cover of all invasive plants using the diagrams on the next page.

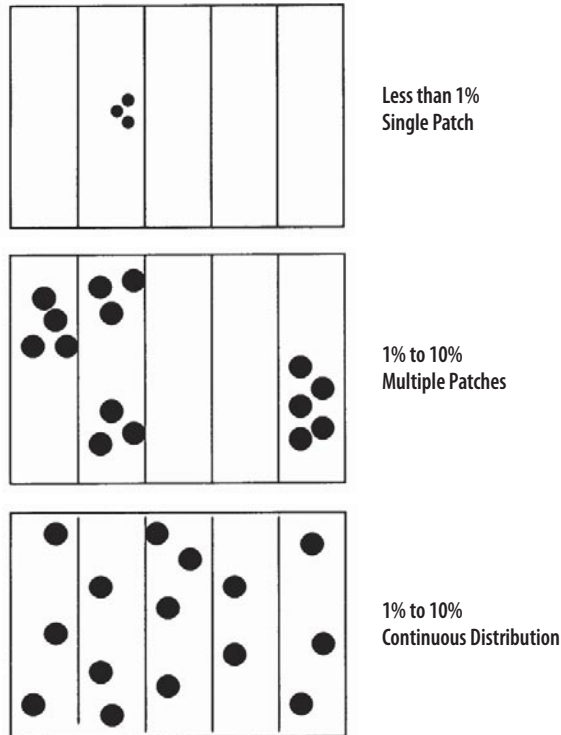
The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant cover is the same for all grasslands plant communities—0%.

Assessed Erosion Cover 2 % Points 8						B 8
						Total A + B = 14
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						
Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 % B	Points 5	3	1	0	A 3	C
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous		
	Points 5	3	1	0	B 3	
						Total A + B = 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						55

Write your assessed cover value for invasive plants **B** and record your score on the score sheet **C**.

Plant and Distribution Diagram for Invasive Plants

Note that one column = 20% of total area. For general cover diagrams see the last page of this booklet.



Invasive plants often establish on disturbed areas that have bare soils. Check small mammal diggings, trails, salting areas, and around corrals and gates for invasive plants. Inspect all salting areas and corrals within the pasture being surveyed even if these areas are not within the actual monitoring site.

Step 3

Determine the distribution of invasive plants on the site **A**

The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant distribution is the same for all grasslands plant communities—None.

Circle your assessed distribution for invasive plants **B** and record your score on the score sheet **C**.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 %	Points 5	3	1	0	A	3
Assessed Distribution A	None	Single patch or a few scattered individuals	Multiple Patches	Continuous		
	Points 5	3	1	0	B	3
Total A + B					=	6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						55

Common Invasive Plants in British Columbia

from *Forest and Range Practices Act Invasive Plant Regulation*

Species	Scientific Name
Anchusa	<i>Anchusa officinalis</i>
Baby's breath	<i>Gypsophila paniculata</i>
Bulbous bluegrass	<i>Poa bulbosa</i>
Bull thistle	<i>Cirsium vulgare</i>
Cheatgrass	<i>Bromus tectorum</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Hoary alyssum	<i>Berteroa incana</i>
Perennial pepperweed	<i>Lepidium latifolium</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Puncture vine	<i>Tribulus terrestris</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Yellow starthistle	<i>Centaurea solstitialis</i>
Yellow toadflax	<i>Linaria vulgaris</i>
Moist sites only	
Canada thistle	<i>Cirsium arvense</i>
Common burdock	<i>Arctium minus</i>

For more information see *Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia*, available through the Ministry of Agriculture and Lands.

Step 4

Enter combined cover and distribution on score sheet

Enter the total of A and B on the score sheet **A**.

Write any additional comments on the work sheet for future reference.

Reference Condition <3%	0	<1%	1-10%	>10%	
Assessed Erosion Cover 2 %	Points	8	6	3	0
					B 8
5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)					Total A + B = 14
Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover <1 %	Points	5	3	1	0
					A 3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
Points	5	3	1	0	
					B 3
Total A + B =					6 A
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					55

DETERMINING YOUR TOTAL SCORE

Add the scores for all questions and write your total in the "Total Score" box at bottom of score sheet **B**.

Assessed Distribution	None	scattered individuals	1	0	
Points	5	3	1	0	B 3
Total A + B =					6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					55 B
C Grassland Status (circle one):	Reference 76-100%	Slightly Altered 51-75%	Moderately Altered 26-50%	Greatly Altered 0-25%	
D Apparent Trend (circle one):	Upward	Downward	Stable	Unknown	

Assess Grassland Status

Based on your score, circle one of four grassland status ranges. Your assessment is complete **C**.

Assessing Apparent Trend

In addition to the five main indicators for grassland assessment, consider the features in the table opposite in order to assess apparent trend. Each feature describes possible grassland conditions that suggest that a downward, stable, or upward trend.

To record your assessment, circle the appropriate category on the last line of the score sheet **D**.

It is important to remember that apparent trend is a one time assessment based on your current observations. In future years, when you combine these results with assessments from the past, you will get important trend information and results.

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal colour, seed production; plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Your site assessment is now complete. Ensure your score sheet is completely filled out and that you have recorded all the necessary notes and comments that will assist you with future management decisions.

Photo-Point Monitoring

Your next step is to complete photo-point monitoring, Chapter 6.

Photographic records are an important part of monitoring your grassland. Photo-point monitoring provides an effective visual tool for comparison of the grassland community.

Score Sheet Sample – Page 1

Grassland Assessment Score Sheet ...PAGE 1

Date May 15, 2009 Site Pasture B Observer(s) Bill Ranger
 Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350
 Description 25 ha, fairly uniform, mainly Bluebunch & shrub
 Slope relatively flat Aspect slight south Elevation 500m
 Current Uses (circle): Livestock Recreation Wildlife Other _____
 Management Objective(s) Increase Bluebunch cover and litter.
General increase in productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4Grassland Type Big Sagebrush, Bluebunch Wheatgrass grassland

Comments (weather, management changes) _____
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	<u>35-50%</u>	20-34%	<20%	SCORE
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	<u>40-60%</u>	20-39%	<20%	
Assessed Cover Value	<u>36</u> %	Points	40	<u>25</u>	10	0
						= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers		
Shrubs	<20 %	13 %	YES <u>NO</u>		
Tall Grasses and Forbs	>40 %	37 %	<u>YES</u> NO		
Medium Grasses and Forbs	1-20 %	15 %	YES <u>NO</u>		
Low Grasses and Forbs	1-20 %	15 %	YES <u>NO</u>		
Biological Crust	15-40 %	30 %	YES <u>NO</u>		
Total Number of Altered Layers	0	1	2	3	4 or 5
Points	10	6	2	1	0
= 6					

3. Nutrient and Hydrological Cycling (Booklets 1-4 page 16; Booklet 5 page 18)

Litter Weight						
Reference Condition	>600 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%
Assessed Litter Weight	200 kg/ha	Points	14	8	2	0
Litter Cover and Biological Crust Cover						A 2
Assessed Litter Cover	20 %	≥75%	25-74%	25-74%	<25%	<25%
Assessed Biological Crust Cover	30 %	0-100%	>25%	<25%	>25%	<25%
	Points	10	8	4	2	0
Total A + B						B 2
4. Site Stability (Booklets 1-4, page 21; Booklet 5, page 23)						= 4

4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover <u>7</u> % Points	8	<u>6</u>	3	0	A <u>6</u>
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover <u>2</u> % Points	<u>8</u>	6	3	0	B <u>8</u>
Total A + B					= <u>14</u>

5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover <u><1</u> %	Points 5	<u>3</u>	1	0	A <u>3</u>
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
Points	5	<u>3</u>	1	0	B <u>3</u>
Total A + B					= <u>6</u>
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					<u>55</u>

Grassland Status (circle one):	Reference 76-100%	<u>Slightly Altered 51-75%</u>	Moderately Altered 26-50%	Greatly Altered 0-25%
Apparent Trend (circle one):	Upward	Downward	<u>Stable</u>	Unknown

Score Sheet Sample – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

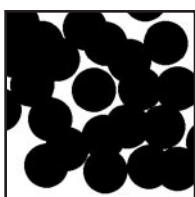
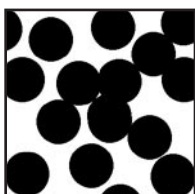
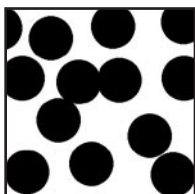
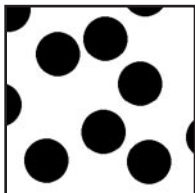
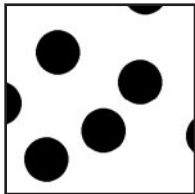
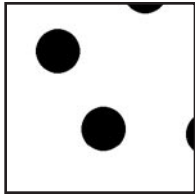
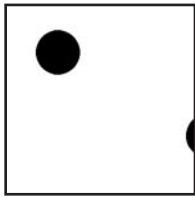
Shrubs Identified	Estimated Percent Cover
<u>Big sagebrush</u>	<u>12</u> %
<u>Common Rabbit Brush</u>	<u>1</u> %
	%
	%
Total Cover (All Shrubs Combined)	<u>13</u> %
Tall Grasses & Forbs	
<u>Bluebunch Wheatgrass</u>	<u>36</u> %
<u>Rough Fescue</u>	%
<u>Balsam Root</u>	<u>1</u> %
	%
Total Cover (All Tall Grasses and Forbs Combined)	<u>37</u> %
Medium Grasses & Forbs	
<u>June Grass</u>	%
<u>Pasture Sage</u>	%
	%
	%
Total Cover (All Medium Grasses and Forbs Combined)	<u>15</u> %
Low Grasses & Forbs	
<u>Sandberg's Bluegrass</u>	%
<u>Prickly pear Cactus</u>	%
	%
	%
Total Cover (All Low Grasses and Forbs Combined)	<u>15</u> %
Biological Crust <input checked="" type="checkbox"/>	Total Biological Crust Cover <u>30</u>
Invasive Plants	
<u>Knapweed - one patch</u>	<u><1</u> %
	%
	%
	%
Total Cover (All Invasive Plants Combined)	<u><1</u> %

Comments

Very dry last 2 years. Litter seems to be declining.Litter cover approx. 20%Bare soil = 7%Little or no erosionGenerally stable, but some concerns with continued dry conditions.Monitor litter and bare soil.

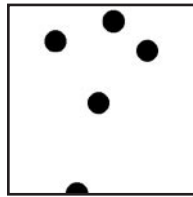
Cover Diagrams for Plant Community Cover

Large

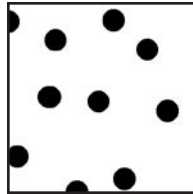


Small

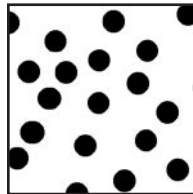
5% Cover



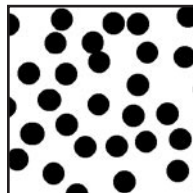
10% Cover



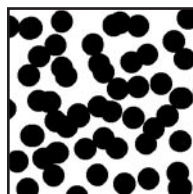
20% Cover



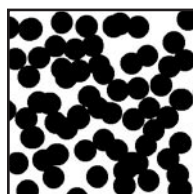
30% Cover



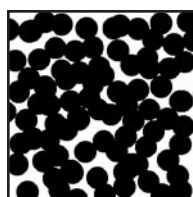
50% Cover



60% Cover



75% Cover



BOOKLET 2

Bluebunch Wheatgrass Grasslands (MIDDLE GRASSLANDS)



GRASSLANDS CONSERVATION COUNCIL OF BRITISH COLUMBIA

Bluebunch Wheatgrass Grasslands

Bluebunch Wheatgrass grasslands are common throughout the Southern Interior at mid elevations from 600 m to 900 m, and are found throughout the Okanagan–Similkameen, Thompson–Nicola, Boundary, Cariboo–Chilcotin, and East Kootenay regions.

Bluebunch Wheatgrass grasslands are mainly found in the Bunchgrass, Ponderosa Pine, and Interior Douglas-fir biogeoclimatic zones, but are sometimes found in the Montane Spruce and Engelmann Spruce–Sub-alpine Fir zones.

Bluebunch wheatgrass dominates this grassland community. Rough fescue may be mixed with bluebunch wheatgrass. On relatively cooler, moister sites, Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass. Note that Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys.

This grassland typically has five structural layers, including a limited shrub layer, tall grasses and forbs, medium grasses and forbs, low grasses and forbs not exceeding 5 cm, and biological crusts (mosses, lichens, and algae). Biological crusts are not as abundant in this grassland community as they are in the Lower Grasslands (Big Sagebrush, Bluebunch Wheatgrass and Antelope-Brush Bluebunch Wheatgrass communities), but still perform an important ecological role.

Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.



Typical Bluebunch Wheatgrass grassland community. PHOTO BRUNO DELESALLE



View overlooking the Lac du Bois Grasslands which span from Rough Fescue grasslands (Upper Grasslands – far left) through the Bluebunch Wheatgrass grasslands (Middle Grasslands – centre to right) to the Big Sagebrush, Bluebunch Wheatgrass grasslands (Lower Grasslands – far right to valley bottom). PHOTO ROBERT SCHEER



Big sagebrush, common rabbit-brush and other shrubs in Bluebunch Wheatgrass grasslands account for less than 5% of the plant cover. When the shrub layer increases significantly in this community, this possibly indicates extended fire suppression, overgrazing or other disturbance. PHOTO RICHARD DOUCETTE



Biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and ensuring soil stability. In Middle and Upper grasslands, biological crust cover often decreases significantly where bunchgrass plants are more tightly spaced and where litter cover is higher. Conversely, biological crusts may increase where increased site disturbance causes a reduction in bunchgrass and other plant cover, as well as a reduction in litter. This trend may serve as an early warning or indicator of over-grazing by wildlife or livestock. PHOTO BRIAN WIKEEM

Scoring This Grassland Community

This section takes you through the process of scoring your Bluebunch Wheatgrass grassland based on the five indicators:

- plant community composition
- plant community structure
- nutrient and hydrological cycling (litter and biological crusts)
- site stability (existing or potential erosion)
- invasive plants

The Grassland Assessment Score Sheet

The grassland assessment score sheet enables you to collect information in a consistent manner from one monitoring site to another and from one assessment period to another. Be sure to complete all information on the form.

Space is provided to record the site name, date, and exact location of your assessment (including GPS coordinates) **A**. Include information such as slope, aspect, and elevation. This information is important for relocating the monitoring site in the future and is helpful when comparing results from one management area to another.

Lines for comments are located near the top right of the score sheet **B** and below the work table on page 2 of the score sheet. Use these spaces to add information that may help you interpret what you are seeing. Also record any information that is not included in the questions, but may help you make management decisions in the future.

Sometimes a question may not seem to apply to your assessment area, or the answer may not agree with your experience or other observations. Record the answer as best you can, but elaborate with comments to explain why your response does not seem to work.

Before You Start

- 1 Select a monitoring site (see Chapter 4).
- 2 Mark or stake your site for future reference.
- 3 Select a blank score sheet (see Tab 8).
- 4 Fill in the top portion of your score sheet **A**.
- 5 Walk around the entire site. Tune your eye to the site and observe your grassland community.
- 6 Begin filling in your score sheet. The following sections explain how to score each indicator.

Top Portion of the Score Sheet

- Take time to fill in all information
What are your objectives?

Grassland Assessment Score Sheet ...PAGE 1 **A**

Date May 15, 2009 Site Pasture D Observer(s) Bill Ranger

Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350

Description Large pasture, 200 ha, rolling, varied terrain

Slope varied Aspect south Elevation 700m

Current Uses (circle): Livestock Recreation Wildlife Other

Management Objective(s) Increase Bunchgrass cover. Maintain or increase productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4

Grassland Type Bluebunch

Comments (weather, management changes) **B**
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%						
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%						
Assessed Cover Value	<u>36</u> %		<u>25</u>	10	0	= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<u><5</u> %	<u>2</u> %	YES <u>NO</u>
Tall Grasses and Forbs	<u>>40</u> %	<u>37</u> %	<u>YES</u> NO
Medium Grasses and Forbs	<u>1-20</u> %	<u>16</u> %	YES <u>NO</u>
Low Grasses and Forbs	<u>1-20</u> %	<u>10</u> %	YES <u>NO</u>
	<u>10-30</u> %	<u>10</u> %	YES <u>NO</u>

Reference Condition

Bluebunch Wheatgrass Grasslands

- Key bunchgrasses cover more than 50% of the site.
 - Site is dominated by bluebunch wheatgrass.
 - Rough fescue may be mixed with bluebunch wheatgrass.
 - Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass.
 - Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys.
- Big sagebrush and other shrubs, such as threetip sagebrush and common rabbit-brush account for less than 5% cover.
- Structural layers are unaltered from the Reference Condition and include:
 - 1 infrequent shrubs (less than 5% of cover)
 - 2 tall grasses and forbs
 - 3 medium grasses and forbs
 - 4 low grasses and forbs not exceeding 5 cm
 - 5 biological crusts
- Biological crusts (mosses, lichens, and algae) are common and make up 10% to 30% of the ground cover. Biological crusts play an important ecological function. When site disturbance

intensifies, bunchgrass, other plants and litter cover decrease, and may result is increased biological crusts.

- Litter weight is greater than 1000 kg/ha and litter cover is 75% or more of the ground surface.
- Stable soils show limited bare soil and soil disturbance. Erosion features and/or bare soil account for less than 10% of the ground surface.
- Invasive plants are not present or account for less than 1% cover on the site.

SCORE SHEET QUESTION 1

Accounts for 40%
of total score

SCORING KEY BUNCHGRASS COVER

What is the composition of your plant community?

The cover of key bunchgrasses provides an index of plant species composition and will help you assess the status of your grassland.

What to expect on your site in the Reference Condition

Key bunchgrasses cover more than 50% of the site.

- Site is dominated by bluebunch wheatgrass.
- Rough fescue may be mixed with bluebunch wheatgrass.
- Idaho fescue and rough fescue will occasionally co-dominate with bluebunch wheatgrass.
- Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys.

Step 1

List known bunchgrasses

List known bunchgrasses on the work table on page 2 of the score sheet **A**. If possible, document other plant species that occur on the site as well. This will save you time during the scoring procedure. This is especially important when the dominant bunchgrasses are limited or not present.

If some species are unfamiliar to you, collect a few specimens for later identification. See Appendix 2: *Collecting Plant Specimens for Later Identification*.

Identification Aid for Key Bunchgrasses



PHOTOS BRIAN WIKEEM

Bluebunch Wheatgrass	Idaho Fescue	Rough Fescue
Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass
Stems erect, 30–100 cm tall	Stems erect, 30–100 cm tall, visible nodes	Stems erect, 40–90 cm tall, no visible nodes
Leaves flat, branched, green to bluish green.	Leaves rough, fine, densely tufted, basal 15–25 cm high, light green to bluish green, brownish at base	Leaves rough, flat or folded, basal 10–60 cm high, dark green, purplish at base
Flowers a spike 8–16 mm long, usually without awns	Flowers an open panicle, 7–25 cm long, awns greater than 1.5 mm	Flowers an open panicle, 5–18 cm long, slightly purplish, awns less than 1.5 mm
Standing litter curled at top	Standing litter not curled	Standing litter not curled

Work Table on Page 2 of the Score Sheet

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Big sagebrush	} ² %
Common Rabbit Brush	%
	%
	%
Total Cover (All Shrubs Combined)	2 %
Tall Grasses & Forbs	
Bluebunch Wheatgrass	}35 %
Rough Fescue A	
Balsam Root	
	2 %
	%

Step 2

Determine the cover of key bunchgrasses

There are two ways to determine the cover of key bunchgrasses. You can list each bunchgrass in the work table **A**. Once you have identified your two or three key bunchgrasses, write down the percent cover of each in the work table **B**. Alternatively, you can estimate the total cover for all of the key bunchgrasses together and write that value in the grey "Total Cover" box **C**.

Use the grassland status photos opposite to assist you with the cover rating. Compare what you see to these photos and to the vegetation cover diagrams on the last page of this booklet.

	Total Cover (All Shrubs Combined)	2	%
Tall Grasses & Forbs			
Bluebunch Wheatgrass A	B	35	%
Rough Fescue			%
Balsam Root		2	%
	C		
	Total Cover (All Tall Grasses and Forbs Combined)	37	%
Medium Grasses & Forbs			
Idaho Fescue		1	%
June Grass		15	%

Step 3

Score plant community composition based on the cover of key bunchgrasses

First check the appropriate Reference Condition box (a. or b.) on your score sheet **D**. For this plant community check box a., as the Reference Condition is greater than 50% bunchgrass cover.

Next, write your assessed bunchgrass cover value on the score sheet **E**. Remember, your cover value should be representative of the entire assessment site. If you are using a 10 square meter area, or a pasture, ensure that you assess the average cover for the entire site. It is sometimes easier to assess a one square meter area and take several samples around the site or pasture. You would then average all your values and insert the average value on the score sheet.

Your assessed cover value will place you in one of the four categories listed opposite.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

D a. ☒ Booklet 1, 2, 5: Reference Condition >50% Assessed Cover Value >50% 35-50% 20-34% <20% SCORE

b. ☐ Booklet 3 or 4: Reference Condition >60% Assessed Cover Value >60% 40-60% 20-39% <20%

Assessed Cover Value **E** 36 % Points 40 25 10 0 = 25

2. Plant Community Structure (Booklets page 11)

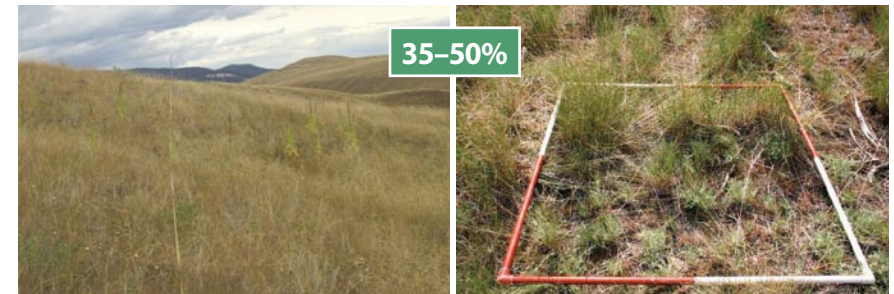
Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	2 %	YES NO
Tall Grasses and Forbs	>40 %	37 %	YES NO

Comparison of Grassland Status and Bunchgrass Cover



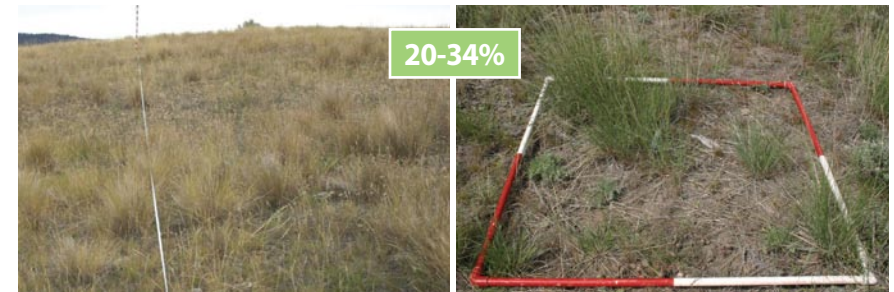
Reference Condition Landscape

Reference Condition Plot



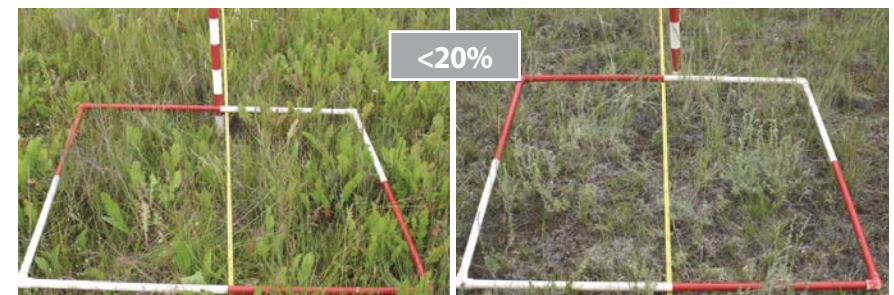
Slightly Altered Landscape

Slightly Altered Plot



Moderately Altered Landscape

Moderately Altered Plot



Greatly Altered Plot

Greatly Altered Plot

PHOTOS BRIAN WIKEM

Assessed Cover Values and Status

Category	Description	Bunchgrass Cover	Score
Reference Condition	The existing plant community closely resembles the Reference Condition. Evidence of disturbance is minimal.	> 50%	40
Slightly Altered	The existing plant community has been slightly altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs may be more abundant. Non-native species may be present but are infrequent.	35–50%	25
Moderately Altered	The existing community has been moderately altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs usually are more abundant. Non-native plant species may be common but native species are still present.	20–34%	10
Greatly Altered	The existing community has been significantly altered compared to the Reference Condition. Non-native species, native annuals, and low-growing native plants dominate the community.	< 20%	0

If your measurement falls on a threshold between two categories or is close to a threshold and you are finding it difficult to make a decision, always err on the side of caution: score to the lower category and record comment.

Select Your Cover Value

Your Assessed Bunchgrass Cover	> 50%	35–50%	20–34%	< 20%
Score	40	25	10	0

Step 4
Determine and enter the appropriate score on the score sheet **A**
Based on your assessed bunchgrass cover value **A**, circle and record your score on the score sheet **B**.

...use productivity and forage.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.					
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35–50% A	<34%	<20%
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40–60%	20–39%	<20%
Assessed Cover Value	36 %	Points	40	25	10 0
					SCORE = 25 B
2. Plant Community Structure (Booklets page 11)					

Step 5
Write comments for future reference

Write any additional comments on page 2 of the score sheet for future reference. The most important indicators of change are:

- A decline in cover of the dominant bunchgrasses.
- An increase in cover of low grasses and forbs relative to the tall and mid layers. Low-growing bunchgrasses and forbs, such as Sandberg’s bluegrass and pussytoes are often more abundant as disturbance increases.
- An increase in the shrub layer— sagebrush and common rabbit-brush and wild rose—may indicate disturbance or the lack of fire. In the Reference Condition, shrubs should account for less than 1% of the plant cover.

SCORING PLANT COMMUNITY STRUCTURE

Do you have the expected plant layers?

This question focuses on the physical structure of the plant layers found in the Bluebunch Wheatgrass grasslands. Changes are determined by comparing the structure of the existing plant community to the Reference Condition.

What to expect on your site in the Reference Condition:

- Big sagebrush and other shrubs, such as threetip sage brush and common rabbit-brush, account for less than 5% of the vegetation cover.
- Five structural layers (see illustration next page) are present including:
 - infrequent shrubs—less than 5% of cover
 - tall grasses and forbs
 - medium grasses and forbs
 - low grasses and forbs not exceeding 5 cm
 - biological crusts
- Biological crusts (mosses, lichens, and algae) are common and make up 10 to 30% of the ground cover. Biological crusts may vary significantly depending on plant and litter cover, decreasing where bunchgrass plants are more tightly spaced and where litter cover is high.

When site disturbance increases, bunchgrass and other plant cover, as well as litter content, decrease. The result may be an increase in biological crusts.

SCORE SHEET
QUESTION 2

Accounts for 10%
of total score

Above ground structure
protects the soil against
wind, rain and heat from
the sun, and supplies
habitat for wildlife.

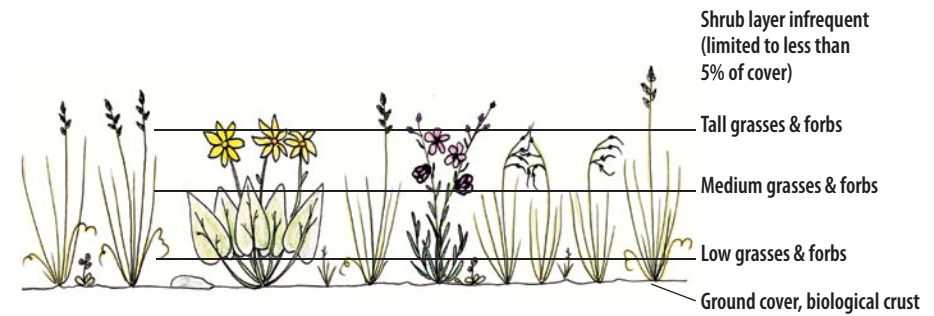
Commonly Occurring Species

Bluebunch Wheatgrass grassland community

Plant Layer	Plant Species
 Shrubs (infrequent) <ul style="list-style-type: none"> • big sagebrush* • common rabbit-brush • threetip sagebrush • prickly rose • saskatoon 	
  Tall Grasses and Forbs <ul style="list-style-type: none"> • bluebunch wheatgrass* • arrowleaf balsamroot* • rough fescue • lemonweed • alfalfa (non-native species) 	
  Medium Grasses and Forbs <ul style="list-style-type: none"> • Idaho fescue* • junegrass • needle-and-thread grass • yarrow* • pasture sage • daisies and fleabanes • asters • milkvetches 	
  Low Grasses and Forbs <ul style="list-style-type: none"> • Sandberg's bluegrass* • small-flowered blue-eyed Mary • pussytoes* • cheatgrass (invasive species) • common dandelion (non-native species) 	
  Biological Crusts <p>mosses, lichens, and algae*</p>	

* shown in photos

Structural Layers for Bluebunch Wheatgrass



Step 1

List species

Refer to your list of species on the work table on page 2 of the score sheet. Add any additional plants you observe within each layer. Refer to the list of commonly occurring species opposite.

Step 2

Assess structural layers

Using the work table, assess existing structural layers. Refer to the structural layer changes shown in the drawings on the next page, and to the cover diagrams on the last page of this booklet to determine a cover value for each layer.

Grassland Assessment Score Sheet ...PAGE 2		GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA
Plant Community Work Table		
Shrubs Identified	Estimated Percent Cover	
Big sagebrush	}	2 %
Common Rabbit Brush		%
		%
		%
Total Cover (All Shrubs Combined)	2	%
Tall Grasses & Forbs		
Bluebunch Wheatgrass	}	35 %
Rough Fescue		%
Balsam Root		2 %
		%
Total Cover (All Tall Grasses and Forbs Combined)	37	%
Medium Grasses & Forbs		
Idaho Fescue		1 %
June Grass	}	15 %

Categories of Structural Layer Changes

1 Reference Condition:
All layers as expected are present



Tall grass layer
absent



2 Slightly Altered:
One layer is absent or altered

Tall and medium
grass layers absent



3 Moderately Altered:
Two layers are absent or altered

Tall and medium grass and forb layers
absent or declining, low grasses declining



4 Greatly Altered:
Three layers are absent or altered

Note: If shrub layer increases over time and is more than 5% cover, it constitutes an altered layer.

Expected Layers in the Reference Condition

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	absent–trace	frequent–abundant	trace–infrequent	trace–infrequent	infrequent–common
Reference Cover Value	< 5%	> 40%	1–20%	1–20%	10–30%

Step 3

Score plant community structure

Score plant community structure based on existing plant layers. Write in the Reference Condition for each layer on score sheet **A**.

- Shrubs = 0 to 5% cover
- Tall Grasses and Forbs = greater than 40% cover
- Medium Grasses and Forbs = 1 to 20% cover
- Low Grasses and Forbs = 1 to 20% cover
- Biological Crusts = 10 to 30% cover

Enter your assessed cover value for each layer on the score sheet **B**.

Booklet 3 or 4: Reference Condition >60%		Assessed Cover value					
Assessed Cover Value	36 %	Points	40	25	10	0	= 25

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers			
Shrubs	A <5 %	B 2 %	YES C NO			
Tall Grasses and Forbs	>40 %	37 %	YES NO			
Medium Grasses and Forbs	1–20 %	16 %	YES NO			
Low Grasses and Forbs	1–20 %	10 %	YES NO			
Biological Crust	10–30 %	10 %	YES NO			
Total Number of Altered Layers	0	1	2	3	4 or 5	
Points	10	6	2	1	0	= 6 E

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Step 4

Assess whether layer is altered or not

For each layer, assess whether it is altered or not altered. Circle YES or NO on your score sheet **C**. Circle the number of altered layers in the appropriate box on the score sheet **D**.

Step 5

Enter score and additional comments

Score your plant community structure. The number of altered layers will determine your score. Enter the score in the grey box on the score sheet **E**. Write any additional comments on the work table on page 2 of the score sheet for future reference.

Structural plant layers in the existing plant community are compared to the Reference Condition. A structural layer is considered altered when its cover no longer falls within the expected range for the Reference Condition.

SCORE SHEET QUESTION 3

*Accounts for 24%
of total score*

SCORING NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

Litter is an important indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, promote infiltration into the soil, and regulate heat on the soil surface.

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down. When collecting litter, collect all litter found within your plot.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate the site.
- Litter cover is uniform on the site.
- Litter matter consists of dead plant material on the soil surface and within plants.
- Litter weight is greater than 1000 kg/ha. Litter weight may vary from 1000–2000 kg/ha.
- Litter covers 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil accounts for less than 10% of the ground surface or site.

Scoring in this section is divided into two components:

- Assessing litter weight
- Assessing the cover of litter and biological crusts

Both litter and biological crusts are measured together. An increase in litter weight and cover over the site often results in a decrease in crust cover—there is less open space for the crusts to establish.

The Importance of Litter



Litter is the key indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, and promote infiltration into the soil. It also regulates heat on and below the soil surface. It slows down soil heating and helps the soil to cool more quickly, reducing moisture loss.



Typical Reference Condition
for Bluebunch Wheatgrass
grassland community. PHOTO
BRIAN WIKHEEM



Biological crusts play an
important role in moisture
retention and soil stability.
PHOTO BRIAN WIKHEEM

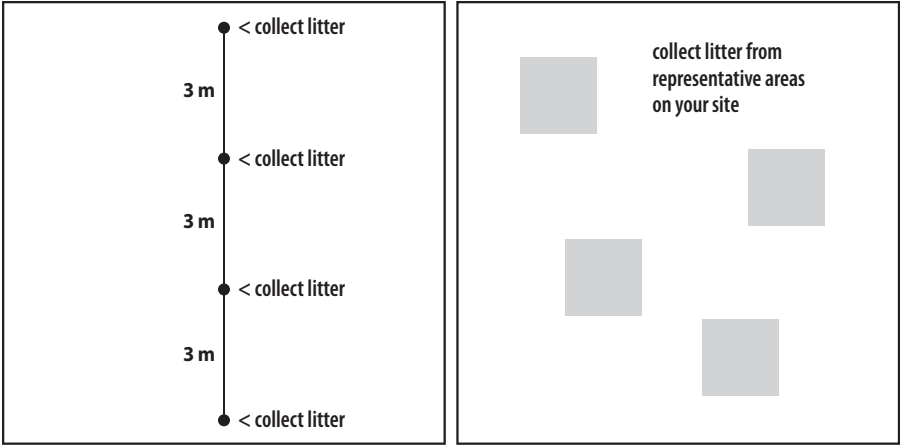
Step 1 Hand rake and assess litter

Litter weight is estimated by hand-raking litter from a 0.25 m² area or within a plot frame. The litter will be either weighed or compared to the photographs on page 19.

Collect three to five samples from representative areas on the site. Remember your site should be 5 to 10 m square. If you have a larger site you may require more samples.

If you installed transects, hand-rake litter from a 0.25 m² area or plot every 3 to 5 m along the transect.

Options for Collecting Litter



Ziplock bags are handy for storing individual litter samples. Prepare litter bags ahead of time for easy reference in the field. See Appendix 3.

Step 2
Compare your samples to the Reference Condition
Compare your samples to the thresholds shown on page 19. Determine which litter weight category most closely resembles your sample. List your samples in the work table. Take an average of all samples on the site.

Step 3
Score litter weight
Write in the Reference Condition for litter weight on the score sheet. In this case it is greater than 1000 kg/ha **A**.

Write in your assessed litter weight on the score sheet **B**.
Your litter weight will fall within one of the four categories shown on the chart opposite. The second column of the chart converts litter weight into a percent of the Reference Condition, and the third column shows the corresponding score.

Using this chart, determine your score and circle it on the score sheet **C**, then enter the score in box A to the right **D**.

The score sheet converts litter weights into values that are relative to the Reference Condition. This conversion was necessary to standardize the score sheet for all plant communities.

Total Number of Altered Layers	0	1	2	1	0	=	6
Points	10	6	2	1	0		

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight							
Reference Condition	A 1000 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%	
Assessed Litter Weight	B 450 kg/ha	Points	14	8	C 2	0	D 2
Litter Cover and Biological Crust Cover							
Assessed Litter Cover	30 %		≥75%	25-74%	25-74%	<25%	<25%

Litter Weight Thresholds
Bluebunch Wheatgrass grassland community

Reference Condition is >1000kg/ha



PHOTOS: KEN MACKENZIE

Your Assessed Litter Weight	Conversion to % of Reference Condition (relative values)	Score
>1000 kg/ha	>100%	15
1000 to 500 kg/ha	50–100%	8
250 to 499 kg/ha	25–49%	2
< 250 kg/ha	< 25%	0

If your assessment falls on or is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

Step 4

Assess litter and biological crust cover

First, make a visual estimate of litter cover. How much ground is covered by litter? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help estimate litter cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed litter cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Next, assess biological crust cover. Make a visual estimate of biological crust cover. How much ground is covered by biological crusts? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help you estimate biological crust cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed biological crust cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Biological crusts play an important role in moisture retention and soil stability. Biological crusts are not considered bare soil.

Points		10		8		6		4		2		0	
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)													
Litter Weight													
Reference Condition	1000 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%							
Assessed Litter Weight	450 kg/ha	Points	14	8	2	0	A	2					
Litter Cover and Biological Crust Cover													
Assessed Litter Cover	30 %	≥75%	25-74%	25-74%	<25%	<25%							
Assessed Biological Crust Cover	10 %	0-100%	>25%	<25%	>25%	<25%							
Points	10	8	4	2	0	B	4						
Total A + B							6						
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)													

Step 5

Score litter and biological crust cover

Both litter and biological crust cover are interrelated and thus are scored together. Check your assessment values carefully before scoring. See *Scoring Tip* below. Record your score on the score sheet **C**.

Add A and B to get total score **D**.

Write any additional comments on the work table for future reference.

Scoring Tip

Both litter and biological crusts are measured together. This is important. For example:

- If litter is high, greater than or equal to 75%, you will get full points, regardless of biological crust cover.
- If litter is moderate, 25 to 74% and biological crust cover is less

3. Nutrient and Hydrological Cycling

Litter Weight							A
Reference Condition _____	kg/ha	% of Reference	>100%	50-99%	25-49%	<25%	
Assessed Litter Weight _____	kg/ha	Points	14	8	2	0	
Litter Cover and Biological Crust Cover							B
Assessed Litter Cover _____	%	≥75%	25-74%	25-74%	<25%	<25%	
Assessed Biological Crust Cover _____	%	0-100%	>25%	<25%	>25%	<25%	
	Points	10	8	A 4	B 2	C 0	

4. Site Stability

than 25%, your score will be 4 **A**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover less than 25% of your site.

- If litter is low, less than 25%, and biological crust cover is more than 25%, your score will be 2 **B**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover more than 25% of your site. This site may be recovering.
- If litter is low, less than 25%, and biological crust cover is low, less than 25%, your score will be 0 **C**. Litter is sparse, patchy, and decaying organic material is the main type of litter on the soil surface. Most of the existing litter is in the plant.

As part of your estimate, include litter standing within living plants and decomposing litter on the soil surface. Look closely for lichens, mosses, and algae. When the soil is dry, they can be inconspicuous and hard to identify.

SCORING SITE STABILITY

Is there existing or potential erosion on site?

Site stability is determined by assessing the total amount of bare soil and erosion on the site caused by wind and water. Bare soil is defined as mineral soil—soil particles less than 5 mm—not covered by live plants, litter, or biological crusts. Particles greater than 5 mm, such as stones and bedrock, should not be included in the bare soil cover estimate. Erosion occurs when there is actual loss of soil particles from a site.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate, and litter cover is uniform on the site.
- Litter covers 75% or more of the ground surface.
- Biological crusts cover 25 to 60% or more of the ground surface.
- Soils are stable with limited bare soil or soil disturbance. Bare soil does not exceed 5% cover.
- Erosion features are limited and do not exceed 5% cover. (Together, erosion features and/or bare soil cover less than 10% of the ground surface.)

SCORE SHEET QUESTION 4

Accounts for 16% of total score

Erosion



PHOTO BRIAN WIKHEEM

This indicator is scored in two parts:

- Assess the cover of bare soil
- Assess the cover of erosion features

Step 1

Estimate area covered by bare soil

Estimate the percentage of the soil surface on your site that is covered by bare soil. Use the cover diagrams on the last page of this booklet to assist you in determining whether cover is greater or less than the threshold values.

The Reference Condition is already identified for you on the score sheet. Reference condition for bare soil is the same for all grasslands plant communities—less than 5%.

Write your assessed cover value for bare soil **A** and record your score on the score sheet **B**.

	Points	10	8	6	4	2	0	B
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)								
Bare Soil: Reference Condition <5%								
Assessed Bare Soil Cover 5 %	Points	8	6	3	0			6
Erosion Features: Reference Condition <5%								
Assessed Erosion Cover 5 %	Points	8	6	3	0			8
								14
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)								
Reference Condition 0%								
Assessed Cover 1 %	Points	5	3	1	0			3

Step 2

Estimate area covered by erosion features

Estimate the cover of the erosion features on site. Use the cover diagrams on the last page of this booklet to determine whether the cover is greater or less than the erosion threshold values listed.

The Reference Condition is already identified for you on the score sheet. Reference Condition for erosion features are the same for all grasslands plant communities—less than 5%.

Examples of Soil Disturbance and Erosion



Bare Soil



Soil Movement



Lichen Line



Erosion Pavement



Pedestal – Exposed Roots



Rills



Gully



Undercutting

PHOTOS BRIAN WIKHEEM

Write your assessed cover value for erosion **A** and record your score on the score sheet **B**.

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)		Total A + B = 6	
Bare Soil: Reference Condition <5%		<5%	5-10%
Assessed Bare Soil Cover <u>5</u> %	Points 8	<u>6</u>	3
Erosion Features: Reference Condition <5%		<5%	5-10%
Assessed Erosion Cover <u><5</u> %	Points <u>8</u>	6	3
		Total A + B = 14	
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)			
Reference Condition 0%		<1%	1-10%
Assessed Cover <u><1</u> %	Points 5	<u>3</u>	1
		Total A + B = 3	

Step 3

Record total score for site stability **C**

Write any additional comments on the work table for future reference.

The following indicators suggest active or potential soil disturbance and increased susceptibility to erosion:

- Reduced litter cover and increased bare soil.
- Evidence of soil movement such as flow patterns on the surface, fan deposits, and rills.
- Evidence of soil loss such as pedestalled plants with exposed roots, exposed gravel on the soil surface, lichen lines on rocks, and wind scouring of exposed soil.
- Physical disturbance such as hoof shearing, trails, and compaction.

Look closely at the soil surface. Be aware that mosses and lichens are protecting the soil surface and should not be considered part of bare soil. Erosion features may be active or healing, and both types are included as erosion. Although numerous features signify erosion (see previous page), the combination of all features present on the site is collectively considered in scoring this indicator.

Most erosion and bare soil in the Reference Condition is restricted to areas with small mammal, bird or insect activity.

SCORING INVASIVE PLANTS

Are invasive plants present on this site?

The cover and distribution of invasive plants are indicators of the status of your grassland.

Invasive plants occupy grasslands because they out-compete native plants. Where disturbance has created available space and conditions for seed germination, invasive species thrive. Some species, such as diffuse and spotted knapweed, can dominate grasslands and persist for decades. As a result, forage values and species diversity on these sites are often much lower than would be expected in native plant communities.

SCORE SHEET QUESTION 5

Accounts for 10% of total score



Invasive plant, Dalmatian Toadflax.
PHOTO BRIAN WIKKEEM

The presence of invasive plants on grasslands is generally considered a risk even though the actual effects of some species are unknown. All invasive plants considered for this indicator are non-native species to British Columbia. Assessing this indicator requires some knowledge of the common invasive plants listed on page 27.

What to expect on your site in the Reference Condition:

- Limited bare soil or soil disturbance.
- Little or no erosion features.
- No invasive plants present.

Document as many invasive plant species as possible. This is especially important when they are abundant. If a species is unfamiliar to you, collect a specimen for later identification. If possible, document their origin.

Step 1

Search the site for invasive plants

If invasive plants are widely dispersed on the site in numerous patches, divide the monitoring site into smaller areas to more accurately estimate total cover and distribution.

List all known invasive plant species in the work table **A**.

Total Cover (All Low Grasses and Forbs Combined)		10 %
Biological Crust <input checked="" type="checkbox"/>	Total Biological Crust Cover	10
Invasive Plants		
A Knapweed - one patch		<1 %
		%
		%
		%

Step 2

Score invasive plant cover

Determine the combined cover of all invasive plants using the diagrams on the next page.

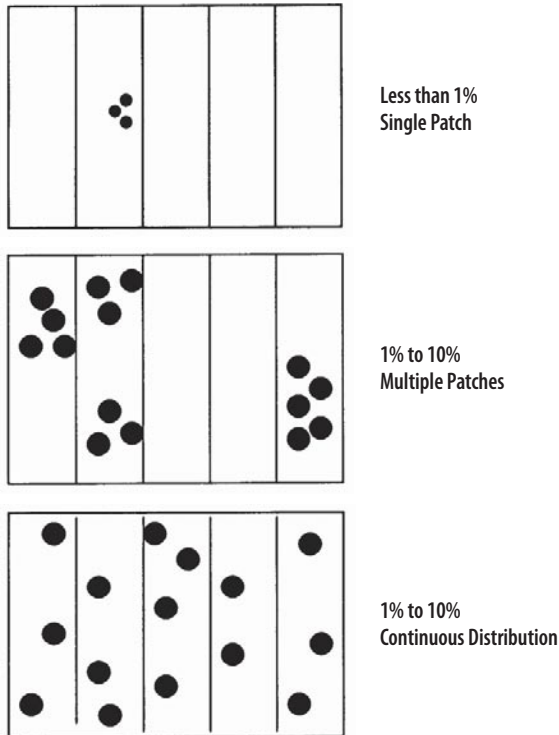
The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant cover is the same for all grasslands plant communities—0%.

Assessed Erosion Cover <u><5</u> %		Points 8	6	3	0	B 8
		Total A + B = 14				
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						
Reference Condition 0%		0	<1%	1-10%	>10%	
Assessed Cover <u><1</u> %	Points 5	<u>3</u>	1	0	A 3	C
Assessed Distribution		None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
	Points 5	<u>3</u>	1	0	B 3	
		Total A + B = 6				
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						
		57				

Write your assessed cover value for invasive plants **B** and record your score on the score sheet **C**.

Plant and Distribution Diagram for Invasive Plants

Note that one column = 20% of total area. For general cover diagrams see the last page of this booklet.



Invasive plants often establish on disturbed areas that have bare soils. Check small mammal diggings, trails, salting areas, and around corrals and gates for invasive plants. Inspect all salting areas and corrals within the pasture being surveyed even if these areas are not within the actual monitoring site.

Step 3

Determine the distribution of invasive plants on the site **A**

The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant distribution is the same for all grasslands plant communities—None.

Circle your assessed distribution for invasive plants **B** and record your score on the score sheet **C**.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover	<1%	Points 5	3	1	0
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
Points	5	3	1	0	
Total A + B					6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					57

Common Invasive Plants in British Columbia

from *Forest and Range Practices Act Invasive Plant Regulation*

Species	Scientific Name
Anchusa	<i>Anchusa officinalis</i>
Blueweed	<i>Echium vulgare</i>
Bulbous bluegrass	<i>Poa bulbosa</i>
Bull thistle	<i>Cirsium vulgare</i>
Cheatgrass	<i>Bromus tectorum</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Hoary alyssum	<i>Berteroa incana</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Leafy spurge	<i>Euphorbia esula</i>
Meadow hawkweed	<i>Hieracium pilosella</i>
Meadow knapweed	<i>Centaurea pratensis</i>
Nodding thistle	<i>Carduus nutans</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Perennial pepperweed	<i>Lepidium latifolium</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Puncture vine	<i>Tribulus terrestris</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scentless chamomile	<i>Matricaria maritima</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Teasel	<i>Dipsacus fullonum</i>
Yellow toadflax	<i>Linaria vulgaris</i>

Moist sites only

Canada thistle	<i>Cirsium arvense</i>
Common burdock	<i>Arctium minus</i>

Salty sites only

Hoary cress	<i>Cardaria draba</i>
-------------	-----------------------

For more information see *Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia*, available through the Ministry of Agriculture and Lands.

Step 4

Enter combined cover and distribution on score sheet

Enter the total of A and B on the score sheet **A**.

Write any additional comments on the work sheet for future reference.

Assessed Erosion Cover	<5%	Points	8	6	3	0	B	8
							Total A + B	= 14
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)								
Reference Condition 0%	0	<1%	1–10%	>10%				
Assessed Cover	<1%	Points	5	3	1	0	A	3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous				
	Points	5	3	1	0	B	3	
							Total A + B	= 6 A
Add scores from all five categories (= grey boxes) to get TOTAL SCORE								57

DETERMINING YOUR TOTAL SCORE

Add the scores for all questions and write your total in the “Total Score” box at bottom of score sheet **B**.

Assessed Distribution	None	scattered individuals	1	0	B	3
Points	5	3	1	0	Total A + B	= 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						57 B
C Grassland Status (circle one):	Reference 76–100%	Slightly Altered 51–75%	Moderately Altered 26–50%	Greatly Altered 0–25%		
D Apparent Trend (circle one):	Upward	Downward	Stable	Unknown		

Assess Grassland Status

Based on your score, circle one of four grassland status ranges. Your assessment is complete **C**.

Assessing Apparent Trend

In addition to the five main indicators for grassland assessment, consider the features in the table opposite in order to assess apparent trend. Each feature describes possible grassland conditions that suggest that a downward, stable, or upward trend.

To record your assessment, circle the appropriate category on the last line of the score sheet **D**.

It is important to remember that apparent trend is a one time assessment based on your current observations. In future years, when you combine these results with assessments from the past, you will get important trend information and results.

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal colour, seed production; plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Your site assessment is now complete. Ensure your score sheet is completely filled out and that you have recorded all the necessary notes and comments that will assist you with future management decisions.

Photo-Point Monitoring

Your next step is to complete photo-point monitoring, Chapter 6.

Photographic records are an important part of monitoring your grassland. Photo-point monitoring provides an effective visual tool for comparison of the grassland community.

Score Sheet Sample – Page 1

Grassland Assessment Score Sheet ...PAGE 1

Date May 15, 2009 Site Pasture D Observer(s) Bill Ranger
 Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350
 Description Large pasture, 200 ha, rolling, varied terrain
 Slope varied Aspect south Elevation 700m
 Current Uses (circle): Livestock Recreation Wildlife Other _____
 Management Objective(s) Increase Bunchgrass cover. Maintain or increase productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4Grassland Type Bluebunch
Wheatgrass grassland

Comments (weather, management changes) _____
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	<u>35-50%</u>	20-34%	<20%	SCORE
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	<u>40-60%</u>	20-39%	<20%	
Assessed Cover Value	<u>36</u> %	Points	40	<u>25</u>	10	0
						= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers			
Shrubs	<5 %	2 %	YES <u>NO</u>			
Tall Grasses and Forbs	>40 %	37 %	<u>YES</u> NO			
Medium Grasses and Forbs	1-20 %	16 %	YES <u>NO</u>			
Low Grasses and Forbs	1-20 %	10 %	YES <u>NO</u>			
Biological Crust	10-30 %	10 %	YES <u>NO</u>			
Total Number of Altered Layers	0	1	2			
Points	10	6	2			
				3	4 or 5	= 6

3. Nutrient and Hydrological Cycling (Booklets 1-4 page 16; Booklet 5 page 18)

Litter Weight					
Reference Condition	<u>1000</u> kg/ha	% of Reference	>100%	50-99%	<u>25-49%</u>
Assessed Litter Weight	<u>450</u> kg/ha	Points	14	8	<u>2</u>
Litter Cover and Biological Crust Cover					
Assessed Litter Cover	<u>30</u> %	≥75%	25-74%	<u>25-74%</u>	<25%
Assessed Biological Crust Cover	<u>10</u> %	0-100%	>25%	<u><25%</u>	>25%
Points	10	8	<u>4</u>	2	0
Total A + B = <u>6</u>					

4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%					
Assessed Bare Soil Cover	<u>5</u> %	Points	8	<u>6</u>	3
Erosion Features: Reference Condition <5%					
Assessed Erosion Cover	<u><5</u> %	Points	<u>8</u>	6	3
Total A + B = <u>14</u>					

5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)

Reference Condition 0%					
Assessed Cover	<u><1</u> %	Points	5	<u>3</u>	1
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
Points	5	<u>3</u>	1	0	
Total A + B = <u>6</u>					
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					
<u>57</u>					

Grassland Status (circle one):	Reference 76-100% <u>Slightly Altered 51-75%</u>	Moderately Altered 26-50%	Greatly Altered 0-25%
Apparent Trend (circle one):	Upward	Downward	<u>Stable</u>

Score Sheet Sample – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

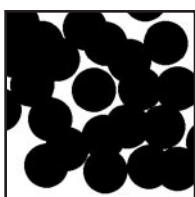
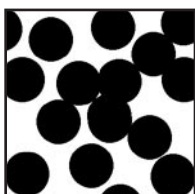
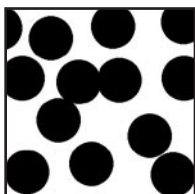
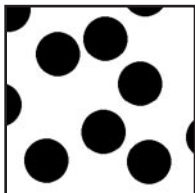
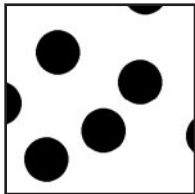
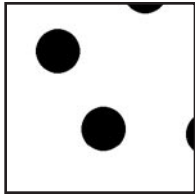
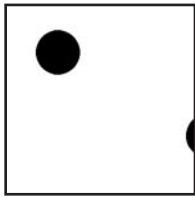
Shrubs Identified	Estimated Percent Cover
<u>Big sagebrush</u>	<u>2</u> %
<u>Common Rabbit Brush</u>	%
	%
	%
Total Cover (All Shrubs Combined)	<u>2</u> %
Tall Grasses & Forbs	
<u>Bluebunch Wheatgrass</u>	<u>35</u> %
<u>Rough Fescue</u>	%
<u>Balsam Root</u>	<u>2</u> %
	%
Total Cover (All Tall Grasses and Forbs Combined)	<u>37</u> %
Medium Grasses & Forbs	
<u>Idaho Fescue</u>	<u>1</u> %
<u>June Grass</u>	<u>15</u> %
<u>Pasture Sage</u>	%
	%
Total Cover (All Medium Grasses and Forbs Combined)	<u>16</u> %
Low Grasses & Forbs	
<u>Sandberg's Bluegrass</u>	%
<u>Forbs</u>	%
	%
	%
Total Cover (All Low Grasses and Forbs Combined)	<u>10</u> %
Biological Crust <input checked="" type="checkbox"/>	
Total Biological Crust Cover	
<u>10</u>	
Invasive Plants	
<u>Knapweed - one patch</u>	<u><1</u> %
	%
	%
	%
Total Cover (All Invasive Plants Combined)	<u><1</u> %

Comments

Very dry spring
Litter cover approx. 30%
Bare soil 5%
Little or no erosion
Stable

Cover Diagrams for Plant Community Cover

Large



5% Cover

10% Cover

20% Cover

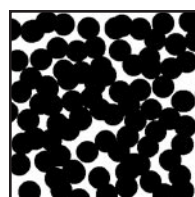
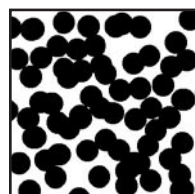
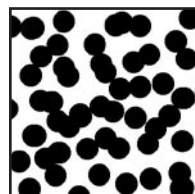
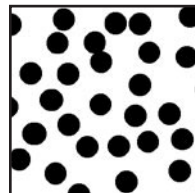
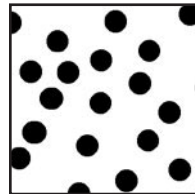
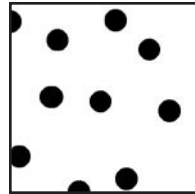
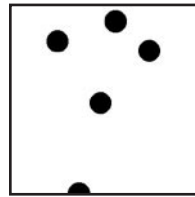
30% Cover

50% Cover

60% Cover

75% Cover

Small



Rough Fescue Grasslands (UPPER GRASSLANDS)



Rough Fescue Grasslands

Rough Fescue grasslands are common throughout the Southern Interior at mid to high elevations from 900 m to 1200 m and are found throughout the Okanagan–Similkameen, Thompson–Nicola, Boundary, and East Kootenay regions.

Rough Fescue grasslands are mainly found in the Interior Douglas-fir biogeoclimatic zones with some limited occurrences in the Bunchgrass and Ponderosa Pine zones.

This grassland community is dominated by rough fescue. Bluebunch wheatgrass may be mixed with rough fescue on south-facing slopes or on drier sites. On relatively drier sites, bluebunch wheatgrass will co-dominate with rough fescue. Note that Idaho fescue may become the dominant bunchgrass on some sites, particularly in the Similkameen and Okanagan valleys at lower elevations.

This grassland community typically has five structural layers, including a limited shrub layer, tall grasses and forbs, medium grasses and forbs, low grasses and forbs not exceeding 5 cm (including sedges and rushes), and biological crusts (mosses, lichens, and algae). Biological crusts are not as abundant in this grassland community as in the Lower Grasslands (Big Sagebrush, Bluebunch Wheatgrass and Antelope-brush Bluebunch Wheatgrass communities), but still perform an important ecological role.



Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.

Typical Rough Fescue grassland community.
PHOTO BRIAN WIKHEEM



Biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and ensuring soil stability. In Middle and Upper grasslands, biological crust cover often decreases significantly where bunchgrass plants are more tightly spaced and where litter cover is higher. Conversely, biological crusts may increase where increased site disturbance causes a reduction in bunchgrass and other plant cover, as well as a reduction in litter. This trend may serve as an early warning or indicator of over-grazing by wildlife or livestock. PHOTO BRIAN WIKKEEM



Rough fescue

Scoring This Grassland Community

This section takes you through the process of scoring your Rough Fescue grassland based on the five key indicators:

- plant community composition
- plant community structure
- nutrient and hydrological cycling (litter and biological crusts)
- site stability (existing or potential erosion)
- invasive plants

The Grassland Assessment Score Sheet

The grassland assessment score sheet enables you to collect information in a consistent manner from one monitoring site to another and from one assessment period to another. Be sure to complete all information on the form.

Space is provided to record the site name, date, and exact location of your assessment (including GPS coordinates) **A**. Include information such as slope, aspect, and elevation. This information is important for relocating the monitoring site in the future and is helpful when comparing results from one management area to another.

Lines for comments are located near the top right of the score sheet **B** and below the work table on page 2 of the score sheet. Use these spaces to add information that may help you interpret what you are seeing. Also record any information that is not included in the questions, but may help you make management decisions in the future.

Sometimes a question may not seem to apply to your assessment area, or the answer may not agree with your experience or other observations. Record the answer as best you can, but elaborate with comments to explain why your response does not seem to work.

Before You Start

- 1 Select a monitoring site (see Chapter 4).
- 2 Mark or stake your site for future reference.
- 3 Select a blank score sheet (see Tab 8).
- 4 Fill in the top portion of your score sheet **A**.
- 5 Walk around the entire site. Tune your eye to the site and observe your grassland community.
- 6 Begin filling in your score sheet. The following sections explain how to score each indicator.

Walk around the entire site. Observe your grassland community. Tune your eye to the site.

Top Portion of the Score Sheet

- Take time to fill in all information
What are your objectives?

Grassland Assessment Score Sheet ...PAGE 1 **A**

Date May 15, 2009 Site Pasture E Observer(s) Bill Ranger

Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350

Description Large pasture, 150 ha with significant variation

Slope variable Aspect south/north Elevation 1000-1100m

Current Uses (circle): Livestock Recreation Wildlife Other

Management Objective(s) Increase Bunchgrass cover - mainly R. fescue. Maintain current productivity/forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☐ 1,2,5 or ☒ 3,4

Grassland Type Rough fescue

Comments (weather, management changes) A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th. **B**

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%						
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%			<u>40-60%</u>	20-39%	<20%	
Assessed Cover Value <u>42</u> %	Points	40	<u>25</u>	10	0	= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	<u>2</u> %	YES <u>NO</u>
Tall Grasses and Forbs	>50 %	<u>42</u> %	YES <u>NO</u>
Medium Grasses and Forbs	6-40 %	<u>15</u> %	YES <u>NO</u>
		<u>10</u> %	YES <u>NO</u>

Reference Condition

Rough Fescue Grasslands

- Key bunchgrasses cover more than 60% of the site.
 - Site is dominated by rough fescue.
 - Bluebunch wheatgrass may be mixed with rough fescue on south-facing slopes and on drier sites. On dry south-facing slopes, bluebunch wheatgrass may dominate the site.
 - Rough fescue will co-dominate with Idaho fescue on some sites, particularly in the Similkameen and Okanagan valleys. On some sites Idaho fescue may become the dominant bunchgrass.
- Shrubs, such as common rabbit-brush and wild rose, are trace and account for less than 5% of the vegetation cover.
- Structural layers are unaltered from the Reference Condition and include:
 - 1 a limited shrub layer (less than 5% of cover)
 - 2 tall grasses and forbs
 - 3 medium grasses and forbs
 - 4 low grasses and forbs not exceeding 5 cm (including sedges and rushes)
 - 5 biological crusts

- Biological crusts (mosses, lichens, and algae) account for 10% to 30% of the ground cover. Biological crusts may vary significantly, depending on plant and litter cover. When site disturbance increases, bunchgrass and other plant cover, as well as litter will decrease, and may result in increased biological crusts.
- Litter weight is greater than 2000 kg/ha and litter cover is 75% or more of the ground surface.
- Stable soils show limited bare soil and soil disturbance. Erosion features and/or bare soil account for less than 10% of the ground surface.
- Invasive plants are not present or account for less than 1% cover on the site.

SCORE SHEET QUESTION 1

*Accounts for 40%
of total score*

SCORING KEY BUNCHGRASS COVER

What is the composition of your plant community?

The cover of key bunchgrasses provides an index of plant species composition and will help you assess the status of your grassland.

What to expect on your site in the Reference Condition:

Key bunchgrasses cover more than 50% of the site and on some sites may exceed 90%.

- Site is dominated by rough fescue.
- Bluebunch wheatgrass may be mixed with rough fescue on south-facing slopes and on drier sites. On dry south-facing slopes, bluebunch wheatgrass may occasionally dominate the site.
- Rough fescue will co-dominate with Idaho fescue on some sites, particularly in the Similkameen and Okanagan valleys. On some sites Idaho fescue may become the dominant bunchgrass.

Step 1

List known bunchgrasses

List known bunchgrasses on the work table on page 2 of the score sheet **A**. If possible, document other plant species that occur on the site as well. This will save you time during the scoring procedure. This is especially important when the dominant bunchgrasses are limited or not present.

If some species are unfamiliar to you, collect a few specimens for later identification. See Appendix 2: *Collecting Plant Specimens for Later Identification*.

Identification Aid for Key Bunchgrasses



PHOTOS BRIAN WIKHEIM

Rough Fescue	Bluebunch Wheatgrass	Idaho Fescue
Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass
Stems erect, 40–90 cm tall, no visible nodes	Stems erect, 30–100 cm tall	Stems erect, 30–100 cm tall, visible nodes
Leaves rough, flat or folded, basal 10–60 cm high, dark green, purplish at base	Leaves flat, branched, green to bluish green.	Leaves rough, fine, densely tufted, basal 15–25 cm high, light green to bluish green, brownish at base
Flowers an open panicle, 5–18 cm long, slightly purplish, awns less than 1.5 mm	Flowers a spike 8–16 mm long, usually without awns	Flowers an open panicle, 7–25 cm long, awns greater than 1.5 mm
Standing litter not curled	Standing litter curled at top	Standing litter not curled

Work Table on Page 2 of the Score Sheet

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Big sagebrush	%
Wild rose	%
	%
	%
Total Cover (All Shrubs Combined)	2 %
Tall Grasses & Forbs	
Rough Fescue	35 %
Bluebunch Wheatgrass A	5 %
Lupine	2 %
	%

Step 2

Determine the cover of key bunchgrasses

There are two ways to determine the cover of key bunchgrasses. You can list each bunchgrass in the work table **A**. Once you have identified your two or three key bunchgrasses, write down the percent cover of each in the work table **B**. Alternatively, you can estimate the total cover for all of the key bunchgrasses together and write that value in the grey "Total Cover" box **C**.

Use the grassland status photos opposite to assist you with the cover rating. Compare what you see to these photos and to the vegetation cover diagrams on the last page of this booklet.

Total Cover (All Shrubs Combined)		2	%
Tall Grasses & Forbs			
Rough Fescue		35	%
Bluebunch Wheatgrass		5	%
Lupine		2	%
Total Cover (All Tall Grasses and Forbs Combined)		42	%
Medium Grasses & Forbs			
Idaho Fescue		2	%
Needle-and-thread		3	%

Step 3

Score plant community composition based on the cover of key bunchgrasses

First check the appropriate Reference Condition box (a. or b.) on your score sheet **D**. For this plant community check box b., as the Reference Condition is greater than 60% bunchgrass cover.

Next, write your assessed bunchgrass cover value on the score sheet **E**. Remember, your cover value should be representative of the entire assessment site. If you are using a 10 square meter area, or a pasture, ensure that you assess the average cover for the entire site. It is sometimes easier to assess a one square meter area and take several samples around the site or pasture. You would then average all your values and insert the average value on the score sheet.

Your assessed cover value will place you in one of the four categories listed opposite.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	20-39%	<20%	
Assessed Cover Value	42 %	Points	40	25	10	0 = 25

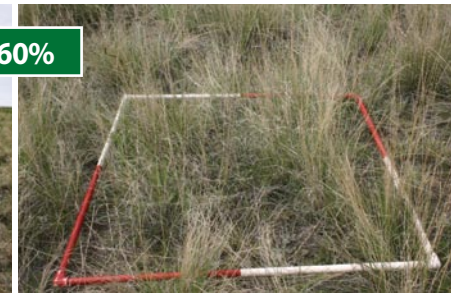
2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	2 %	YES NO
Tall Grasses and Forbs	>50 %	42 %	YES NO

Comparison of Grassland Status and Bunchgrass Cover



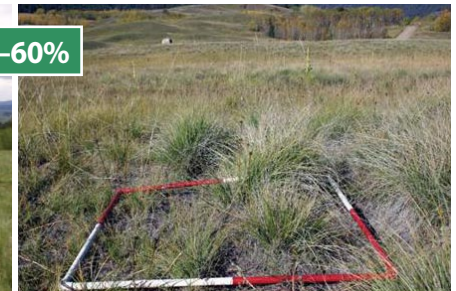
Reference Condition Landscape



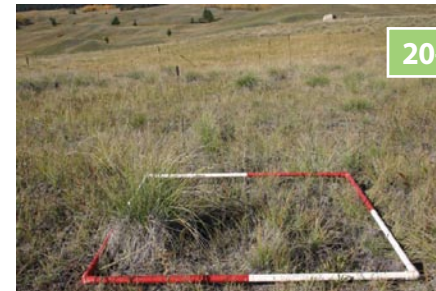
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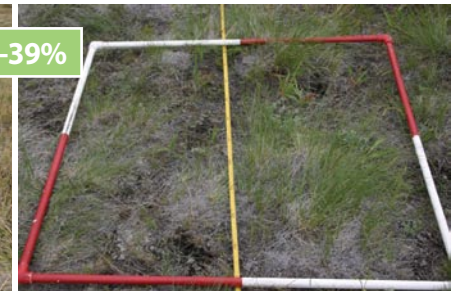
Slightly Altered Landscape



Slightly Altered Plot



Moderately Altered Landscape



Moderately Altered Plot



Greatly Altered Plot



Greatly Altered Plot

PHOTOS BRIAN WIKHEEM

Assessed Cover Values and Status

Category	Description	Bunchgrass Cover	Score
Reference Condition	The existing plant community closely resembles the Reference Condition. Evidence of disturbance is minimal.	> 60%	40
Slightly Altered	The existing plant community has been slightly altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs may be more abundant. Non-native species may be present but are infrequent.	40–60%	25
Moderately Altered	The existing community has been moderately altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs usually are more abundant. Non-native plant species may be common but native species are still present.	20–39%	10
Greatly Altered	The existing community has been significantly altered compared to the Reference Condition. Non-native species, native annuals, and low-growing native plants dominate the community.	< 20%	0

If your measurement falls on a threshold between two categories or is close to a threshold and you are finding it difficult to make a decision, always err on the side of caution: score to the lower category and record comment.

Select Your Cover Value

Your Assessed Bunchgrass Cover	> 60%	40–60%	20–39%	< 20%
Score	40	25	10	0

Step 4
Determine and enter the appropriate score on the score sheet ^A
Based on your assessed bunchgrass cover value ^A, circle and record your score on the score sheet ^B.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	39%	<20%	
Assessed Cover Value	42 %	Points	40	25	10	

2. Plant Community Structure (Booklets page 11)

Step 5
Write comments for future reference

Write any additional comments on the work table for future reference. The most important indicators of change are:

- A decline in cover of the dominant bunchgrasses.
- An increase in cover of low grasses and forbs relative to the tall and mid layers. Low-growing bunchgrasses and forbs, such as Sandberg’s bluegrass and pussytoes are often more abundant as disturbance increases.
- A decrease in rough fescue and an increase in bluebunch wheatgrass on sites where rough fescue should dominate (wetter, cooler sites) may indicate disturbance, stress, or other change.
- A higher cover or even dominance of bluebunch wheatgrass on dry south-facing slopes or on shallow course soils may be indicative of normal topographic, soil and climatic factors.

SCORING PLANT COMMUNITY STRUCTURE

Do you have the expected plant layers?

This question focuses on the physical structure of the plant layers found in the Rough Fescue grasslands. Changes are determined by comparing the structure of the existing plant community to the Reference Condition.

What to expect on your site in the Reference Condition:

- Shrubs, such as common rabbit-brush and wild rose, may be found in trace amounts and account for less than 5% of the vegetation cover.
- Five structural layers (see illustration next page) are present including:
 - a limited shrub layer (less than 5% of cover)
 - tall grasses and forbs
 - medium grasses and forbs
 - low grasses and forbs not exceeding 5 cm (including sedges and rushes)
 - biological crusts
- Biological crusts (mosses, lichens, and algae) may vary significantly depending on plant and litter cover, and make up 10 to 30% of the ground cover.

When site disturbance increases, bunchgrass and other plant cover, as well as litter content, decrease. The result may be an increase in biological crusts.

SCORE SHEET
QUESTION 2

Accounts for 10%
of total score

Above ground structure
protects the soil against
wind, rain and heat from
the sun, and supplies
habitat for wildlife.

Commonly Occurring Species Rough Fescue grassland community

		Plant Layer	Plant Species
		Shrubs (infrequent)	<ul style="list-style-type: none"> • common rabbit-brush* • prickly rose* • grey horsebrush
		Tall Grasses and Forbs	<ul style="list-style-type: none"> • rough fescue* • bluebunch wheatgrass • arrowleaf balsamroot* • silky lupine
		Medium Grasses and Forbs	<ul style="list-style-type: none"> • Idaho fescue* • junegrass • needle-and-thread grass • timber milk-vetch • yarrow* • short-beaked agoseris • Kentucky bluegrass (non-native species)
		Low Grasses and Forbs	<ul style="list-style-type: none"> • brittle prickly-pear cactus • Sandberg's bluegrass* • small-flowered blue-eyed Mary • pussytoes* • cheatgrass (invasive species) • common dandelion (non-native species)
		Biological Crusts	mosses, lichens, and algae*
		* shown in photos	

Structural Layers for Rough Fescue Grasslands



Shrubs such as prickly rose and common rabbit-brush are infrequent and account for less than 5% cover. They may be found in patches or as individual shrubs.

Step 1 List species

Refer to your list of species on the work table on page 2 of the score sheet. Add any additional plants you observe within each layer. Refer to the list of commonly occurring species opposite.

Step 2 Assess structural layers

Using the work table, assess existing structural layers. Refer to the structural layer changes shown in the drawings on the next page, and to the cover diagrams on the last page of this booklet to determine a cover value for each layer.

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover	
Big sagebrush		%
Wild rose		%
		%
		%
Total Cover (All Shrubs Combined)	2	%
Tall Grasses & Forbs		
Rough Fescue	35	%
Bluebunch Wheatgrass	5	%
Lupine	2	%
		%
Total Cover (All Tall Grasses and Forbs Combined)	42	%
Medium Grasses & Forbs		
Idaho Fescue	2	%
Needle-and-thread	3	%

Categories of Structural Layer Changes

1 Reference Condition:
All layers as expected are present



2 Slightly Altered:
One layer is absent or altered



3 Moderately Altered:
Two layers are absent or altered



4 Greatly Altered:
Three layers are absent or altered



Expected Layers in the Reference Condition

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	absent–trace	frequent–abundant	infrequent–common	trace–infrequent	infrequent–common
Reference Cover Value	< 5%	> 50%	6–40%	1–20%	10–30%

Step 3

Score plant community structure

Score plant community structure based on existing plant layers. Write in the Reference Condition for each layer on score sheet **A**.

- Shrubs = 0 to 5% cover
- Tall Grasses and Forbs = greater than 50% cover
- Medium Grasses and Forbs = 6 to 40% cover
- Low Grasses and Forbs = 1 to 20% cover
- Biological Crusts = 10 to 30% cover

Enter your assessed cover value for each layer on the score sheet **B**.

Booklet 3 or 4: Reference Condition >60%		Assessed Cover value					
Assessed Cover Value	42 %	Points	40	25	10	0	= 25

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers			
Shrubs	A <5 %	B 2 %	YES NO C			
Tall Grasses and Forbs	>50 %	42 %	YES NO			
Medium Grasses and Forbs	6–40 %	15 %	YES NO			
Low Grasses and Forbs	1–20 %	10 %	YES NO			
Biological Crust	10–30 %	12 %	YES NO			
Total Number of Altered Layers	0	1	3	4 or 5		
Points	10	6 D	2	1	0	= 6 E

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Step 4

Assess whether layer is altered or not

For each layer, assess whether it is altered or not altered. Circle YES or NO on your score sheet **C**. Circle the number of altered layers in the appropriate box on the score sheet **D**.

Step 5

Enter score and additional comments

Score your plant community structure. The number of altered layers will determine your score. Enter the score in the grey box on the score sheet **E**. Write any additional comments on the work table on page 2 of the score sheet for future reference.

Structural plant layers in your plant community are compared to the Reference Condition. A structural layer is considered altered when its cover no longer falls within the expected range for the Reference Condition.

SCORE SHEET QUESTION 3

*Accounts for 24%
of total score*

Litter weight and cover can be highly variable depending on available moisture and grazing pressure. Ideally, litter will provide complete ground cover on ungrazed fescue grasslands in the Reference Condition.

SCORING NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

Litter is an important indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, promote infiltration into the soil, and regulate heat on the soil surface.

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down. When collecting litter, collect all litter found within your plot.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate the site.
- Litter cover is uniform on the site.
- Litter matter consists of dead plant material on the soil surface and within plants.
- Litter weight is greater than 2000 kg/ha. Litter weight may vary from 2000–6000 kg/ha.
- Litter covers 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil accounts for less than 10% of the ground surface or site.

Scoring in this section is divided into two components:

- Assessing litter weight
- Assessing the cover of litter and biological crusts on the site

Both litter and biological crusts are measured together. An increase in litter weight and cover over the site often results in a decrease

The Importance of Litter

Litter is the key indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, and promote infiltration into the soil. It also regulates heat on and below the soil surface. It slows down soil heating and helps the soil to cool more quickly, reducing moisture loss.



Typical Reference Condition
for Rough Fescue grassland
community. PHOTO BRUNO
DELESALLE



Biological crusts play an
important role in moisture
retention and soil stability.
PHOTO BRIAN WIKHEEM

in crust cover—there is less open space for the crusts to establish. Rough Fescue grasslands typically have significant litter and few open spaces for biological crusts to establish.

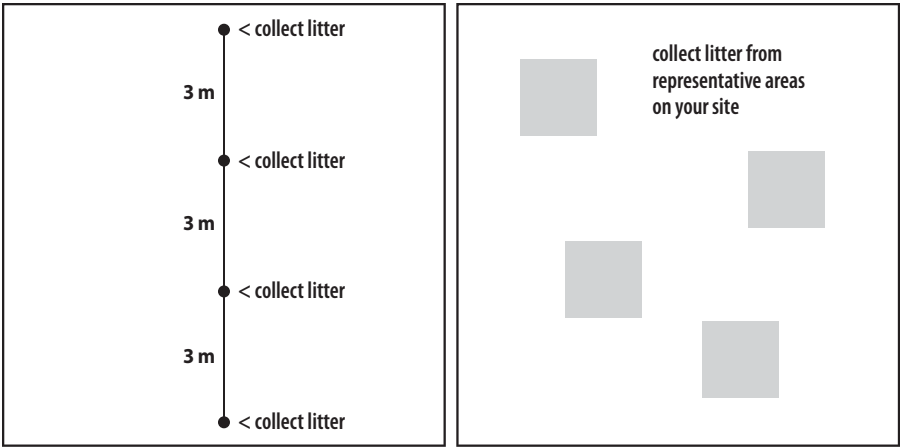
Step 1 Hand rake and assess litter

Litter weight is estimated by hand-raking litter from a 0.25 m² area or within a plot frame. The litter will be either weighed or compared to the photographs on page 19.

Collect three to five samples from representative areas on the site. Remember your site should be 5 to 10 m square. If you have a larger site you may require more samples.

If you installed transects, hand-rake litter from a 0.25 m² area or plot every 3 to 5 m along the transect.

Options for Collecting Litter



Ziplock bags are handy for storing individual litter samples. Prepare litter bags ahead of time for easy reference in the field. See Appendix 3.

Step 2
Compare your samples to the Reference Condition
Compare your samples to the thresholds shown on page 19. Determine which litter weight category most closely resembles your sample. List your samples in the work table on page 2 of the score sheet. Take an average of all samples on the site.

Step 3
Score litter weight
Write in the Reference Condition for litter weight on the score sheet. In this case it is greater than 2000 kg/ha **A**.

Write in your assessed litter weight on the score sheet **B**.
Your litter weight will fall within one of the four categories shown on the chart opposite. The second column of the chart converts litter weight into a percent of the Reference Condition, and the third column shows the corresponding score.

Using this chart, determine your score and circle it on the score sheet **C**, then enter the score in box A to the right **D**.

The score sheet converts litter weights into values that are relative to the Reference Condition. This conversion was necessary to standardize the score sheet for all plant communities.

Total Number of Altered Layers	0	1	2	1	0	=	6
Points	10	6	2	1	0		

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight						
Reference Condition	A 2000 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%
Assessed Litter Weight	B 750 kg/ha	Points	14	8	C 2	0
Litter Cover and Biological Crust Cover						
Assessed Litter Cover	60 %		≥75%	25-74%	C 25-74%	<25%

Litter Weight Thresholds
Rough Fescue grassland community

Reference Condition is >2000kg/ha



PHOTOS: KEN MACKENZIE

Your Assessed Litter Weight	Conversion to % of Reference Condition (relative values)	Score
>2000 kg/ha	>100%	15
1000 to 2000 kg/ha	50–100%	8
500 to 1000 kg/ha	25–49%	2
< 500 kg/ha	< 25%	0

If your assessment falls on or is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

Step 4

Assess litter and biological crust cover

First, make a visual estimate of litter cover. How much ground is covered by litter? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help estimate litter cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed litter cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Next, assess biological crust cover. Make a visual estimate of biological crust cover. How much ground is covered by biological crusts? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help you estimate biological crust cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed biological crust cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Biological crusts play an important role in moisture retention and soil stability. Biological crusts are not considered bare soil.

Points		10		8		6		4		2		0	
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)													
Litter Weight													
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%	<25%							
Assessed Litter Weight	750	kg/ha	Points	14	8	2	0	A	2				
Litter Cover and Biological Crust Cover													
Assessed Litter Cover	60	%	≥75%	25-74%	25-74%	<25%	<25%						
Assessed Biological Crust Cover	12	%	0-100%	>25%	<25%	<25%	<25%						
Points	10	8	4	2	0	B	4						
Total A + B							= 6						
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)													

Step 5

Score litter and biological crust cover

Both litter and biological crust cover are interrelated and thus are scored together. Check your assessment values carefully before scoring. See *Scoring Tip* below. Record your score on the score sheet **C**.

Add A and B to get total score **D**.

Write any additional comments on the work table for future reference.

Scoring Tip

Both litter and biological crusts are measured together. This is important. For example:

- If litter is high, greater than or equal to 75%, you will get full points, regardless of biological crust cover.
- If litter is moderate, 25 to 74% and biological crust cover is less

3. Nutrient and Hydrological Cycling

Litter Weight						
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%	<25%
Assessed Litter Weight	kg/ha	Points	14	8	2	0
Litter Cover and Biological Crust Cover						
Assessed Litter Cover	%	≥75%	25-74%	25-74%	<25%	<25%
Assessed Biological Crust Cover	%	0-100%	>25%	<25%	>25%	<25%
Points	10	8	4	2	0	B
Total A + B						

4. Site Stability

(Booklets 1–4 page 21; Booklet 5 page 23)

than 25%, your score will be 4 **A**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover less than 25% of your site.

- If litter is low, less than 25%, and biological crust cover is more than 25%, your score will be 2 **B**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover more than 25% of your site. This site may be recovering.
- If litter is low, less than 25%, and biological crust cover is low, less than 25%, your score will be 0 **C**. Litter is sparse, patchy, and decaying organic material is the main type of litter on the soil surface. Most of the existing litter is in the plant.

As part of your estimate, include litter standing within living plants and decomposing litter on the soil surface. Look closely for lichens, mosses, and algae. When the soil is dry, they can be inconspicuous and hard to identify.

SCORING SITE STABILITY

Is there existing or potential erosion on site?

Site stability is determined by assessing the total amount of bare soil and erosion on the site caused by wind and water. Bare soil is defined as mineral soil—soil particles less than 5 mm—not covered by live plants, litter, or biological crusts. Particles greater than 5 mm, such as stones and bedrock, should not be included in the bare soil cover estimate. Erosion occurs when there is actual loss of soil particles from a site.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate, and litter cover is uniform on the site.
- Litter covers 75% or more of the ground surface.
- Soils are stable with limited bare soil or soil disturbance. Bare soil does not exceed 5% cover.
- Erosion features are limited and do not exceed 5% cover. (Together, erosion features and/or bare soil cover less than 10% of the ground surface.)

SCORE SHEET QUESTION 4

Accounts for 16% of total score

Erosion



PHOTO BRIAN WIKEEM

This indicator is scored in two parts:

- Assess the cover of bare soil
- Assess the cover of erosion features

Step 1

Estimate area covered by bare soil

Estimate the percentage of the soil surface on your site that is covered by bare soil. Use the cover diagrams on the last page of this booklet to assist you in determining whether cover is greater or less than the threshold values.

The Reference Condition is already identified for you on the score sheet. Reference condition for bare soil is the same for all grasslands plant communities—less than 5%.

Write your assessed cover value for bare soil **A** and record your score on the score sheet **B**.

	Points	10	8	4	2	0	B
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)							4
Bare Soil: Reference Condition <5%							
Assessed Bare Soil Cover <u>2–5</u> %	Points	8	6	3	0	A	8
Erosion Features: Reference Condition <5%							
Assessed Erosion Cover <u><5</u> %	Points	8	6	3	0	B	8
						Total A + B	= 16
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)							
Reference Condition 0%							
Assessed Cover <u><1</u> %	Points	5	3	1	0	A	3

Step 2

Estimate area covered by erosion features

Estimate the cover of the erosion features on site. Use the cover diagrams on the last page of this booklet to determine whether the cover is greater or less than the erosion threshold values listed.

The Reference Condition is already identified for you on the score sheet. Reference Condition for erosion features are the same for all grasslands plant communities—less than 5%.

Examples of Soil Disturbance and Erosion



Bare Soil



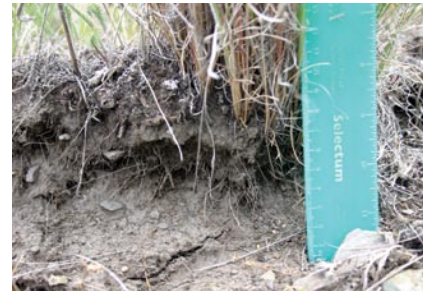
Soil Movement



Lichen Line



Erosion Pavement



Pedestal – Exposed Roots



Rills



Gully



Undercutting

PHOTOS BRIAN WIKEEM

Write your assessed cover value for erosion **A** and record your score on the score sheet **B**.

Points		10	5	0		
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						
Total A + B = 6						
Bare Soil: Reference Condition <5%						
Assessed Bare Soil Cover	2–5 %	Points	8	6	3	0
					A	8
Erosion Features: Reference Condition <5%						
Assessed Erosion Cover	<5 %	Points	8	6	3	0
					B	8
Total A + B = 16						
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						
Reference Condition 0%						
Assessed Cover	<1 %	Points	5	<1%	1–10%	>10%
				3	1	0
					A	3

Step 3

Record total score for site stability **C**

Write any additional comments on the work table for future reference.

The following indicators suggest active or potential soil disturbance and increased susceptibility to erosion:

- Reduced litter cover and increased bare soil.
- Evidence of soil movement such as flow patterns on the surface, fan deposits, and rills.
- Evidence of soil loss such as pedestalled plants with exposed roots, exposed gravel on the soil surface, lichen lines on rocks, and wind scouring of exposed soil.
- Physical disturbance such as hoof shearing, trails, and compaction.

Look closely at the soil surface. Be aware that mosses and lichens are protecting the soil surface and should not be considered part of bare soil. Erosion features may be active or healing, and both types are included as erosion. Although numerous features signify erosion (see photos previous page), the combination of all features present on the site is collectively considered in scoring this indicator.

Most erosion and bare soil in the Reference Condition is restricted to areas with small mammal, bird or insect activity.

SCORING INVASIVE PLANTS

Are invasive plants present on this site?

The cover and distribution of invasive plants are indicators of the status of your grassland.

Invasive plants occupy grasslands because they out-compete native plants. Where disturbance has created available space and conditions for seed germination, invasive species thrive. Some species, such as diffuse and spotted knapweed, can dominate grasslands and persist for decades. As a result, forage values and species diversity on these sites are often much lower than would be expected in native plant communities.

SCORE SHEET QUESTION 5

Accounts for 10% of total score



Invasive plant, Dalmatian Toadflax.
PHOTO BRIAN WIKKEEM

The presence of invasive plants on grasslands is generally considered a risk even though the actual effects of some species are unknown. All invasive plants considered for this indicator are non-native species to British Columbia. Assessing this indicator requires some knowledge of the common invasive plants listed on page 27.

What to expect on your site in the Reference Condition:

- Limited bare soil or soil disturbance.
- Little or no erosion features.
- No invasive plants present.

Document as many invasive plant species as possible. This is especially important when they are abundant. If a species is unfamiliar to you, collect a specimen for later identification. If possible, document their origin.

Step 1

Search the site for invasive plants

If invasive plants are widely dispersed on the site in numerous patches, divide the monitoring site into smaller areas to more accurately estimate total cover and distribution.

List all known invasive plant species in the work table **A**.

		%
	Total Cover (All Low Grasses and Forbs Combined)	10 %
A	Biological Crust ✓	Total Biological Crust Cover 12
	Invasive Plants	
	Knapweed – scattered individuals	<1 %
		%
		%
		%

Step 2

Score invasive plant cover

Determine the combined cover of all invasive plants using the diagrams on the next page.

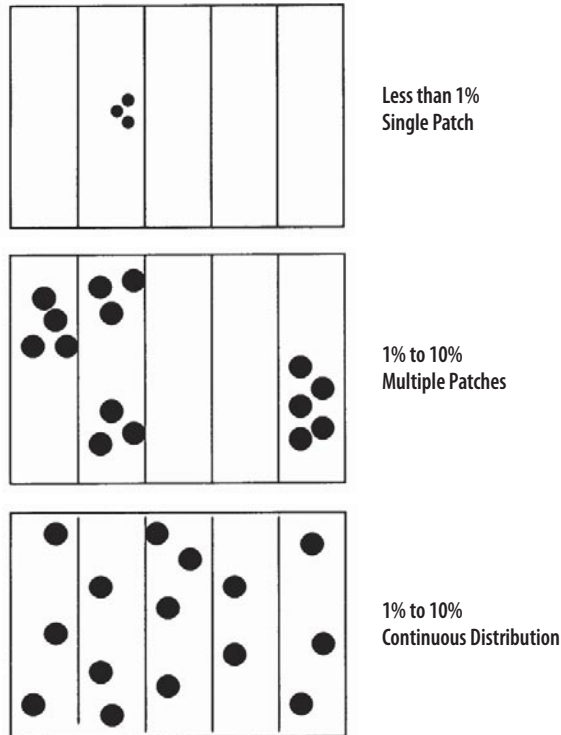
The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant cover is the same for all grasslands plant communities—0%.

Assessed Erosion Cover	<5 %	Points	8	6	3	0	B	8
Total A + B = 16								
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)								
Reference Condition 0%								
Assessed Cover	<1 %	Points	5	<1%	1–10%	>10%		
				3	1	0	A	3
Assessed Distribution								
	None	Single patch or a few scattered individuals	Multiple Patches	Continuous				
		Points	5	3	1	0	B	3
Total A + B = 6								
Add scores from all five categories (= grey boxes) to get TOTAL SCORE								
59								

Write your assessed cover value for invasive plants **B** and record your score on the score sheet **C**.

Plant and Distribution Diagram for Invasive Plants

Note that one column = 20% of total area. For general cover diagrams see the last page of this booklet.



Invasive plants often establish on disturbed areas that have bare soils. Check small mammal diggings, trails, salting areas, and around corrals and gates for invasive plants. Inspect all salting areas and corrals within the pasture being surveyed even if these areas are not within the actual monitoring site.

Step 3

Determine the distribution of invasive plants on the site **A**

The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant distribution is the same for all grasslands plant communities—None.

Circle your assessed distribution for invasive plants **B** and record your score on the score sheet **C**.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1%	Points 5	3	1	0	A	3
Assessed Distribution A	None	Single patch or a few scattered individuals	Multiple Patches	Continuous		
	Points 5	3	1	0	B	3
Total A + B					=	6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						59

Common Invasive Plants in British Columbia

from *Forest and Range Practices Act Invasive Plant Regulation*

Species	Scientific Name
Anchusa	<i>Anchusa officinalis</i>
Black knapweed	<i>Centaurea nigra</i>
Blueweed	<i>Echium vulgare</i>
Brown knapweed	<i>Centaurea jacea</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Common burdock	<i>Arctium minus</i>
Common tansy	<i>Tanacetum vulgare</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Field scabious	<i>Knautia arvensis</i>
Hoary alyssum	<i>Berteroa incana</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Leafy spurge	<i>Euphorbia esula</i>
Meadow hawkweed	<i>Hieracium pilosella</i>
Meadow knapweed	<i>Centaurea pratensis</i>
Nodding thistle	<i>Carduus nutans</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scentless chamomile	<i>Matricaria maritima</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Teasel	<i>Dipsacus fullonum</i>
Yellow iris	<i>Iris pseudacorus</i>
Yellow toadflax	<i>Linaria vulgaris</i>

Salty sites only

Hoary cress	<i>Cardaria draba</i>
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For more information see *Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia*, available through the Ministry of Agriculture and Lands.

Step 4

Enter combined cover and distribution on score sheet

Enter the total of A and B on the score sheet **A**.

Write any additional comments on the work sheet for future reference.

Assessed Erosion Cover	<5 %	Points	8	6	3	0	B	8
Total A + B								= 16
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)								
Reference Condition 0%	0	<1%	1–10%	>10%				
Assessed Cover	<1 %	Points	5	3	1	0	A	3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous				
Points	5	3	1	0	B	3		
Total A + B								= 6 A
Add scores from all five categories (= grey boxes) to get TOTAL SCORE								59

DETERMINING YOUR TOTAL SCORE

Add the scores for all questions and write your total in the “Total Score” box at bottom of score sheet **B**.

Assessed Distribution	None	scattered individuals	1	0	B	3
Points	5	3	1	0	Total A + B = 6	
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						
59 B						
C Grassland Status (circle one):	Reference 76–100%	Slightly Altered 51–75%	Moderately Altered 26–50%	Greatly Altered 0–25%		
D Apparent Trend (circle one):	Upward	Downward	Stable	Unknown		
Note: decrease in litter						

Assess Grassland Status

Based on your score, circle one of four grassland status ranges. Your assessment is complete **C**.

Assessing Apparent Trend

In addition to the five main indicators for grassland assessment, consider the features in the table opposite in order to assess apparent trend. Each feature describes possible grassland conditions that suggest that a downward, stable, or upward trend.

To record your assessment, circle the appropriate category on the last line of the score sheet **D**.

It is important to remember that apparent trend is a one time assessment based on your current observations. In future years, when you combine these results with assessments from the past, you will get important trend information and results.

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal colour, seed production; plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Your site assessment is now complete. Ensure your score sheet is completely filled out and that you have recorded all the necessary notes and comments that will assist you with future management decisions.

Photo-Point Monitoring

Your next step is to complete photo-point monitoring, Chapter 6.

Photographic records are an important part of monitoring your grassland. Photo-point monitoring provides an effective visual tool for comparison of the grassland community.

Score Sheet Sample – Page 1

Grassland Assessment Score Sheet ...PAGE 1

Date May 15, 2009 Site Pasture E Observer(s) Bill Ranger
 Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350
 Description Large pasture, 150 ha with significant variation
 Slope variable Aspect south/north Elevation 1000-1100m
 Current Uses (circle): Livestock Recreation Wildlife Other _____
 Management Objective(s) Increase Bunchgrass cover - mainly
R. fescue. Maintain current productivity/forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☐ 1,2,5 or ☒ 3,4Grassland Type Rough fescue
grasslandComments (weather, management changes) _____
A very cool, dry spring. Little
snow. Fall grazed 2 weeks,
out October 20th.**1. Key Bunchgrass Cover** (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	<u><40-60%</u>	20-39%	<20%	
Assessed Cover Value	<u>42</u> %	Points	40	<u>25</u>	10	0
						= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	2 %	YES NO
Tall Grasses and Forbs	>50 %	42 %	YES NO
Medium Grasses and Forbs	6-40 %	15 %	YES NO
Low Grasses and Forbs	1-20 %	10 %	YES NO
Biological Crust	10-30 %	12 %	YES NO
Total Number of Altered Layers	0	1	2
Points	10	6	2
= 6			

3. Nutrient and Hydrological Cycling (Booklets 1-4 page 16; Booklet 5 page 18)

Litter Weight					
Reference Condition	<u>2000</u> kg/ha	% of Reference	>100%	50-99%	<u>25-49%</u>
Assessed Litter Weight	<u>750</u> kg/ha	Points	14	8	<u>2</u>
Litter Cover and Biological Crust Cover					
Assessed Litter Cover	<u>60</u> %	≥75%	25-74%	<u>25-74%</u>	<25%
Assessed Biological Crust Cover	<u>12</u> %	0-100%	>25%	<u><25%</u>	>25%
Points	10	8	<u>4</u>	2	0
Total A + B					= <u>6</u>

4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover <u>2-5</u> % Points	8	6	3	0	A 8
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover <u><5</u> % Points	8	6	3	0	B 8
Total A + B					= 16

5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 %	Points	5	3	1	0	A 3
Assessed Distribution		None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
	Points	5	3	1	0	B 3
					Total A + B	= 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						59

Grassland Status (circle one):	Reference 76-100% <u>Slightly Altered 51-75%</u>	Moderately Altered 26-50%	Greatly Altered 0-25%
Apparent Trend (circle one):	Upward	Downward	<u>Stable</u>

Note: decrease in litter

Score Sheet Sample – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

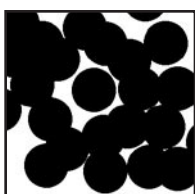
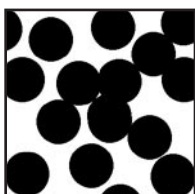
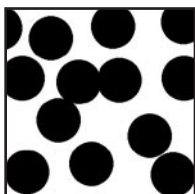
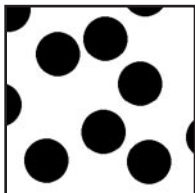
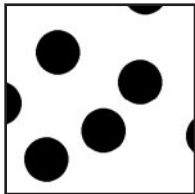
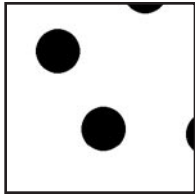
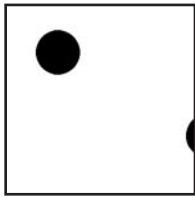
Shrubs Identified	Estimated Percent Cover
<u>Big sagebrush</u>	%
<u>Wild rose</u>	%
	%
	%
Total Cover (All Shrubs Combined)	<u>2</u> %
Tall Grasses & Forbs	
<u>Rough Fescue</u>	<u>35</u> %
<u>Bluebunch Wheatgrass</u>	<u>5</u> %
<u>Lupine</u>	<u>2</u> %
	%
Total Cover (All Tall Grasses and Forbs Combined)	<u>42</u> %
Medium Grasses & Forbs	
<u>Idaho Fescue</u>	<u>2</u> %
<u>Needle-and-thread</u>	<u>3</u> %
<u>Yarrow</u>	<u>2</u> %
<u>June Grass</u>	<u>8</u> %
Total Cover (All Medium Grasses and Forbs Combined)	<u>15</u> %
Low Grasses & Forbs	
<u>Sandberg's Bluegrass</u>	} <u>10</u> %
<u>Low forbs</u>	
	%
	%
Total Cover (All Low Grasses and Forbs Combined)	<u>10</u> %
Biological Crust <input checked="" type="checkbox"/>	Total Biological Crust Cover
	<u>12</u>
Invasive Plants	
<u>Knapweed - scattered individuals</u>	<u><1</u> %
	%
	%
	%
Total Cover (All Invasive Plants Combined)	<u><1</u> %

Comments

Very dry springLitter cover approx. 60%Bare soil 2 to 5%Little or no erosionPasture seems stable, litter has declined slightly.

Cover Diagrams for Plant Community Cover

Large



5% Cover

10% Cover

20% Cover

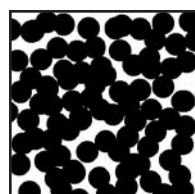
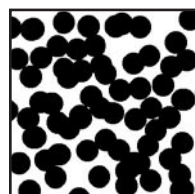
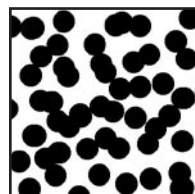
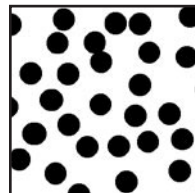
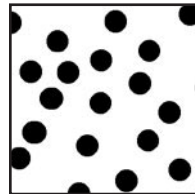
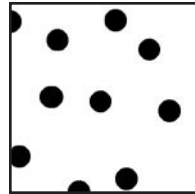
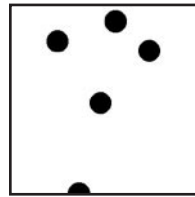
30% Cover

50% Cover

60% Cover

75% Cover

Small



Rough Fescue, Antelope-brush Grasslands (UPPER GRASSLANDS)



Rough Fescue, Antelope-brush Grasslands

Rough Fescue, Antelope-brush grasslands are only found in the East Kootenay region in the dry, mild Interior Douglas-fir biogeoclimatic zone at elevations from 750 m to 1200 m.

This grassland community is dominated by rough fescue. Bluebunch wheatgrass may be mixed with rough fescue on drier sites. Bluebunch wheatgrass will co-dominate with rough fescue on relatively drier sites, while Idaho fescue may become the dominant bunchgrass on some sites.

Antelope-brush and other shrubs, such as Rocky Mountain juniper, saskatoon, common snowberry and choke cherry are common and account for less than 40% of the plant cover. Biological crusts (mosses, lichens, and algae) are less frequent in this grassland community, but still provide an important ecological role.

This grassland community typically has five structural layers, including shrubs, tall grasses and forbs, medium grasses and forbs, low grasses and forbs not exceeding 5 cm, and biological crusts.

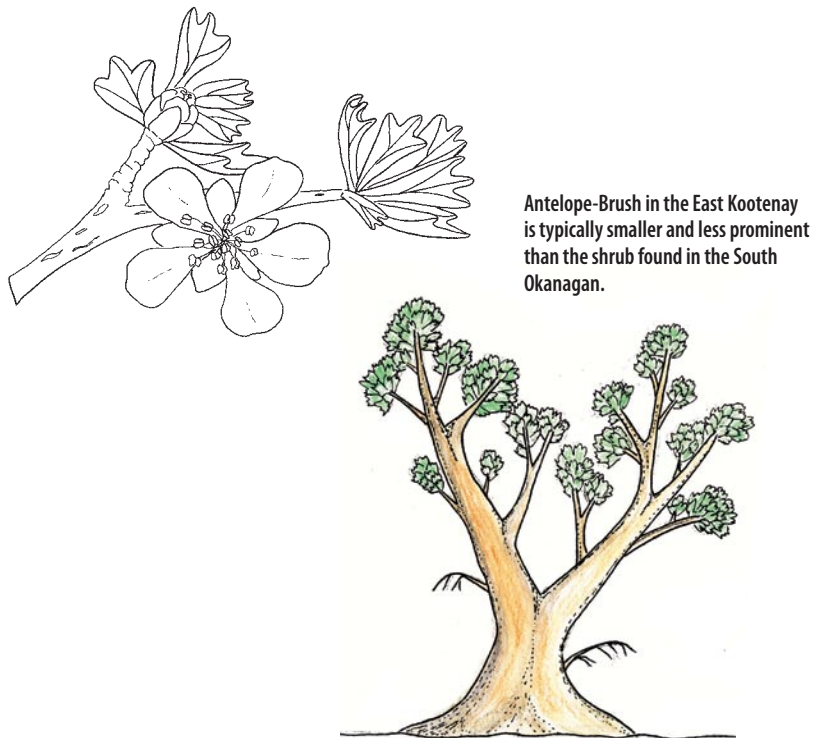
Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.



Typical Rough Fescue, Antelope-brush grassland community. PHOTO BRIAN WIKEEM



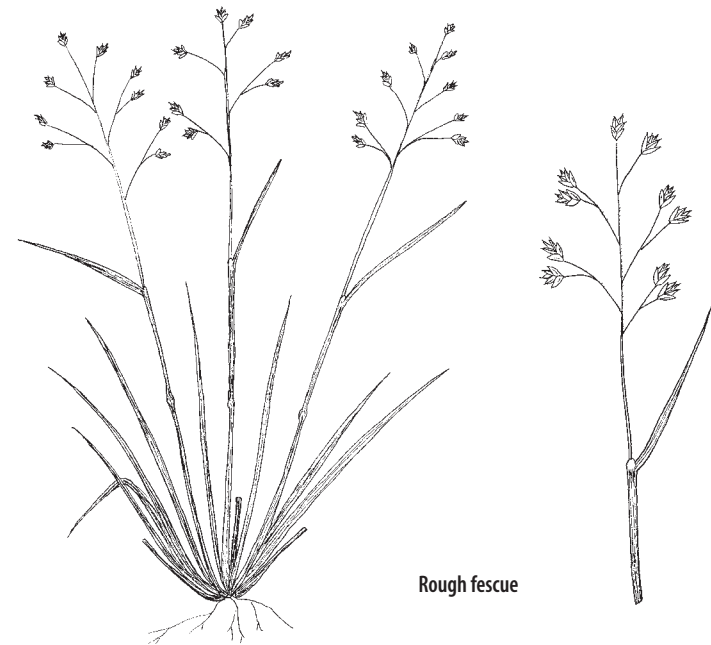
Antelope-brush, Bluebunch Wheatgrass grasslands are different than the Rough Fescue, Antelope-brush grasslands of the East Kootenay and are mainly found in the very hot and dry Bunchgrass and Ponderosa Pine biogeoclimatic zones in the South Okanagan-Similkameen, shown above. PHOTO BRIAN WIKHEM



Antelope-Brush in the East Kootenay is typically smaller and less prominent than the shrub found in the South Okanagan.



Biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and ensuring soil stability. In Middle and Upper grasslands, biological crust cover often decreases significantly where bunchgrass plants are more tightly spaced and where litter cover is higher. Conversely, biological crusts may increase where increased site disturbance causes a reduction in bunchgrass and other plant cover, as well as a reduction in litter. This trend may serve as an early warning or indicator of over-grazing by wildlife or livestock. PHOTO BRIAN WIKHEM



Rough fescue

Scoring This Grassland Community

This section takes you through the process of scoring your Rough Fescue, Antelope-brush grassland based on the five key indicators:

- plant community composition
- plant community structure
- nutrient and hydrological cycling (litter and biological crusts)
- site stability (existing or potential erosion)
- invasive plants

The Grassland Assessment Score Sheet

The grassland assessment score sheet enables you to collect information in a consistent manner from one monitoring site to another and from one assessment period to another. Be sure to complete all information on the form.

Space is provided to record the site name, date, and exact location of your assessment (including GPS coordinates) **A**. Include information such as slope, aspect, and elevation. This information is important for relocating the monitoring site in the future and is helpful when comparing results from one management area to another.

Lines for comments are located near the top right of the score sheet **B** and below the work table on page 2 of the score sheet. Use these spaces to add information that may help you interpret what you are seeing. Also record any information that is not included in the questions, but may help you make management decisions in the future.

Sometimes a question may not seem to apply to your assessment area, or the answer may not agree with your experience or other observations. Record the answer as best you can, but elaborate with comments to explain why your response does not seem to work.

Before You Start

- 1 Select a monitoring site (see Chapter 4).
- 2 Mark or stake your site for future reference.
- 3 Select a blank score sheet (see Tab 8).
- 4 Fill in the top portion of your score sheet **A**.
- 5 Walk around the entire site. Tune your eye to the site and observe your grassland community.
- 6 Begin filling in your score sheet. The following sections explain how to score each indicator.

Walk around the entire site. Observe your grassland community. Tune your eye to the site.

Top Portion of the Score Sheet

- Take time to fill in all information
What are your objectives?

Grassland Assessment Score Sheet ...PAGE 1 **A**

Date May 15, 2009 Site Pasture C Observer(s) Bill Ranger

Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350

Description Small pasture, 20 ha, uniform slope

Slope shallow Aspect west Elevation 900m

Current Uses (circle): Livestock Recreation Wildlife Other

Management Objective(s) Increase R. fescue, increase productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☐ 1,2,5 or ☒ 3,4

Grassland Type Rough fescue, Antelope-brush grassland

Comments (weather, management changes) A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th. **B**

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%						
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%						
Assessed Cover Value <u>27</u> %	Points	40	25	<u>10</u>	0	= <u>10</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<u>6-40</u> %	<u>35</u> %	YES <u>NO</u>
Tall Grasses and Forbs	<u>>60</u> %	<u>26</u> %	YES <u>NO</u>
Medium Grasses and Forbs	<u>6-40</u> %	<u>15</u> %	YES <u>NO</u>
Low Grasses and Forbs	<u>1-20</u> %	<u>10</u> %	YES <u>NO</u>
Biological Crust	<u>10-30</u> %	<u>5</u> %	YES <u>NO</u>

Reference Condition

Rough Fescue, Antelope-brush Grasslands

- Key bunchgrasses cover more than 60% of the site and on some sites may exceed 90%.
 - Site is dominated by rough fescue.
 - Rough fescue co-dominates with Idaho fescue and bluebunch wheatgrass.
 - Bluebunch wheatgrass may become the dominant bunchgrass on some sites, particularly drier sites and coarser soils.
- Antelope-brush and other shrubs such as Rocky Mountain juniper, saskatoon, common snowberry and wild rose are common and account for 6 to 40% of the cover.
- Structural layers are unaltered from the Reference Condition and include:
 - 1 shrubs
 - 2 tall grasses and forbs
 - 3 medium grasses and forbs
 - 4 low grasses and forbs not exceeding 5 cm (including sedges and rushes)
 - 5 biological crusts

- Biological crusts (mosses, lichens, and algae) are infrequent to common and account for 10% to 30% of the ground cover. Biological crusts play an important ecological function. When site disturbance intensifies, bunchgrass, other plants and litter cover decrease, and may result in increased biological crusts.
- Litter weight is greater than 2000 kg/ha and litter cover is 75% or more of the ground surface.
- Stable soils show limited bare soil and soil disturbance. Erosion features and/or bare soil account for less than 10% of the ground surface.
- Invasive plants are not present or account for less than 1% cover on the site.

SCORE SHEET QUESTION 1

*Accounts for 40%
of total score*

SCORING KEY BUNCHGRASS COVER

What is the composition of your plant community?

The cover of key bunchgrasses provides an index of plant species composition and will help you assess the status of your grassland.

What to expect on your site in the Reference Condition:

Key bunchgrasses cover more than 60% of the site.

- Site is dominated by rough fescue.
- Rough fescue will co-dominate with Idaho fescue and bluebunch wheatgrass.
- Bluebunch wheatgrass may become the dominant bunchgrass on some sites, particularly drier sites and coarser soils. Where bluebunch wheatgrass dominates, use Booklet 2 for assessment.

Step 1

List known bunchgrasses

List known bunchgrasses on the work table on page 2 of the score sheet **A**. If possible, document other plant species that occur on the site as well. This will save you time during the scoring procedure. This is especially important when the dominant bunchgrasses are limited or not present.

If some species are unfamiliar to you, collect a few specimens for later identification. See Appendix 2: *Collecting Plant Specimens for Later Identification*.

Identification Aid for Key Bunchgrasses



PHOTOS BRIAN WIKEEM

Rough Fescue	Idaho Fescue	Bluebunch Wheatgrass
Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass	Densely tufted perennial bunchgrass
Stems erect, 40–90 cm tall, no visible nodes	Stems erect, 30–100 cm tall, visible nodes	Stems erect, 30–100 cm tall
Leaves rough, flat or folded, basal 10–60 cm high, dark green, purplish at base	Leaves rough, fine, densely tufted, basal 15–25 cm high, light green to bluish green, brownish at base	Leaves flat, branched, green to bluish green
Flowers an open panicle, 5–18 cm long, slightly purplish, awns less than 1.5 mm	Flowers an open panicle, 7–25 cm long, awns greater than 1.5 mm	Flowers a spike 8–16 mm long, usually without awns
Standing litter not curled	Standing litter not curled	Standing litter curled at top

Work Table on Page 2 of the Score Sheet

Grassland Assessment Score Sheet ...PAGE 2		GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA
Plant Community Work Table		
Shrubs Identified	Estimated Percent Cover	
Bitter brush	25 %	
Snowberry	} 10 %	
Juniper		
Saskatoon		
Total Cover (All Shrubs Combined)	35 %	
Tall Grasses & Forbs		
Rough Fescue	} 25 %	
Bluebunch Wheatgrass A		
Balsam root		<1 %
		%

Step 2

Determine the cover of key bunchgrasses

There are two ways to determine the cover of key bunchgrasses. You can list each bunchgrass in the work table **A**. Once you have identified your two or three key bunchgrasses, write down the percent cover of each in the work table **B**. Alternatively, you can estimate the total cover for all of the key bunchgrasses together and write that value in the grey "Total Cover" box **C**.

Use the grassland status photos opposite to assist you with the cover rating. Compare what you see to these photos and to the vegetation cover diagrams on the last page of this booklet.

Total Cover (All Shrubs Combined)		35	%
Tall Grasses & Forbs			
Rough Fescue	A	B	
Bluebunch Wheatgrass		25	%
Balsam root		<1	%
Total Cover (All Tall Grasses and Forbs Combined)		26	%
Medium Grasses & Forbs			
Idaho Fescue		2	%
Blue grass		1	%

Step 3

Score plant community composition based on the cover of key bunchgrasses

First check the appropriate Reference Condition box (a. or b.) on your score sheet **D**. For this plant community check box b., as the Reference Condition is greater than 60% bunchgrass cover.

Next, write your assessed bunchgrass cover value on the score sheet **E**. Remember, your cover value should be representative of the entire assessment site. If you are using a 10 square meter area, or a pasture, ensure that you assess the average cover for the entire site. It is sometimes easier to assess a one square meter area and take several samples around the site or pasture. You would then average all your values and insert the average value on the score sheet.

Your assessed cover value will place you in one of the four categories listed opposite.

and storage.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

D ☐ Booklet 1, 2, 5: Reference Condition >50% ☒ Booklet 3 or 4: Reference Condition >60%

Assessed Cover Value	Points	40	25	10	0	SCORE
27						10

E

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	6-40 %	35 %	YES NO
Tall Grasses and Forbs	>60 %	26 %	YES NO

Comparison of Grassland Status and Bunchgrass Cover



Reference Condition Landscape



Reference Condition Plot



Slightly Altered Landscape



Slightly Altered Plot



Moderately Altered Landscape



Moderately Altered Plot



Greatly Altered Landscape



Greatly Altered Plot

PHOTOS BRIAN WIKHEEM

Assessed Cover Values and Status

Category	Description	Bunchgrass Cover	Score
Reference Condition	The existing plant community closely resembles the Reference Condition. Evidence of disturbance is minimal.	> 60%	40
Slightly Altered	The existing plant community has been slightly altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs may be more abundant. Non-native species may be present but are infrequent.	40–60%	25
Moderately Altered	The existing community has been moderately altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs usually are more abundant. Non-native plant species may be common but native species are still present.	20–39%	10
Greatly Altered	The existing community has been significantly altered compared to the Reference Condition. Non-native species, native annuals, and low-growing native plants dominate the community.	< 20%	0

If your measurement falls on a threshold between two categories or is close to a threshold and you are finding it difficult to make a decision, always err on the side of caution: score to the lower category and record comment.

Select Your Cover Value

Your Assessed Bunchgrass Cover	> 60%	40–60%	20–39%	< 20%
Score	40	25	10	0

Step 4
Determine and enter the appropriate score on the score sheet **A**
Based on your assessed bunchgrass cover value **A**, circle and record your score on the score sheet **B**.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	20-39%	20%	
Assessed Cover Value	27 %	Points	40	25	10	0

2. Plant Community Structure (Booklets page 11)

Step 5
Write comments for future reference

Write any additional comments on the work table for future reference. The most important indicators of change are:

- A decline in cover of the dominant bunchgrasses.
- An increase in cover of low grasses and forbs relative to the tall and mid layers. Low-growing bunchgrasses and forbs, such as Sandberg’s bluegrass and pussytoes are often more abundant as disturbance increases.

SCORING PLANT COMMUNITY STRUCTURE

Do you have the expected plant layers?

This question focuses on the physical structure of the plant layers found in the Rough Fescue, Antelope-brush grasslands. Changes are determined by comparing the structure of the existing plant community to the Reference Condition.

What to expect on your site in the Reference Condition:

- Antelope-brush and other shrubs such as Rocky Mountain juniper, saskatoon, common snowberry and wild rose are common and account for 6 to 40% of the vegetation cover.
- Five structural layers (see illustration next page) are present including:
 - shrubs
 - tall grasses and forbs
 - medium grasses and forbs
 - low grasses and forbs not exceeding 5 cm (including sedges and rushes)
 - biological crusts
- Biological crusts (mosses, lichens, and algae) account for 10 to 30% of the ground cover. Biological crusts may vary significantly depending on plant and litter cover.

When site disturbance increases, bunchgrass and other plant cover, as well as litter content, decrease. The result may be an increase in biological crusts.

SCORE SHEET
QUESTION 2

Accounts for 10% of total score

Above ground structure protects the soil against wind, rain and heat from the sun, and supplies habitat for wildlife.

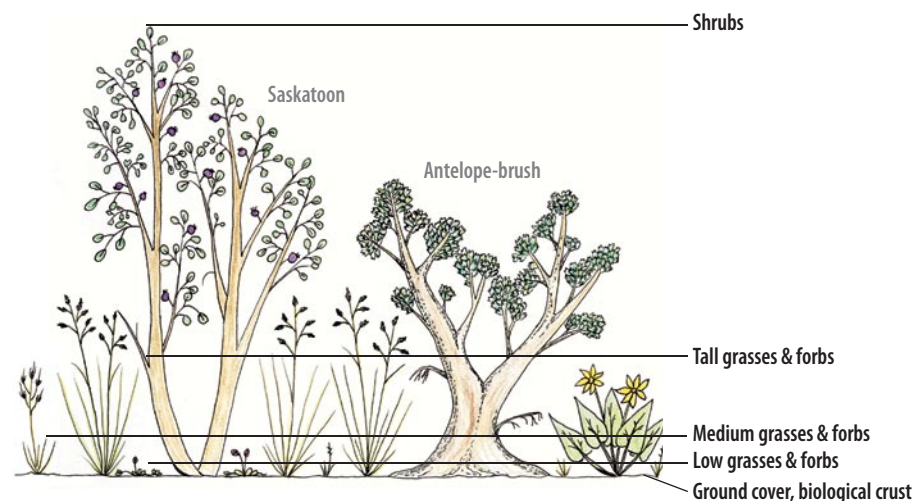
Commonly Occurring Species

Rough Fescue, Antelope-brush grassland community

Plant Layer		Plant Species
	Shrubs	<ul style="list-style-type: none"> • antelope-brush (bitter-brush)* • common rabbit-brush • choke cherry • prickly rose* • saskatoon • Rocky Mountain juniper
	Tall Grasses and Forbs	<ul style="list-style-type: none"> • rough fescue* • bluebunch wheatgrass • arrowleaf balsamroot* • lemonweed
	Medium Grasses and Forbs	<ul style="list-style-type: none"> • Canada bluegrass • cut-leaved anemone • Idaho fescue* • field locoweed • junegrass • Kentucky bluegrass (non-native) • needle-and-thread grass • timber milk-vetch • yarrow*
	Low Grasses and Forbs	<ul style="list-style-type: none"> • Sandberg's bluegrass* • small-flowered blue-eyed Mary • pussytoes* • cheatgrass (invasive species) • common dandelion (non-native species)
	Biological Crusts	mosses, lichens, and algae* including pixie cups and pelts

* shown in photos

Structural Layers for Rough Fescue, Antelope-brush Grasslands



Step 1

List species

Refer to your list of species on the work table on page 2 of the score sheet. Add any additional plants you observe within each layer. Refer to the list of commonly occurring species opposite.

Step 2

Assess structural layers

Using the work table, assess existing structural layers. Refer to the structural layer changes shown in the drawings on the next page, and to the cover diagrams on the last page of this booklet to determine a cover value for each layer.

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Bitter brush	25 %
Snowberry	} 10 %
Juniper	
Saskatoon	
Total Cover (All Shrubs Combined)	35 %
Tall Grasses & Forbs	
Rough Fescue	} 25 %
Bluebunch Wheatgrass	
Balsam root	
	<1 %
Total Cover (All Tall Grasses and Forbs Combined)	26 %
Medium Grasses & Forbs	
Idaho Fescue	2 %

Categories of Structural Layer Changes

1 Reference Condition:
All layers as expected are present



2 Slightly Altered:
One layer is absent or altered



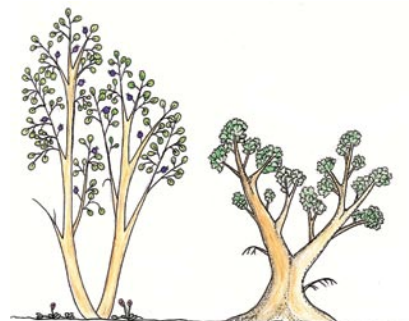
Tall grass layer
absent or declining

3 Moderately Altered:
Two layers are absent or altered



Tall and medium
grass layer absent and
tall/medium forb layer
absent or declining

4 Greatly Altered:
Three layers are absent or altered



Tall and medium grass
and forb layers absent
or declining, low grasses
declining

Expected Layers in the Reference Condition

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	infrequent–common	abundant	infrequent–common	trace–infrequent	infrequent–common
Reference Cover Value	6–40%	> 60%	6–40%	1–20%	10–30%

Step 3 Score plant community structure

Score plant community structure based on existing plant layers. Write in the Reference Condition for each layer on score sheet **A**.

- Shrubs = 6 to 40% cover
- Tall Grasses and Forbs = greater than 60% cover
- Medium Grasses and Forbs = 6 to 40% cover
- Low Grasses and Forbs = 1 to 20% cover
- Biological Crusts = 10 to 30% cover

Enter your assessed cover value for each layer on the score sheet **B**.

Booklet 3 or 4: Reference Condition >60%		Assessed Cover value					
Assessed Cover Value	27 %	Points	40	25	10	0	= 10
2. Plant Community Structure (Booklets page 11)							
Layer	Reference Condition	Assessed Cover Value	Altered Layers				
Shrubs	A 6–40 %	B 35 %	YES	NO C			
Tall Grasses and Forbs	>60 %	26 %	YES	NO			
Medium Grasses and Forbs	6–40 %	15 %	YES	NO			
Low Grasses and Forbs	1–20 %	10 %	YES	NO			
Biological Crust	10–30 %	5 %	YES	NO			
Total Number of Altered Layers	0	1	2 D	3	4 or 5		
Points	10	6	2	1	0		
					= 2 E		
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)							

Step 4 Assess whether layer is altered or not

For each layer, assess whether it is altered or not altered. Circle YES or NO on your score sheet **C**. Circle the number of altered layers in the appropriate box on the score sheet **D**.

Step 5 Enter score and additional comments

Score your plant community structure. The number of altered layers will determine your score. Enter the score in the grey box on the score sheet **E**. Write any additional comments on the work table on page 2 of the score sheet for future reference.

Structural plant layers in the existing plant community are compared to the Reference Condition. A structural layer is considered altered when its cover no longer falls within the expected range for the Reference Condition.

SCORE SHEET QUESTION 3

*Accounts for 24%
of total score*

Litter weight and cover can be highly variable depending on available moisture and grazing pressure. Ideally, litter will provide complete ground cover on ungrazed fescue grasslands in the Reference Condition.

Litter is the key indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, and promote infiltration into the soil. It also regulates heat on and below the soil surface. It slows down soil heating and helps the soil to cool more quickly, reducing moisture loss.

SCORING NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

Litter is an important indicator of nutrient cycling and hydrological function. Litter on the soil surface help intercept rainfall, slow water movement across the soil surface, promote infiltration into the soil, and regulate heat on the soil surface.

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down. When collecting litter, collect all litter found within your plot.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate the site.
- Litter cover is uniform on the site.
- Litter matter consists of dead plant material on the soil surface and within plants.
- Litter weight is greater than 2000 kg/ha. Litter weight may vary from 2000 to 4400 kg/ha.
- Litter covers 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil accounts for less than 10% of the ground surface or site.

Scoring in this section is divided into two components:

- Assessing litter weight
- Assessing the cover of litter and biological crusts on the site

Both litter and biological crusts are measured together. An increase in litter weight and cover over the site often results in a decrease

The Importance of Litter



Typical Rough Fescue,
Antelope-brush grassland
community. PHOTOS SHAWNA
LARADE



Biological crusts, although
not as common in rough
fescue-dominated
grasslands, play an
important role in moisture
retention and soil stability.
PHOTOS BRIAN WIKHEEM

in crust cover—there is less open space for the crusts to establish. Rough fescue-dominated grasslands typically have significant litter and few open spaces for biological crusts to establish.

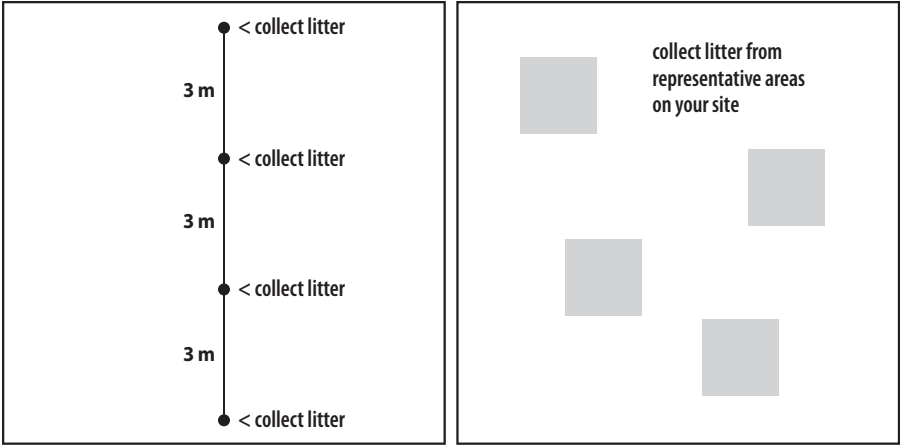
Step 1 Hand rake and assess litter

Litter weight is estimated by hand-raking litter from a 0.25 m² area or within a plot frame. The litter will be either weighed or compared to the photographs on page 19.

Collect three to five samples from representative areas on the site. Remember your site should be 5 to 10 m square. If you have a larger site you may require more samples.

If you installed transects, hand-rake litter from a 0.25 m² area or plot every 3 to 5 m along the transect.

Options for Collecting Litter



Ziplock bags are handy for storing individual litter samples. Prepare litter bags ahead of time for easy reference in the field. See Appendix 3.

Step 2
Compare your samples to the Reference Condition
Compare your samples to the thresholds shown on page 19. Determine which litter weight category most closely resembles your sample. List your samples in the work table on page 2 of the score sheet. Take an average of all samples on the site.

Step 3
Score litter weight
Write in the Reference Condition for litter weight on the score sheet. In this case it is greater than 2000 kg/ha **A**.

Write in your assessed litter weight on the score sheet **B**.
Your litter weight will fall within one of the four categories shown on the chart opposite. The second column of the chart converts litter weight into a percent of the Reference Condition, and the third column shows the corresponding score.

Using this chart, determine your score and circle it on the score sheet **C**, then enter the score in box A to the right **D**.

The score sheet converts litter weights into values that are relative to the Reference Condition. This conversion was necessary to standardize the score sheet for all plant communities.

Total Number of Altered Layers

0	1	2	3	4	5	6	7	8	9	10
10	6	2	1	0	=	2				

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight			
Reference Condition	A 2000 kg/ha	% of Reference	>100% 50-99% 25-49% <25%
Assessed Litter Weight	B 750 kg/ha	Points	14 8 2 C 0
Litter Cover and Biological Crust Cover			
Assessed Litter Cover	40 %	≥75% 25-74% 25-74% <25% <25%	A D 2

Litter Weight Thresholds
Rough Fescue, Antelope-brush grassland community

Reference Condition is >2000kg/ha	Your Assessed Litter Weight	Conversion to % of Reference Condition (relative values)	Score
	>2000 kg/ha	>100%	14
	1000 to 2000 kg/ha	50–100%	8
	500 to 1000 kg/ha	25–49%	2
	< 500 kg/ha	< 25%	0

If your assessment falls on or is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

Step 4

Assess litter and biological crust cover

First, make a visual estimate of litter cover. How much ground is covered by litter? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help estimate litter cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed litter cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Next, assess biological crust cover. Make a visual estimate of biological crust cover. How much ground is covered by biological crusts? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help you estimate biological crust cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed biological crust cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Biological crusts play an important role in moisture retention and soil stability. Biological crusts are not considered bare soil.

Points	10	6	4	2	0	
3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)						
Litter Weight						
Reference Condition	2000 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%
Assessed Litter Weight	750 kg/ha	Points	14	8	2	0
Litter Cover and Biological Crust Cover						
Assessed Litter Cover	40 %	≥75%	25-74%	25-74%	<25%	<25%
Assessed Biological Crust Cover	5 %	0-100%	>25%	<25%	>25%	<25%
Points	10	8	4	2	0	
Total A + B						6
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						

Step 5

Score litter and biological crust cover

Both litter and biological crust cover are interrelated and thus are scored together. Check your assessment values carefully before scoring. See *Scoring Tip* below. Record your score on the score sheet **C**.

Add A and B to get total score **D**.

Write any additional comments on the work table for future reference.

Scoring Tip

Both litter and biological crusts are measured together. This is important. For example:

- If litter is high, greater than or equal to 75%, you will get full points, regardless of biological crust cover.
- If litter is moderate, 25 to 74% and biological crust cover is less

3. Nutrient and Hydrological Cycling

Litter Weight					
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%
Assessed Litter Weight	kg/ha	Points	14	8	2
Litter Cover and Biological Crust Cover					
Assessed Litter Cover	%	≥75%	25-74%	<25%	<25%
Assessed Biological Crust Cover	%	0-100%	>25%	<25%	<25%
Points	10	8	4	2	0

4. Site Stability

(Booklets 1–4 page 21; Booklet 5 page 23)

than 25%, your score will be 4 **A**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover less than 25% of your site.

- If litter is low, less than 25%, and biological crust cover is more than 25%, your score will be 2 **B**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover more than 25% of your site. This site may be recovering.
- If litter is low, less than 25%, and biological crust cover is low, less than 25%, your score will be 0 **C**. Litter is sparse, patchy, and decaying organic material is the main type of litter on the soil surface. Most of the existing litter is in the plant.

As part of your estimate, include litter standing within living plants and decomposing litter on the soil surface. Look closely for lichens, mosses, and algae. When the soil is dry, they can be inconspicuous and hard to identify.

SCORING SITE STABILITY

Is there existing or potential erosion on site?

Site stability is determined by assessing the total amount of bare soil and erosion on the site caused by wind and water. Bare soil is defined as mineral soil—soil particles less than 5 mm—not covered by live plants, litter, or biological crusts. Particles greater than 5 mm, such as stones and bedrock, should not be included in the bare soil cover estimate. Erosion occurs when there is actual loss of soil particles from a site.

What to expect on your site in the Reference Condition:

- Bunchgrasses dominate, and litter cover is uniform on the site.
- Litter covers 75% or more of the ground surface.
- Soils are stable with limited bare soil or soil disturbance. Bare soil does not exceed 5% cover.
- Erosion features are limited and do not exceed 5% cover. (Together, erosion features and/or bare soil cover less than 10% of the ground surface.)

SCORE SHEET QUESTION 4

Accounts for 16% of total score

Erosion



PHOTO BRIAN WIKHEEM

This indicator is scored in two parts:

- Assess the cover of bare soil
- Assess the cover of erosion features

Step 1

Estimate area covered by bare soil

Estimate the percentage of the soil surface on your site that is covered by bare soil. Use the cover diagrams on the last page of this booklet to assist you in determining whether cover is greater or less than the threshold values.

The Reference Condition is already identified for you on the score sheet. Reference condition for bare soil is the same for all grasslands plant communities—less than 5%.

Write your assessed cover value for bare soil **A** and record your score on the score sheet **B**.

Points	10	8	4	2	0	B	4
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						Total A + B	= 6
A Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%			
Assessed Bare Soil Cover 5-10 %	Points	8	6	3	0	A	6 B
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%			
Assessed Erosion Cover <5 %	Points	8	6	3	0	B	8
						Total A + B	= 14
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)							
Reference Condition 0%	0	<1%	1-10%	>10%			
Assessed Cover <1 %	Points	5	3	1	0	A	3

Step 2

Estimate area covered by erosion features

Estimate the cover of the erosion features on site. Use the cover diagrams on the last page of this booklet to determine whether the cover is greater or less than the erosion threshold values listed.

The Reference Condition is already identified for you on the score sheet. Reference Condition for erosion features are the same for all grasslands plant communities—less than 5%.

Examples of Soil Disturbance and Erosion



Bare Soil



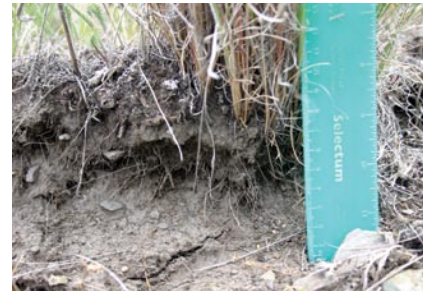
Soil Movement



Lichen Line



Erosion Pavement



Pedestal – Exposed Roots



Rills



Gully



Undercutting

PHOTOS BRIAN WIKHEEM

Write your assessed cover value for erosion **A** and record your score on the score sheet **B**.

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)					Total A + B =	6
Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%		
Assessed Bare Soil Cover 5-10 %	Points	8	6	3	0	A 6
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%		
Assessed Erosion Cover <5 %	Points	8	6	3	0	B 8
					Total A + B =	14

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)					Total A + B =	14
Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 %	Points	5	3	1	0	A 3

Step 3

Record total score for site stability **C**

Write any additional comments on the work table for future reference.

The following indicators suggest active or potential soil disturbance and increased susceptibility to erosion:

- Reduced litter cover and increased bare soil.
- Evidence of soil movement such as flow patterns on the surface, fan deposits, and rills.
- Evidence of soil loss such as pedestalled plants with exposed roots, exposed gravel on the soil surface, lichen lines on rocks, and wind scouring of exposed soil.
- Physical disturbance such as hoof shearing, trails, and compaction.

Look closely at the soil surface. Be aware that mosses and lichens are protecting the soil surface and should not be considered part of bare soil. Erosion features may be active or healing, and both types are included as erosion. Although numerous features signify erosion (see photos previous page), the combination of all features present on the site is collectively considered in scoring this indicator.

Most erosion and bare soil in the Reference Condition is restricted to areas with small mammal, bird or insect activity.

SCORING INVASIVE PLANTS

Are invasive plants present on this site?

The cover and distribution of invasive plants are indicators of the status of your grassland.

Invasive plants occupy grasslands because they out-compete native plants. Where disturbance has created available space and conditions for seed germination, invasive species thrive. Some species, such as diffuse and spotted knapweed, can dominate grasslands and persist for decades. As a result, forage values and species diversity on these sites are often much lower than would be expected in native plant communities.

SCORE SHEET QUESTION 5

Accounts for 10% of total score



Invasive plant, Dalmatian Toadflax.
PHOTO BRIAN WIKEEM

The presence of invasive plants on grasslands is generally considered a risk even though the actual effects of some species are unknown. All invasive plants considered for this indicator are non-native species to British Columbia. Assessing this indicator requires some knowledge of the common invasive plants listed on page 27.

What to expect on your site in the Reference Condition:

- Limited bare soil or soil disturbance.
- Little or no erosion features.
- No invasive plants present.

Document as many invasive plant species as possible. This is especially important when they are abundant. If a species is unfamiliar to you, collect a specimen for later identification. If possible, document their origin.

Step 1

Search the site for invasive plants

If invasive plants are widely dispersed on the site in numerous patches, divide the monitoring site into smaller areas to more accurately estimate total cover and distribution.

List all known invasive plant species in the work table **A**.

	Total Cover (All Low Grasses and Forbs Combined)	10 %
A	Biological Crust little	Total Biological Crust Cover 5
	Invasive Plants	
	Pepperweed - small patch	<1 %
		%
		%
		%

Step 2

Score invasive plant cover

Determine the combined cover of all invasive plants using the diagrams on the next page.

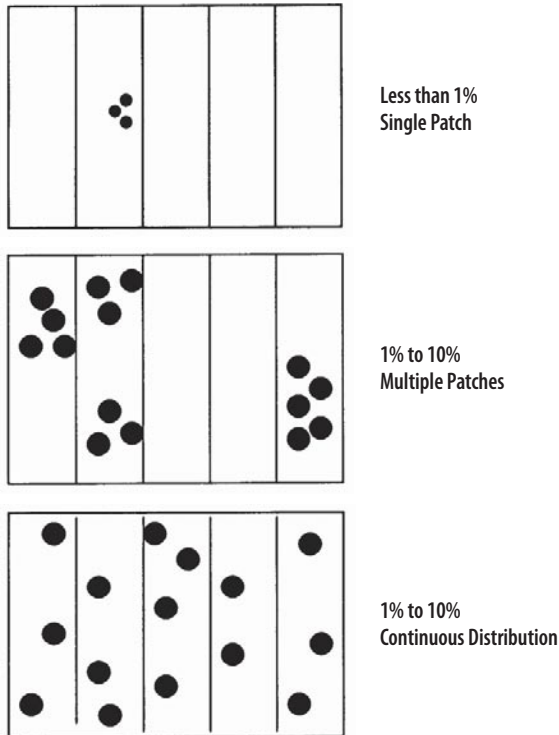
The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant cover is the same for all grasslands plant communities—0%.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)					Total A + B =	14
Reference Condition 0%	0	<1%	1-10%	>10%		
Assessed Cover <1 % B	Points	5	3	1	0	A 3 C
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous		
	Points	5	3	1	0	B 3
					Total A + B =	6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						38

Write your assessed cover value for invasive plants **B** and record your score on the score sheet **C**.

Plant and Distribution Diagram for Invasive Plants

Note that one column = 20% of total area. For general cover diagrams see the last page of this booklet.



Invasive plants often establish on disturbed areas that have bare soils. Check small mammal diggings, trails, salting areas, and around corrals and gates for invasive plants. Inspect all salting areas and corrals within the pasture being surveyed even if these areas are not within the actual monitoring site.

Step 3

Determine the distribution of invasive plants on the site **A**

The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant distribution is the same for all grasslands plant communities—None.

Circle your assessed distribution for invasive plants **B** and record your score on the score sheet **C**.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover	5	3	1	0	A 3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
Points	5	3	1	0	B 3 C
Total A + B					= 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					38

Common Invasive Plants in British Columbia

from *Forest and Range Practices Act Invasive Plant Regulation*

Species	Scientific Name
Anchusa	<i>Anchusa officinalis</i>
Black knapweed	<i>Centaurea nigra</i>
Blueweed	<i>Echium vulgare</i>
Brown knapweed	<i>Centaurea jacea</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Common burdock	<i>Arctium minus</i>
Common tansy	<i>Tanacetum vulgare</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Field scabious	<i>Knautia arvensis</i>
Hoary alyssum	<i>Berteroa incana</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Leafy spurge	<i>Euphorbia esula</i>
Meadow hawkweed	<i>Hieracium pilosella</i>
Meadow knapweed	<i>Centaurea pratensis</i>
Nodding thistle	<i>Carduus nutans</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scentless chamomile	<i>Matricaria maritima</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Teasel	<i>Dipsacus fullonum</i>
Yellow iris	<i>Iris pseudacorus</i>
Yellow toadflax	<i>Linaria vulgaris</i>

Salty sites only

Hoary cress	<i>Cardaria draba</i>
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For more information see *Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia*, available through the Ministry of Agriculture and Lands.

Step 4

Enter combined cover and distribution on score sheet

Enter the total of A and B on the score sheet **A**.

Write any additional comments on the work sheet for future reference.

Assessed Erosion Cover	<5%	Points	8	6	3	0	B	8
							Total A + B	= 14
5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)								
Reference Condition 0%	0	<1%	1-10%	>10%				
Assessed Cover	<1%	Points	5	3	1	0	A	3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous				
	Points	5	3	1	0	B	3	
							Total A + B	= 6 A
Add scores from all five categories (= grey boxes) to get TOTAL SCORE								38

DETERMINING YOUR TOTAL SCORE

Add the scores for all questions and write your total score in the "Total Score" box at bottom of score sheet **B**.

Assessed Distribution	None	scattered individuals	1	0	B	3
Points	5	3	1	0	Total A + B	= 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						38 B
C Grassland Status (circle one):	Reference 76-100%	Slightly Altered 51-75%	Moderately Altered 26-50%	Greatly Altered 0-25%		
D Apparent Trend (circle one):	Upward	Downward	Stable	Unknown		
Note: decrease in litter/increased invasives/some erosion						

Assess Grassland Status

Based on your score, circle one of four grassland status ranges. Your assessment is complete **C**.

Assessing Apparent Trend

In addition to the five main indicators for grassland assessment, consider the features in the table opposite in order to assess apparent trend. Each feature describes possible grassland conditions that suggest that a downward, stable, or upward trend.

To record your assessment, circle the appropriate category on the last line of the score sheet **D**.

It is important to remember that apparent trend is a one time assessment based on your current observations. In future years, when you combine these results with assessments from the past, you will get important trend information and results.

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal colour, seed production; plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Your site assessment is now complete. Ensure your score sheet is completely filled out and that you have recorded all the necessary notes and comments that will assist you with future management decisions.

Photo-Point Monitoring

Your next step is to complete photo-point monitoring, Chapter 6.

Photographic records are an important part of monitoring your grassland. Photo-point monitoring provides an effective visual tool for comparison of the grassland community.

Score Sheet Sample – Page 1

Grassland Assessment Score Sheet ...PAGE 1

Date May 15, 2009 Site Pasture C Observer(s) Bill Ranger
 Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350
 Description Small pasture, 20 ha, uniform slope
 Slope shallow Aspect west Elevation 900m
 Current Uses (circle): Livestock Recreation Wildlife Other
 Management Objective(s) Increase R. fescue, increase productivity and forage.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☐ 1,2,5 or ☒ 3,4Grassland Type Rough fescue,
Antelope-brush grasslandComments (weather, management changes)
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.**1. Key Bunchgrass Cover** (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input checked="" type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	20-39%	<20%	
Assessed Cover Value	<u>27</u> %	Points	40	25	<u>10</u>	= <u>10</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<u>6-40</u> %	<u>35</u> %	YES <u>NO</u>
Tall Grasses and Forbs	<u>>60</u> %	<u>26</u> %	<u>YES</u> NO
Medium Grasses and Forbs	<u>6-40</u> %	<u>15</u> %	YES <u>NO</u>
Low Grasses and Forbs	<u>1-20</u> %	<u>10</u> %	YES <u>NO</u>
Biological Crust	<u>10-30</u> %	<u>5</u> %	<u>YES</u> NO
Total Number of Altered Layers	0	1	<u>2</u> 3 4 or 5
Points	10	6	<u>2</u> 1 0 = <u>2</u>

3. Nutrient and Hydrological Cycling (Booklets 1-4 page 16; Booklet 5 page 18)

Litter Weight					
Reference Condition	<u>2000</u> kg/ha	% of Reference	>100%	50-99%	<u>25-49%</u> <25%
Assessed Litter Weight	<u>750</u> kg/ha	Points	14	8	<u>2</u> 0 A <u>2</u>
Litter Cover and Biological Crust Cover					
Assessed Litter Cover	<u>40</u> %	≥75%	25-74%	<u>25-74%</u> <25%	<25%
Assessed Biological Crust Cover	<u>5</u> %	0-100%	>25%	<u><25%</u> >25%	<25%
Points	10	8	<u>4</u> 2 0 B <u>4</u>	Total A + B = <u>6</u>	

4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%		<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover	<u>5-10</u> %	Points	8	6	3	0
Erosion Features: Reference Condition <5%		<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover	<u><5</u> %	Points	8	6	3	0
Total A + B						= 14

5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)

Reference Condition 0%		0	<1%	1-10%	>10%	
Assessed Cover	<1 %	Points	5	3	1	0
Assessed Distribution		None	Single patch or a few scattered individuals	Multiple Patches	Continuous	A
	Points	5	3	1	0	B
Total A + B						=
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						6
						38

Grassland Status (circle one):	Reference 76-100% Slightly Altered 51-75% <u>Moderately Altered 26-50%</u> Greatly Altered 0-25%
Apparent Trend (circle one):	Upward <u>Downward</u> Stable Unknown

Note: decrease in litter/increased invasives/some erosion

Score Sheet Sample – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

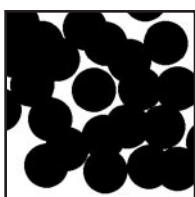
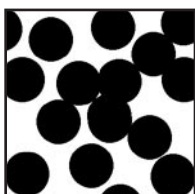
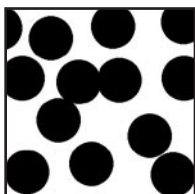
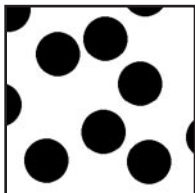
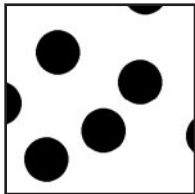
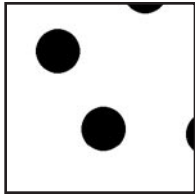
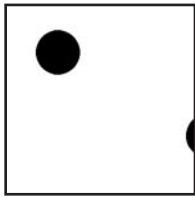
Shrubs Identified	Estimated Percent Cover
Bitter brush	<u>25</u> %
Snowberry	} <u>10</u> %
Juniper	
Saskatoon	
Total Cover (All Shrubs Combined)	<u>35</u> %
Tall Grasses & Forbs	
Rough Fescue	} <u>25</u> %
Bluebunch Wheatgrass	
Balsam root	<u><1</u> %
Total Cover (All Tall Grasses and Forbs Combined)	<u>26</u> %
Medium Grasses & Forbs	
Idaho Fescue	<u>2</u> %
Blue grass	} <u>13</u> %
June grass	
Needle-and-thread	
Yarrow	<u>15</u> %
Total Cover (All Medium Grasses and Forbs Combined)	<u>15</u> %
Low Grasses & Forbs	
Sandberg's Bluegrass	%
Blue-eyed Mary	%
Pussytoes	%
Total Cover (All Low Grasses and Forbs Combined)	<u>10</u> %
Biological Crust <u>little</u>	Total Biological Crust Cover <u>5</u>
Invasive Plants	
Pepperweed - small patch	<u><1</u> %
Total Cover (All Invasive Plants Combined)	<u><1</u> %

Comments

Very dry springLitter cover approx. 40%Bare soil 5-10%Some visible erosion <5%Amount of litter has declinedInvasive plants are increasing

Cover Diagrams for Plant Community Cover

Large



5% Cover

10% Cover

20% Cover

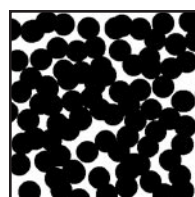
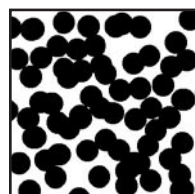
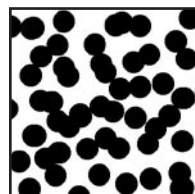
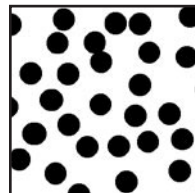
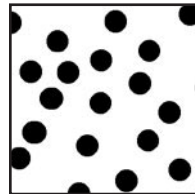
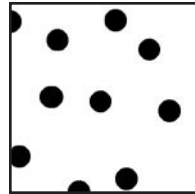
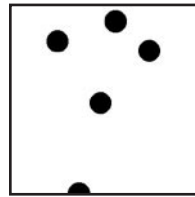
30% Cover

50% Cover

60% Cover

75% Cover

Small



Porcupinegrass, Bluebunch Wheatgrass Grasslands (UPPER GRASSLANDS)

and

Spreading Needlegrass Grasslands (UPPER GRASSLANDS)



Porcupinegrass, Bluebunch Wheatgrass Grasslands and Spreading Needlegrass Grasslands

Two communities, the Short-awned Porcupinegrass, Bluebunch Wheatgrass community and the Spreading Needlegrass community comprise these Cariboo-Chilcotin Upper Grasslands.*

Found in the Cariboo Basin and on the Chilcotin Plateau immediately above the Bluebunch Wheatgrass Grasslands (Middle Grasslands) of the Fraser and Chilcotin rivers, these communities range in elevation from 750 m to 1200 m within the very dry, mild Interior Douglas-fir biogeoclimatic zone. Due to their similar and inter-dispersed nature, the Porcupinegrass, Bluebunch Wheatgrass and the Spreading Needlegrass communities are described in this booklet.

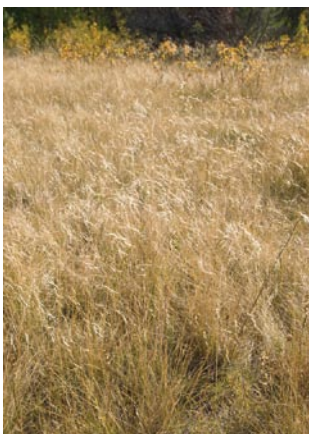
Short-awned porcupinegrass and bluebunch wheatgrass may co-dominate or be sole dominants on undisturbed sites, depending on slope, aspect, elevation, and geographic location. Short-awned porcupinegrass is more common on gentle north-facing slopes, or in slightly moister conditions such as depressions or at the eastern and northern extent of these grasslands. Conversely, bluebunch wheatgrass will become the dominant bunchgrass on steep south-facing slopes and on drier sites with coarse soils.



Training is an essential first step for all first time users of this manual. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results. See Appendix for details.

Typical Porcupinegrass, Bluebunch Wheatgrass community. PHOTO BRIAN WIKEEM

* For space considerations, short-awned porcupinegrass will be referred to as porcupinegrass throughout this booklet.



Spreading needlegrass is frequent throughout the Upper Grasslands and is often intermixed with porcupinegrass and bluebunch wheatgrass. However, needlegrass becomes the dominant bunchgrass near the forest edge and in grassland openings within the forest.

Porcupinegrass, Bluebunch Wheatgrass grasslands and Spreading Needlegrass grasslands typically have five structural layers, including shrubs, tall grasses and forbs, medium grasses and forbs, low grasses and forbs not exceeding 5 cm (including sedges and rushes), and biological crusts.



Biological crusts play a critical ecological role by assisting in moisture retention, fixing atmospheric nitrogen, and in ensuring soil stability. In Lower Grasslands, biological crust cover increases significantly where bunchgrass plants are more spaced and where litter cover is lower. Biological crusts may increase where increased site disturbance causes a reduction in bunchgrass and other plant cover, as well as a reduction in litter. This trend may serve as an early warning or indicator of over-grazing by wildlife or livestock. PHOTO BRIAN WIKEM

Scoring These Grassland Communities

This section takes you through the process of scoring your Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass communities based on the five key indicators:

- plant community composition
- plant community structure
- nutrient and hydrological cycling (litter and biological crusts)
- site stability (existing or potential erosion)
- invasive plants

The Grassland Assessment Score Sheet

The grassland assessment score sheet enables you to collect information in a consistent manner from one monitoring site to another and from one assessment period to another. Be sure to complete all information on the form.

Space is provided to record the site name, date, and exact location of your assessment (including GPS coordinates) **A**. Include information such as slope, aspect, and elevation. This information is important for relocating the monitoring site in the future and is helpful when comparing results from one management area to another.

Lines for comments are located near the top right of the score sheet **B** and below the work table on page 2 of the score sheet. Use these spaces to add information that may help you interpret

Top Portion of the Score Sheet

- Take time to fill in all information
- What are your objectives?

Grassland Assessment Score Sheet ...PAGE 1 **A**

Date May 15, 2009 Site Pasture F Observer(s) Bill Ranger

Location: UTM Zone NAD83 Zone 10 N 5625335 E 682350

Description Large relatively flat bench

Slope flat Aspect East/SE Elevation 900m

Current Uses (circle): Livestock Recreation Wildlife Other

Management Objective(s) Maintain or increase key bunchgrasses and productivity. Maintain or increase litter.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4

Grassland Type Porcupine grass,
Bluebunch Wheatgrass grassland

Comments (weather, management changes) **B**
A very cool, dry spring. Little snow. Fall grazed 2 weeks, out October 20th.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%			<u>35-50%</u>			
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%			<u>40-60%</u>			
Assessed Cover Value	<u>37</u> %		<u>25</u>	10	0	= <u>25</u>

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	<u>2</u> %	YES <u>NO</u>
Tall Grasses and Forbs	10-30 %	<u>13</u> %	YES <u>NO</u>
	>40 %	<u>31</u> %	<u>YES</u> NO

what you are seeing. Also record any information that is not included in the questions, but may help you make management decisions in the future.

Sometimes a question may not seem to apply to your assessment area, or the answer may not agree with your experience or other observations. Record the answer as best you can, but elaborate with comments to explain why your response does not seem to work.

Before You Start

- 1 Select a monitoring site (see Chapter 4).
- 2 Mark or stake your site for future reference.
- 3 Select a blank score sheet (see Tab 8).
- 4 Fill in the top portion of your score sheet.
- 5 Walk around the entire site. Tune your eye to the site and observe your grassland community.
- 6 Begin filling in your score sheet. The following sections explain how to score each indicator.



Short-awned Porcupinegrass

Reference Condition

Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass Grasslands

- Key bunchgrasses (short-awned porcupinegrass, bluebunch wheatgrass, and/or spreading needlegrass) cover more than 50% of the site. One or more of these species may dominate depending on slope, aspect, elevation, latitude, climate, and soils:
 - Short-awned porcupinegrass will often co-dominate with bluebunch wheatgrass.
 - On gentle north-facing slopes and on cooler moister sites, short-awned porcupinegrass tends to become the dominant bunchgrass.
 - On drier sites with coarse soils, bluebunch wheatgrass tends to become the dominant bunchgrass.
 - Near the forest edge and in grassland openings within the forest, spreading needlegrass will become the dominant bunchgrass.
- Shrubs, such as common rabbit-brush, prickly rose, and common snowberry, are found in trace amounts and account for less than 5% of the vegetation cover.
- Structural layers are unaltered from the Reference Condition and include:
 - 1 shrubs
 - 2 tall grasses and forbs
 - 3 medium grasses and forbs
 - 4 low grasses and forbs (including sedges and rushes) not exceeding 5 cm
 - 5 biological crusts
- Biological crusts (mosses, lichens, and algae) are common and make up 10 to 30% of the ground cover. Biological crusts play an important ecological function. When site disturbance intensifies, bunchgrass, other plants and litter cover decrease, and may result in increased biological crusts.
- Litter weight varies from 1000 kg/ha for bluebunch wheatgrass-dominated sites to greater than 2000 kg/ha for porcupinegrass- and spreading needlegrass-dominated sites. On all sites, litter cover is 75% or more of the ground surface.
- Stable soils show limited bare soil and soil disturbance. Erosion features and/or bare soil account for less than 10% of the ground surface.
- Invasive plants are not present or account for less than 1% cover on the site.

SCORE SHEET QUESTION 1

Accounts for 40%
of total score

SCORING KEY BUNCHGRASS COVER

What is the composition of your plant community?

The cover of key bunchgrasses provides an index of plant species composition and will help you assess the status of your grassland.

What to expect on your site in the Reference Condition:

Key bunchgrasses cover more than 50% of the site and on some sites may exceed 90%.

- Site is dominated by short-awned porcupinegrass, bluebunch wheatgrass, and/or spreading needlegrass.
- Short-awned porcupinegrass may co-dominate with bluebunch wheatgrass.
- Bluebunch wheatgrass may become the dominant bunchgrass on some sites, particularly drier sites with coarse soils.
- Spreading needlegrass may dominate near the forest edge and in grassland openings within the forest.

Step 1

List known bunchgrasses

List known bunchgrasses on the work table on page 2 of the score sheet **A**. If possible, document other plant species that occur on the site as well. This will save you time during the scoring procedure. This is especially important when the dominant bunchgrasses are limited or not present.

If some species are unfamiliar to you, collect a few specimens for later identification. See Appendix 2: *Collecting Plant Specimens for Later Identification*.

Work Table on Page 2 of the Score Sheet

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Common snowberry	} 2 %
Wild rose	
	%
	%
Total Cover (All Shrubs Combined)	2 %
Tall Grasses & Forbs A	
Bluebunch Wheatgrass	12 %
Balsam Root	1 %
	%
	%

Identification Aid for Key Bunchgrasses



PHOTOS BRIAN WIKEEM

Short-awned Porcupinegrass	Bluebunch Wheatgrass	Spreading Needlegrass
Tufted perennial bunchgrass	Densely tufted perennial bunchgrass	Tufted perennial bunchgrass
Stems ascending to erect, 24–65 cm tall, lower nodes usually smooth	Stems erect, 30–100 cm tall	Stems ascending to erect with a nodding top, 40–100 cm tall
Leaves 1.3–3 mm wide, flat, lower sheath smooth	Leaves flat, branched, green to bluish green	Leaves basal, flat or with inrolled margins
Flower a loose but narrow panicle, 6–24 cm long, awns twice bent, 50–105 mm long, rough	Flowers a spike 8–16 mm long, usually without awns	Flowers an open panicle with loose spreading branches, each with a single floret spikelet at the tip
Lemma (seed) smooth with brown margins and brown hairs at base		Seeds with 3 cm corkscrewed awn
Litter usually lays flat on ground	Standing litter curled at top	Litter is usually fallen and may form thick accumulations

Step 2

Determine the cover of key bunchgrasses

There are two ways to determine the cover of key bunchgrasses. You can list each bunchgrass in the work table **A**. Once you have identified your two or three key bunchgrasses, write down the percent cover of each in the work table **B**. Alternatively, you can estimate the total cover for all of the key bunchgrasses together and write that value in the grey "Total Cover" box **C**.

Use the grassland status photos opposite to assist you with the cover rating. Compare what you see to these photos and to the vegetation cover diagrams on the last page of this booklet.

Total Cover (All Shrubs Combined)		2	%
Tall Grasses & Forbs			
Bluebunch Wheatgrass	B	12	%
Balsam Root	A	1	%
			%
			%
Total Cover (All Tall Grasses and Forbs Combined)		C 13	%
Medium Grasses & Forbs			
Porcupine grass - dominant		20	%
Spreading needle grass		5	%

Step 3

Score plant community composition based on the cover of key bunchgrasses

First check the appropriate Reference Condition box (a. or b.) on your score sheet **D**. For this plant community check box a., as the Reference Condition is greater than 50% bunchgrass cover.

Next, write your assessed bunchgrass cover value on the score sheet **E**. Remember, your cover value should be representative of the entire assessment site. If you are using a 10 square meter area, or a pasture, ensure that you assess the average cover for the entire site. It is sometimes easier to assess a one square meter area and take several samples around the site or pasture. You would then average all your values and insert the average value on the score sheet.

Your assessed cover value will place you in one of the four categories listed opposite.

D 1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	20-39%	<20%	
Assessed Cover Value	Points	40	25	10	0	= 25

E 2. Plant Community Structure (booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	<5 %	2 %	YES NO
Tall Grasses and Forbs	10-30 %	13 %	YES NO

Comparison of Grassland Status and Bunchgrass Cover



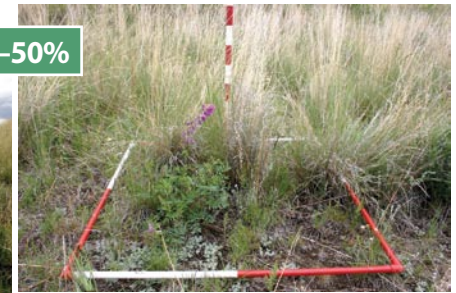
Reference Condition Landscape



Reference Condition Plot



Slightly Altered Landscape



Slightly Altered Plot



Moderately Altered Landscape



Moderately Altered Plot



Greatly Altered Landscape



Greatly Altered Plot

PHOTOS BRIAN WIKHEM

Assessed Cover Values and Status

Category	Description	Bunchgrass Cover	Score
Reference Condition	The existing plant community closely resembles the Reference Condition. Evidence of disturbance is minimal.	> 50%	40
Slightly Altered	The existing plant community has been slightly altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs may be more abundant. Non-native species may be present but are infrequent.	35–50%	25
Moderately Altered	The existing community has been moderately altered compared to the Reference Condition. Low-growing to mid-sized grasses and forbs usually are more abundant. Non-native plant species may be common but native species are still present.	20–34%	10
Greatly Altered	The existing community has been significantly altered compared to the Reference Condition. Non-native species, native annuals, and low-growing native plants dominate the community.	< 20%	0

If your measurement falls on a threshold between two categories or is close to a threshold and you are finding it difficult to make a decision, always err on the side of caution: score to the lower category and record comment.

Select Your Cover Value

Your Assessed Bunchgrass Cover	> 50%	35–50%	20–34%	< 20%
Score	40	25	10	0

Step 4 Determine and enter the appropriate score on the score sheet

Based on your assessed bunchgrass cover value **A**, circle and record your score on the score sheet **B**.

Productivity. Maintain or increase litter.

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.					
a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35–50% A	20–34%	<20%
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40–60%	20–39%	<20%
Assessed Cover Value	37 %	Points	40	25	10
					Score = 25 B
2. Plant Community Structure (Booklets page 11)					

Step 5 Write comments for future reference

Write any additional comments on the work table for future reference. The most important indicators of change are:

- A decline in cover of the dominant bunchgrasses.
- An increase in cover of low grasses, forbs, and sometimes shrubs. Low-growing bunchgrasses and forbs, such as Sandberg's bluegrass and pussytoes are often more abundant as disturbance increases.

SCORING PLANT COMMUNITY STRUCTURE

Do you have the expected plant layers?

This question focuses on the physical structure of plant layers found in Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass Grasslands. Changes are determined by comparing the structure of the existing plant community to the Reference Condition.

What to expect on your site in the Reference Condition:

- Shrubs, such as common rabbit-brush, prickly rose, and common snowberry are found in trace amounts and account for less than 5% of the vegetation cover.
- Five structural layers (see illustration next page) are present including:
 - shrubs
 - tall grasses and forbs
 - medium grasses and forbs
 - low grasses and forbs not exceeding 5 cm (including sedges and rushes)
 - biological crusts
- Biological crusts (mosses, lichens, and algae) are common and make up 10 to 30% of the ground cover. Biological crusts may vary significantly depending on plant and litter cover.

When site disturbance increases, bunchgrass and other plant cover, as well as litter content, decrease. The result may be an increase in biological crusts.

SCORE SHEET QUESTION 2

Accounts for 10% of total score

Above ground structure protects the soil against wind, rain and heat from the sun, and supplies habitat for wildlife.

Commonly Occurring Species

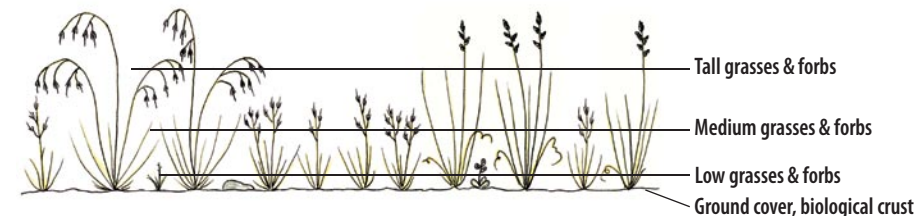
Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass grassland communities

Plant Layer		Plant Species
 	Shrubs	<ul style="list-style-type: none"> • common snowberry • common rabbit-brush* • prickly rose*
 	Tall Grasses and Forbs	<ul style="list-style-type: none"> • bluebunch wheatgrass* • arrowleaf balsamroot* • northern sweet-vetch • alfalfa (non-native species)
 	Medium Grasses and Forbs	<ul style="list-style-type: none"> • short-awned porcupine grass • needle-and-thread grass • spreading needlegrass* • meadow aster • junegrass • field locoweed • timber milk vetch • Kentucky bluegrass (non-native) • yarrow*
 	Low Grasses and Forbs	<ul style="list-style-type: none"> • Sandberg's bluegrass* • small-flowered blue-eyed Mary • pussytoes* • cheatgrass (invasive species)
 	Biological Crusts	mosses, lichens, and algae*
		* shown in photos

Structural Layers for Short-awned Porcupinegrass-dominated Grasslands

Short-awned porcupinegrass is a medium height grass and may dominate undisturbed sites, depending on slope, aspect, elevation and geographic location. Spreading needlegrass and other grasses also occur.

Spreading needlegrass often dominates near the forest edge and in grassland openings within the forest. These grasslands have similar structural layers as porcupinegrass dominated sites, and therefore are assessed the same.



Structural Layers for Bluebunch Wheatgrass-dominated Sites

Bluebunch wheatgrass is a tall grass species and contributes to your tall grass and forb layer..



Step 1

List species

Refer to your list of species on the work table on page 2 of the score sheet. Add any additional plants you observe within each layer.

Refer to the list of commonly occurring species opposite.

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Shrubs Identified	Estimated Percent Cover
Common snowberry	2 %
Wild rose	%
	%
	%
Total Cover (All Shrubs Combined)	2 %
Tall Grasses & Forbs	
Bluebunch Wheatgrass	12 %
Balsam Root	1 %
	%

Categories of Structural Layer Changes Porcupinegrass-dominated Sites

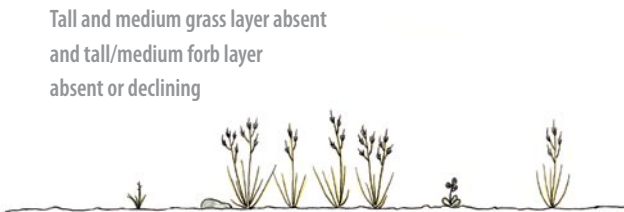
1 Reference Condition:
All layers as expected are present



2 Slightly Altered:
One layer is absent or altered



3 Moderately Altered:
Two layers are absent or altered



4 Greatly Altered:
Three layers are absent or altered



Categories of Structural Layer Changes Bluebunch Wheatgrass-dominated Sites

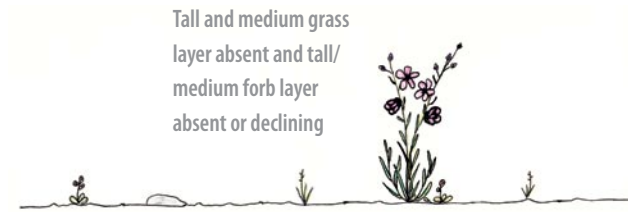
1 Reference Condition:
All layers as expected are present



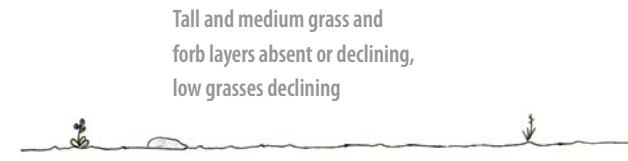
2 Slightly Altered:
One layer is absent or altered



3 Moderately Altered:
Two layers are absent or altered



4 Greatly Altered:
Three layers are absent or altered



Step 2 Assess structural layers

Check one:

- ☐ I am assessing a short-awned porcupinegrass-dominated site.
- ☐ I am assessing a spreading needlegrass-dominated site.
- ☐ I am assessing a bluebunch wheatgrass-dominated site.

Using the work table, assess existing structural layers. Refer to the structural layer changes shown in the drawings on pages 14 and 15, and to the cover diagrams on the last page of this booklet to determine a cover value for each layer.

Both short-awned porcupinegrass- and spreading needlegrass-dominated sites are assessed and scored similarly for structure.

Bluebunch wheatgrass is a tall grass species and contributes to your tall grass and forb layer, while short-awned porcupinegrass and spreading needlegrass contributes to the medium grass and forb layer.

Expected Layers in the Reference Condition

1 – Porcupinegrass and Spreading Needlegrass Dominated Sites (PG)

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	trace	infrequent–common	frequent–abundant	trace–infrequent	infrequent–common
Reference Cover Value	< 5%	10–30%	>40%	1–20%	10–30%

2 – Bluebunch Wheatgrass Dominated Sites (BBW)

Plant Layer	Shrubs	Tall Grasses and Forbs	Medium Grasses and Forbs	Low Grasses and Forbs	Biological Crusts
	trace	frequent–abundant	infrequent–common	trace–infrequent	infrequent–common
Reference Cover Value	< 5%	>60%	6–40%	1–20%	10–30%

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers
Shrubs	A <5 %	B 2 %	YES C NO
Tall Grasses and Forbs	10–30 %	13 %	YES NO
Medium Grasses and Forbs	>40 %	31 %	YES NO
Low Grasses and Forbs	1–20 %	10 %	YES NO
Biological Crust	10–30 %	15 %	YES NO
Total Number of Altered Layers	0	1	2
Points	10	6 D	2
			1
			0
			= 6 E

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Step 3 Score plant community structure

Score plant community structure based on existing plant layers. Write in the Reference Condition for each layer on score sheet **A**.

- | | 1 – PG | 2 – BBW |
|------------------------|--------------------|--------------------|
| • Shrubs | = less than 5% | = less than 5% |
| • Tall Grasses & Forbs | = 10 to 30% | = greater than 60% |
| • Medium Grasses/Forbs | = greater than 40% | = 6 to 40% |
| • Low Grasses/Forbs | = 1 to 20% | = 1 to 20% |
| • Biological Crusts | = 10 to 30% | = 10 to 30% |

Enter your assessed cover value for each layer on the score sheet **B**.

Scoring Tip

Selecting your site in the Upper Grasslands of the Cariboo is important. You may encounter sites where porcupinegrass, bluebunch wheatgrass, and spreading needlegrass each dominate. In some areas, short-awned porcupinegrass and blue-bunch wheatgrass will co-dominate. If you do encounter this situation while selecting a site, find a site that is dominated by either short-awned porcupinegrass, bluebunch wheatgrass, or spreading needlegrass. Whenever possible, try to select a bluebunch wheatgrass site, as it is more likely to have higher grazing pressure due to the palatability of bluebunch wheatgrass over porcupinegrass. This will ensure you get an adequate picture of grazing pressure.

Step 4 Assess whether layer is altered or not

For each layer, assess whether it is altered or not altered. Circle YES or NO on your score sheet **C**. Circle the number of altered layers in the appropriate box on the score sheet **D**.

Step 5 Enter score and additional comments

Score your plant community structure. The number of altered layers will determine your score. Enter the score on the score sheet **E**. Write any additional comments on the back of the score sheet for future reference.

Structural plant layers in the existing plant community are compared to the Reference Condition. A structural layer is considered altered when its cover no longer falls within the expected range for the Reference Condition.

SCORE SHEET QUESTION 3

Accounts for 24%
of total score

Litter weight and cover can be highly variable depending on available moisture and grazing pressure. Ideally, litter will provide complete ground cover on ungrazed Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass grasslands in the Reference Condition.

SCORING NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

Litter is an important indicator of nutrient cycling and hydrological function. Litter on the soil surface help intercept rainfall, slow water movement across the soil surface, promote infiltration into the soil, and regulate heat on the soil surface.

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down. When collecting litter, collect all litter found within your plot.

What to expect on your site in the Reference Condition for short-awned porcupinegrass- and spreading needlegrass-dominated sites:

- Litter cover is uniform on the site.
- Litter matter consists of dead plant material on the soil surface and within plants.
- Litter weight is greater than 2000 kg/ha. Litter weight may vary from 2000 to 4400 kg/ha.
- Litter cover is 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil accounts for less than 10% of the ground surface or site.

What to expect on your site in the Reference Condition for bluebunch wheatgrass-dominated sites:

- Litter cover is uniform on the site.
- Litter matter consists of dead plant material on the soil surface and within plants.
- Litter weight is greater than 1000 kg/ha. Litter weight may vary from 1000 to 2000 kg/ha or more.
- Litter cover is 75% or more of the ground surface.
- Stable soils with limited bare soil and soil disturbance, where erosion features and/or bare soil accounts for less than 10% of the ground surface or site.

Scoring in this section is divided into two components:

- Assessing litter weight
- Assessing the cover of litter and biological crusts

Both litter and biological crusts are measured together. An increase

The Importance of Litter



Litter is the key indicator of nutrient cycling and hydrological function. Litter on the soil surface helps intercept rainfall, slow water movement across the soil surface, and promote infiltration into the soil. It also regulates heat on and below the soil surface. It slows down soil heating and helps the soil to cool more quickly, reducing moisture loss.

in litter weight and cover over the site often results in a decrease in crust cover—there is less open space for the crusts to establish.

Step 1 Hand rake and assess litter

Litter weight is estimated by hand-raking litter from a 0.25 m² area or within a plot frame. The litter will be either weighed or compared to the photographs on page 21.

Collect three to five samples from representative areas on the site. Remember your site should be 5 to 10 m square. If you have a larger site you may require more samples.

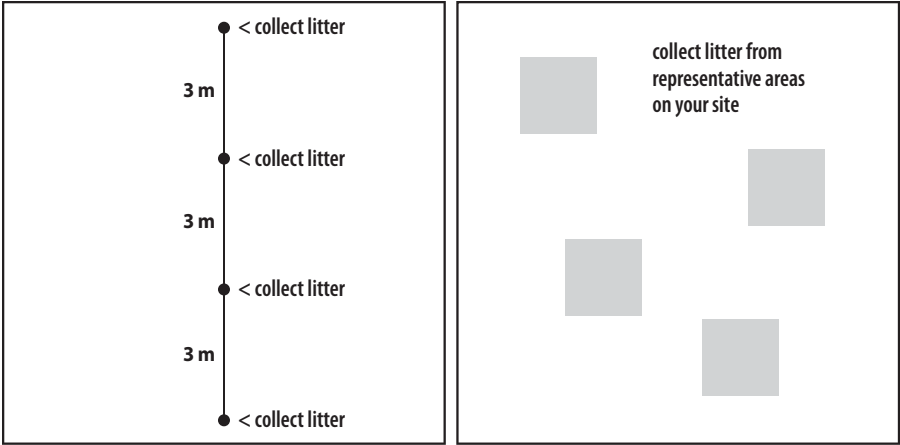
If you installed transects, hand-rake litter from a 0.25 m² area or plot every 3 to 5 m along the transect.



Typical Reference Condition for the Porcupinegrass, Bluebunch Wheatgrass and Spreading Needlegrass grasslands.

PHOTO BRIAN WIKHEM

Options for Collecting Litter



Ziplock bags are handy for storing individual litter samples. Prepare litter bags ahead of time for easy reference in the field. See Appendix 3.

Step 2
Compare your samples to the Reference Condition
Compare your samples to the thresholds shown on page 21. Determine which litter weight category most closely resembles your sample. List your samples in the work table on page 2 of the score sheet. Take an average of all samples on the site.

Step 3
Score litter weight
Write in the Reference Condition for litter weight on score sheet **A**.
• Short-awned porcupinegrass-dominated site is greater than 2000 kg/ha.
• Spreading needlegrass-dominated site is greater than 2000 kg/ha.
• Bluebunch wheatgrass-dominated sites is greater than 1000 kg/ha.

Write in your assessed litter weight on the score sheet **B**.
Your litter weight will fall within one of the four categories shown on the chart opposite. The second column of the chart converts litter weight into a percent of the Reference Condition, and the third column shows the corresponding score.

Using this chart, determine your score and circle it on the score sheet **C**, then enter the score in box A to the right **D**.

Total Number of Altered Layers	0	1	2	1	0	=	6
Points	10	6	2	1	0		





3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight	
Reference Condition A	2000 kg/ha
% of Reference	>100% 50-99% (25-49%) <25%
Assessed Litter Weight B	750 kg/ha
Points	14 8 2 C 0
Litter Cover and Biological Crust Cover	
Assessed Litter Cover	50 %
%	>75% 25-74% (25-74%) <25% <25%

D 2

Litter Weight Thresholds

Porcupinegrass, Spreading Needlegrass, or Bluebunch Wheatgrass dominated sites

Reference Condition is >1000kg/ha		Bluebunch Wheatgrass dominated sites	Conversion to % of Reference Condition (relative values)	Score
Reference Condition is >2000kg/ha	Porcupinegrass or Spreading Needlegrass dominated sites Your Assessed Litter Weight	Your Assessed Litter Weight		
	>2000 kg/ha	>1000 kg/ha	>100%	15
	2000 to 1000 kg/ha	1000 to 500 kg/ha	50–100%	8
	1000 to 500 kg/ha	500 to 250 kg/ha	25–49%	2
	< 500 kg/ha	< 250 kg/ha	< 25%	0

If your assessment falls on or is close to a threshold and you are finding difficult to make a decision, always err on the side of caution: score to the lower category.

The score sheet converts litter weights into values that are relative to the Reference Condition. This conversion was necessary to standardize the score sheet for all plant communities.

Step 4

Assess litter and biological crust cover

First, make a visual estimate of litter cover. How much ground is covered by litter? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help estimate litter cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed litter cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Next, assess biological crust cover. Make a visual estimate of biological crust cover. How much ground is covered by biological crusts? It is important to assess your entire site. Use the cover diagrams on the last page of this booklet to help you estimate biological crust cover. Ask yourself: Is the cover greater than or less than the threshold values presented in the cover diagrams?

Write in your assessed biological crust cover value on the score sheet **A**, then circle the appropriate cover value category to the right **B**.

Biological crusts play an important role in moisture retention and soil stability. Biological crusts are not considered bare soil.

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight		Points				A	
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%		<25%
Assessed Litter Weight	2000	750	14	8	2	0	2
Litter Cover and Biological Crust Cover		Points				B	
Assessed Litter Cover	%	≥75%	25-74%	<25%	<25%		
Assessed Biological Crust Cover	50	15	4	2	0	4	
Total A + B						6	

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)

Step 5

Score litter and biological crust cover

Both litter and biological crust cover are interrelated and thus are scored together. Check your assessment values carefully before scoring. See *Scoring Tip* below. Record your score on the score sheet **C**.

Add A and B to get total score **D**.

Write additional comments on the work table for future reference.

Scoring Tip

Both litter and biological crusts are measured together. This is important. For example:

- If litter is high, greater than or equal to 75%, you will get full points, regardless of biological crust cover.

As part of your estimate, include litter standing within living plants and decomposing litter on the soil surface. Look closely for lichens, mosses, and algae. When the soil is dry, they can be inconspicuous and hard to identify.

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight		Points				A	
Reference Condition	kg/ha	% of Reference	>100%	50-99%	25-49%		<25%
Assessed Litter Weight			14	8	2	0	
Litter Cover and Biological Crust Cover		Points				B	
Assessed Litter Cover	%	≥75%	25-74%	<25%	<25%		
Assessed Biological Crust Cover			4	2	0		
Total A + B							

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)

- If litter is moderate, 25 to 74% and biological crust cover is less than 25%, your score will be 4 **A**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover less than 25% of your site.
- If litter is low, less than 25%, and biological crust cover is more than 25%, your score will be 2 **B**. Litter is likely patchy and most of the litter remains on the plant, not on the ground. Little organic matter is on the soil. Biological crusts cover more than 25% of your site. This site may be recovering.
- If litter is low, less than 25%, and biological crust cover is low, less than 25%, your score will be 0 **C**. Litter is sparse, patchy, and decaying organic material is the main type of litter on the soil surface. Most of the existing litter is in the plant.

SCORING SITE STABILITY

Is there existing or potential erosion on site?

Site stability is determined by assessing the total amount of bare soil and erosion on the site caused by wind and water. Bare soil is defined as mineral soil—soil particles less than 5 mm—not covered by live plants, litter, or biological crusts. Particles greater than 5 mm, such as stones and bedrock, should not be included in the bare soil cover estimate. Erosion occurs when there is actual loss of soil particles from a site.

What to expect on your site in the Reference Condition:

- Bunchgrasses are widely spaced with uniform litter cover.
- A combination of litter and biological crusts cover 75% or more of the ground surface.
- Bare soil does not exceed 5% cover.
- Erosion features are limited and do not exceed 5% cover. (Together, erosion features and/or bare soil cover less than 10% of the ground surface.)

SCORE SHEET QUESTION 4

Accounts for 16% of total score

Erosion



PHOTO BRIAN WIKHEEM

This indicator is scored in two parts:

- Assess the cover of bare soil
- Assess the cover of erosion features

Step 1

Estimate area covered by bare soil

Estimate the percentage of the soil surface on your site that is covered by bare soil. Use the cover diagrams on the last page of this booklet to assist you in determining whether cover is greater or less than the threshold values.

The Reference Condition is already identified for you on the score sheet. Reference condition for bare soil is the same for all grasslands plant communities—less than 5%.

Write your assessed cover value for bare soil **A** and record your score on the score sheet **B**.

Points	10	8	6	4	2	0	B
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)							4
Bare Soil: Reference Condition <5%				5-10%	11-20%	>20%	
Assessed Bare Soil Cover <u>10</u> %	8	6	3	0			6
Erosion Features: Reference Condition <5%				5-10%	11-20%	>20%	
Assessed Erosion Cover <u>>5</u> %	8	6	3	0			6
Total A + B							12
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)							
Reference Condition 0%	0			<1%	1-10%	>10%	
Assessed Cover <u><1</u> %	5	3	1	0			3

Step 2

Estimate area covered by erosion features

Estimate the cover of the erosion features on site. Use the cover diagrams on the last page of this booklet to determine whether the cover is greater or less than the erosion threshold values listed.

The Reference Condition is already identified for you on the score sheet. Reference Condition for erosion features are the same for all grasslands plant communities—less than 5%.

Examples of Soil Disturbance and Erosion



Bare Soil



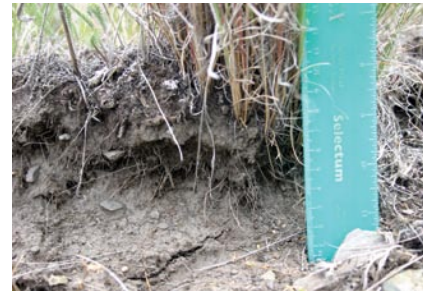
Soil Movement



Lichen Line



Erosion Pavement



Pedestal – Exposed Roots



Rills



Gully



Undercutting

PHOTOS BRIAN WIKHEEM

Write your assessed cover value for erosion **A** and record your score on the score sheet **B**.

Points		10	20	30	40	Total A + B
4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)						
Bare Soil: Reference Condition <5%		<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover	10%	Points	8	6	3	0
Erosion Features: Reference Condition <5%		<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover	>5%	Points	8	6	3	0
Total A + B						6
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)						
Reference Condition 0%		0%	<1%	1-10%	>10%	
Assessed Cover	<1%	Points	5	3	1	0
Total A + B						3

Step 3

Record total score for site stability **C**

Write any additional comments on the work table for future reference.

The following indicators suggest active or potential soil disturbance and increased susceptibility to erosion:

- Reduced litter cover and increased bare soil.
- Evidence of soil movement such as flow patterns on the surface, fan deposits, and rills.
- Evidence of soil loss such as pedestalled plants with exposed roots, exposed gravel on the soil surface, lichen lines on rocks, and wind scouring of exposed soil.
- Physical disturbance such as hoof shearing, trails, and compaction.

Look closely at the soil surface. Be aware that mosses and lichens are protecting the soil surface and should not be considered part of bare soil. Erosion features may be active or healing, and both types are included as erosion. Although numerous features signify erosion (see photos previous page), the combination of all features present on the site is collectively considered in scoring this indicator.

Most erosion and bare soil in the Reference Condition is restricted to areas with small mammal, bird or insect activity.

SCORING INVASIVE PLANTS

Are invasive plants present on this site?

The cover and distribution of invasive plants are indicators of the status of your grassland.

Invasive plants occupy grasslands because they out-compete native plants. Where disturbance has created available space and conditions for seed germination, invasive species thrive. Some species, such as diffuse and spotted knapweed, can dominate grasslands and persist for decades. As a result, forage values and species diversity on these sites are often much lower than would be expected in native plant communities.

SCORE SHEET QUESTION 5

Accounts for 10% of total score



Invasive plant, Dalmatian Toadflax.
PHOTO BRIAN WIKEEM

The presence of invasive plants on grasslands is generally considered a risk even though the actual effects of some species are unknown. All invasive plants considered for this indicator are non-native species to British Columbia. Assessing this indicator requires some knowledge of the common invasive plants listed on page 27.

What to expect on your site in the Reference Condition:

- Limited bare soil or soil disturbance.
- Little or no erosion features.
- No invasive plants present.

Document as many invasive plant species as possible. This is especially important when they are abundant. If a species is unfamiliar to you, collect a specimen for later identification. If possible, document their origin.

Step 1

Search the site for invasive plants

If invasive plants are widely dispersed on the site in numerous patches, divide the monitoring site into smaller areas to more accurately estimate total cover and distribution.

List all known invasive plant species in the work table **A**.

	Total Cover (All Low Grasses and Forbs Combined)	10 %
A	Biological Crust ✓	Total Biological Crust Cover 15
	Invasive Plants	
	Oxeye Daisy	<1 %
		%
		%
		%

Step 2

Score invasive plant cover

Determine the combined cover of all invasive plants using the diagrams on the next page.

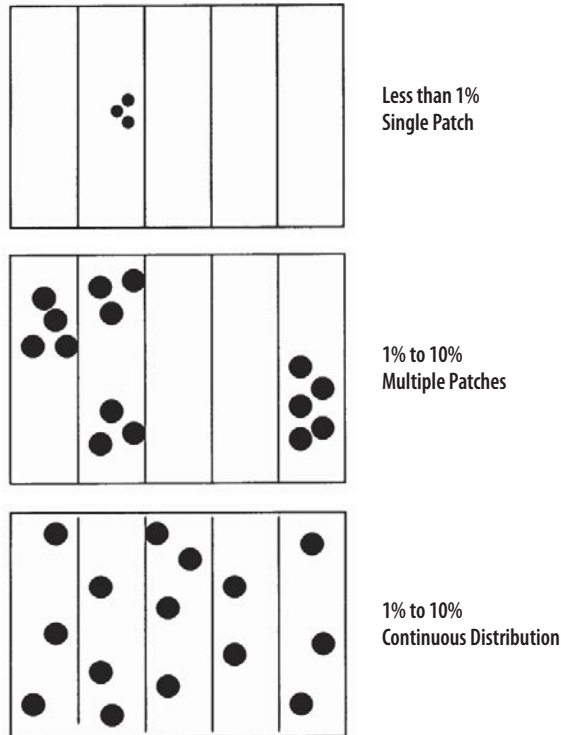
The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant cover is the same for all grasslands plant communities—0%.

Points		8	6	4	2	0	Total A + B
5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)							
Reference Condition 0%		0	<1%	1-10%	>10%		
Assessed Cover	<1% B	Points	5	3	1	0	A 3 C
Assessed Distribution		None	Single patch or a few scattered individuals	Multiple Patches	Continuous		
Points		5	3	1	0		B 3
Total A + B							6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE							55

Write your assessed cover value for invasive plants **B** and record your score on the score sheet **C**.

Plant and Distribution Diagram for Invasive Plants

Note that one column = 20% of total area. For general cover diagrams see the last page of this booklet.



Invasive plants often establish on disturbed areas that have bare soils. Check small mammal diggings, trails, salting areas, and around corrals and gates for invasive plants. Inspect all salting areas and corrals within the pasture being surveyed even if these areas are not within the actual monitoring site.

Step 3

Determine the distribution of invasive plants on the site **A**

The Reference Condition is already identified for you on the score sheet. Reference Condition for invasive plant distribution is the same for all grasslands plant communities—None.

Circle your assessed distribution for invasive plants **B** and record your score on the score sheet **C**.

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover <1%	Points 5	3	1	0	A 3
Assessed Distribution A	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	
	Points 5	B 3	1	0	B 3 C
Total A + B					= 6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					55

Common Invasive Plants in British Columbia

from *Forest and Range Practices Act Invasive Plant Regulation*

Species	Scientific Name
Anchusa	<i>Anchusa officinalis</i>
Black knapweed	<i>Centaurea nigra</i>
Blueweed	<i>Echium vulgare</i>
Brown knapweed	<i>Centaurea jacea</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Common burdock	<i>Arctium minus</i>
Common tansy	<i>Tanacetum vulgare</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Field scabious	<i>Knautia arvensis</i>
Hoary alyssum	<i>Berteroa incana</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Leafy spurge	<i>Euphorbia esula</i>
Meadow hawkweed	<i>Hieracium pilosella</i>
Meadow knapweed	<i>Centaurea pratensis</i>
Nodding thistle	<i>Carduus nutans</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scentless chamomile	<i>Matricaria maritima</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. John's-wort	<i>Hypericum perforatum</i>
Sulphur cinquefoil	<i>Potentilla recta</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Teasel	<i>Dipsacus fullonum</i>
Yellow iris	<i>Iris pseudacorus</i>
Yellow toadflax	<i>Linaria vulgaris</i>

Salty sites only

Hoary cress	<i>Cardaria draba</i>
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For more information see *Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia*, available through the Ministry of Agriculture and Lands.

Step 4

Enter combined cover and distribution on score sheet

Enter the total of A and B on the score sheet **A**.

Write any additional comments on the work sheet for future reference.

Assessed Erosion Cover	>5 %	Points	8	6	3	0	B	6
5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)								Total A + B = 12
Reference Condition 0%	0	<1%	1-10%	>10%				
Assessed Cover	<1 %	Points	5	3	1	0	A	3
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous				
Points	5	3	1	0	B	3		
Total A + B = 6								A
Add scores from all five categories (= grey boxes) to get TOTAL SCORE								55

DETERMINING YOUR TOTAL SCORE

Add the scores for all questions and write your total in the "Total Score" box at bottom of score sheet **B**.

Assessed Distribution	None	scattered individuals	1	0	B	3
Points	5	3	1	0	Total A + B =	6
Add scores from all five categories (= grey boxes) to get TOTAL SCORE						55 B
C Grassland Status (circle one):	Reference 76-100%	Slightly Altered 51-75%	Moderately Altered 26-50%	Greatly Altered 0-25%		
D Apparent Trend (circle one):	Upward	Downward	Stable	Unknown		
New weeds - action required						

Assess Grassland Status

Based on your score, circle one of four grassland status ranges. Your assessment is complete **C**.

Assessing Apparent Trend

In addition to the five main indicators for grassland assessment, consider the features in the table opposite in order to assess apparent trend. Each feature describes possible grassland conditions that suggest that a downward, stable, or upward trend.

To record your assessment, circle the appropriate category on the last line of the score sheet **D**.

It is important to remember that apparent trend is a one time assessment based on your current observations. In future years, when you combine these results with assessments from the past, you will get important trend information and results.

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal colour, seed production; plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Your site assessment is now complete. Ensure your score sheet is completely filled out and that you have recorded all the necessary notes and comments that will assist you with future management decisions.

Photo-Point Monitoring

Your next step is to complete photo-point monitoring, Chapter 6.

Photographic records are an important part of monitoring your grassland. Photo-point monitoring provides an effective visual tool for comparison of the grassland community.

Score Sheet Sample – Page 1

Grassland Assessment Score Sheet ...PAGE 1

Date May 15, 2009 Site Pasture F Observer(s) Bill RangerLocation: UTM Zone NAD83 Zone 10 N 5625335 E 682350Description Large relatively flat benchSlope flat Aspect East/SE Elevation 900mCurrent Uses (circle): Livestock Recreation Wildlife OtherManagement Objective(s) Maintain or increase key bunchgrasses and productivity. Maintain or increase litter.

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Assessment booklet being used ☒ 1,2,5 or ☐ 3,4Grassland Type Porcupine grass,Bluebunch Wheatgrass grassland

Comments (weather, management changes) _____

A very cool, dry spring. Littlesnow. Fall grazed 2 weeks, outOctober 20th.**1. Key Bunchgrass Cover** (Booklets page 6) Use EITHER line a. OR line b. according to your Reference Condition Value or booklet number.

a. <input checked="" type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%	Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE	
b. <input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%	Assessed Cover Value	>60%	40-60%	20-39%	<20%		
Assessed Cover Value	37 %	Points	40	25	10	0	= 25

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers			
Shrubs	<5 %	2 %	YES	NO		
Tall Grasses and Forbs	10-30 %	13 %	YES	NO		
Medium Grasses and Forbs	>40 %	31 %	YES	NO		
Low Grasses and Forbs	1-20 %	10 %	YES	NO		
Biological Crust	10-30 %	15 %	YES	NO		
Total Number of Altered Layers	0	1	2	3	4 or 5	
Points	10	6	2	1	0	= 6

3. Nutrient and Hydrological Cycling (Booklets 1-4 page 16; Booklet 5 page 18)

Litter Weight						
Reference Condition	2000 kg/ha	% of Reference	>100%	50-99%	25-49%	<25%
Assessed Litter Weight	750 kg/ha	Points	14	8	2	0
Litter Cover and Biological Crust Cover						
Assessed Litter Cover	50 %	≥75%	25-74%	25-74%	<25%	<25%
Assessed Biological Crust Cover	15 %	0-100%	>25%	<25%	>25%	<25%
	Points	10	8	4	2	0
Total A + B						= 6

4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover <u>10</u> % Points	8	6	3	0	A 6
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover <u>>5</u> % Points	8	6	3	0	B 6
Total A + B					= 12

5. Invasive Plants (Booklets 1-4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	
Assessed Cover <1 %	Points	5	3	1	0
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	A
	Points	5	3	1	0
Total A + B					=
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					6
					55

Grassland Status (circle one):	Reference 76-100%	<u>Slightly Altered 51-75%</u>	Moderately Altered 26-50%	Greatly Altered 0-25%
Apparent Trend (circle one):	Upward	Downward	<u>Stable</u>	Unknown

New weeds - action required

Score Sheet Sample – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

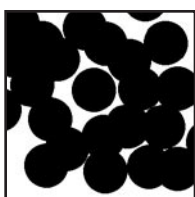
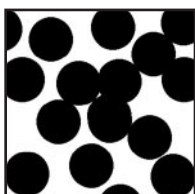
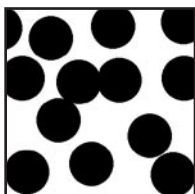
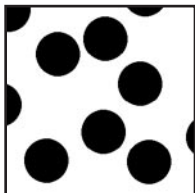
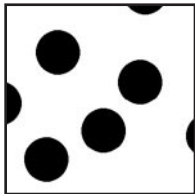
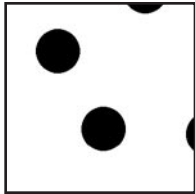
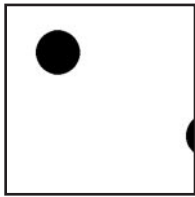
Shrubs Identified	Estimated Percent Cover
<u>Common snowberry</u>	<u>2</u> %
<u>Wild rose</u>	%
	%
	%
Total Cover (All Shrubs Combined)	<u>2</u> %
Tall Grasses & Forbs	
<u>Bluebunch Wheatgrass</u>	<u>12</u> %
<u>Balsam Root</u>	<u>1</u> %
	%
	%
Total Cover (All Tall Grasses and Forbs Combined)	<u>13</u> %
Medium Grasses & Forbs	
<u>Porcupine grass - dominant</u>	<u>20</u> %
<u>Spreading needle grass</u>	<u>5</u> %
<u>Needle-and-thread</u>	<u><5</u> %
<u>Aster</u>	<u>1</u> %
Total Cover (All Medium Grasses and Forbs Combined)	<u>31</u> %
Low Grasses & Forbs	
<u>Sandberg's Bluegrass</u>	%
<u>Blue-eyed Mary</u>	%
<u>Pussytoes</u>	%
	%
Total Cover (All Low Grasses and Forbs Combined)	<u>10</u> %
Biological Crust <input checked="" type="checkbox"/>	
Total Biological Crust Cover	<u>15</u>
Invasive Plants	
<u>Oxeye Daisy</u>	<u><1</u> %
	%
	%
	%
Total Cover (All Invasive Plants Combined)	<u><1</u> %

Comments

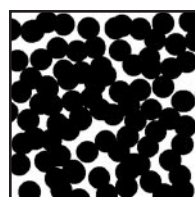
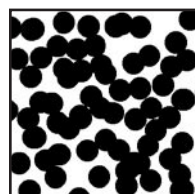
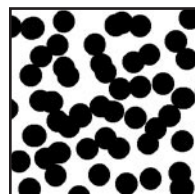
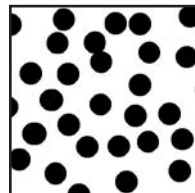
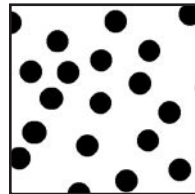
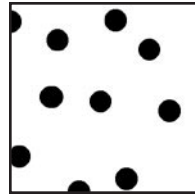
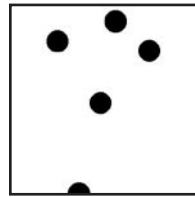
Very dry springLitter cover 50%Bare soil 10%Some visible erosion >5%Litter seems to be increasingNew invasive plants -- action required.

Cover Diagrams for Plant Community Cover

Large



Small



5% Cover

10% Cover

20% Cover

30% Cover

50% Cover

60% Cover

75% Cover

6. CONDUCTING PHOTO-POINT MONITORING



PHOTO MIKE DUFFY

GRASSLANDS CONSERVATION COUNCIL OF BRITISH COLUMBIA

CONDUCTING PHOTO-POINT MONITORING

Photographic records are an important part of monitoring your grasslands. Photo-point monitoring involves taking three photos of the same site regularly with every assessment.

Comparison of these photos, along with the written notes made when they were taken, will give useful information about the status of your grassland—is the health of your grassland community improving, stable, or deteriorating? Consistent and repeated comparisons over time are key to effective monitoring.



Over time photo-point monitoring documents changes in the vegetation. It yields objective and visual documentation of the plant community (general species composition and structure). When applied consistently – yearly or every other year – photo-point monitoring provides an effective visual tool for comparison of the grassland community. PHOTO BRUNO DELESALLE

Assessing grassland status and trend over time is most accurate when you use a combination of grassland assessment and photo-point monitoring. This dual approach ensures that all indicators of grassland status are assessed and recorded for future reference, which is critical to repeatable and accurate comparisons. This will help you determine if your management strategies are achieving anticipated goals. They also help you make decisions regarding necessary management changes.

How to Do Photo-Point Monitoring

This section takes you through the process of setting up your photo-points, taking the pictures, and storing your records.

Before you go into the field, you will need the following equipment:

- **Camera (film or digital)**
The lens must have a zoom lens or a focal length of 50 mm.
- **Carpenter's tape measure**
5 or 10 meters long or a soft tape more than 10 metres long.
- **Stadia rod or second carpenter's tape**
- **Three pins per photo-point site**
Rebar pins of $\frac{3}{8}$ inch diameter are ideal as they are strong. Each pin should be 12 to 16 inches long with the top bent at least 90°. Painting the top of the pins a bright colour (red or blue) will make them easier to relocate in tall grass.
- **Hammer**
Small sledge hammer – 2 to 4 lbs
- **Photo Identifier Card and Photo Information Sheet**
One of each per site
- **Clipboard, paper and Photo Information Sheet**
- **Felt pen**
- **GPS unit**
If available
- **Compass, clinometer, and altimeter**
If available

Grassland Monitoring Photo Identifier Card

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Ranch:

Pasture:

Transect #:

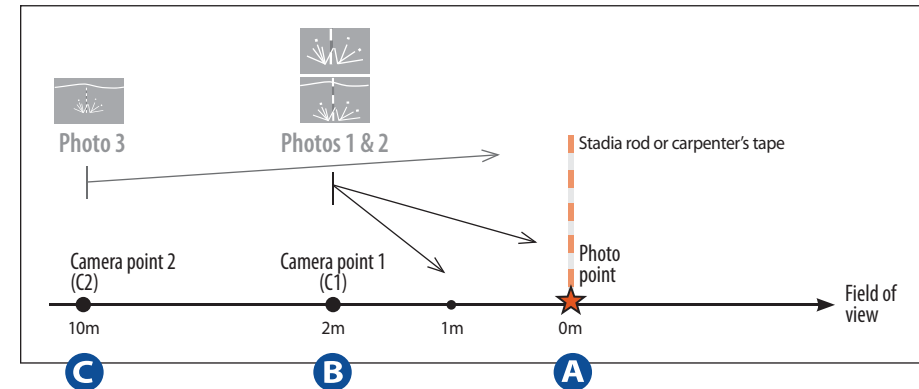
Photo #:

Date:

Time:

A photo identifier card is important and should be placed in each photograph to assist identification of the photograph in later years.

Setting Your Pins



Step 1

Mark your photo points with pins

Once a site is selected, permanently mark your photo-points. Three pins are sufficient to allow plots to be quickly relocated in future years.

Install your first pin **A** at the Photo Point, which must be located in the representative part of the pasture that you wish to photograph.

Install your second pin **B** at Camera Point 1 (C1), which must be located 2 meters from the photo point pin. This is where you will stand to take your first photograph.

Continuing in a straight line, install your third pin **C** at Camera Point 2 (C2). It must be located 10 meters from the Photo Point (8 meters behind C1).

Make sure the pins are pounded in flush with the soil to minimize the effect of increased fertilizer input that can occur if the pins are used by perching birds. As well, pins may be a hazard if sticking out of the ground.

Tread lightly! Before you begin your installation, plan your movements carefully in order to minimize the impact of walking.

You are now ready to take pictures.



If a pin is lost, the remaining pins can be used to re-establish the photo-point or camera points. Take your original photographs into the field to precisely relocate camera points. This relocation is important for accurate comparison of photographs. PHOTO GLENDA

MATHEW

Step 2

Fill in the top portion of the Photo Information Sheet

Select a blank photo information sheet (see Tab 8) and fill in the top portion, making sure to indicate whether or not you have completed a grassland assessment by checking either ☐ YES or ☐ NO at the bottom of the sheet.

Grassland Monitoring Photo Information Sheet		GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA
Grassland Community:	Big sagebrush and Bluebunch wheatgrass	
Site:	25 ha, uniform pasture, mainly bluebunch & shrub	
Observer(s):	Bill Ranger	
Date:	May 15, 2009	Time: 9 am
Name of Photographer:	Bill Ranger	
Plot Location/Site (GPS):	FB81 50°40' 21" 120°20' 21"	
Pasture Name:	Pasture B	
Photo Number:	B-2009-1	Comments (s): Camera point 1, Photo 1, Close-up
Photo Number:	B-2009-2	Comments (s): Camera point 1, Photo 2, Landscape
Photo Number:	B-2009-3	Comments (s): Camera point 2, Photo 3, Landscape
<input checked="" type="checkbox"/> YES I have completed the Grassland Assessment Score Sheet (Ensure that you have referenced the site appropriately, as you will want to keep the photo points with the assessment results.)		
<input type="checkbox"/> NO I did not complete the grassland assessment		

Add comments containing any information that will help you interpret the images in subsequent years: grazing levels, annual growing conditions, presence of invasive plants, etc.

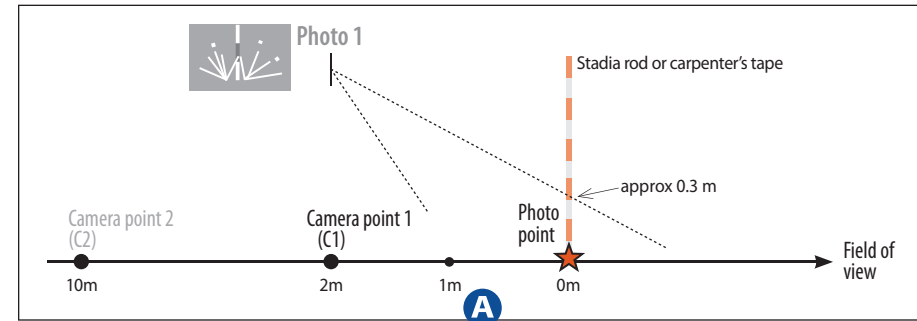
Step 3

Take three photographs

Given the prevalence of zoom lenses, you must ensure that your photographs are taken using a focal length equivalent to a 50 mm lens on a 35 mm camera.

To do this, stand over Camera Point 1 (C1) and adjust your zoom so that the bottom of the photograph is 1 meter in front of you **A** (halfway between C1 and the Photo Point) and the top of the image is 0.3 m above the photo point pin. This will give you a field of view that approximates a 50 mm lens.

Adjusting Zoom and Taking Photo 1



Note: Once the zoom is adjusted to fit these specifications, use this setting for ALL photos. This is very important.

Photo 1

Photo 1 is a close-up angled from eye level down towards the photo-point. It is taken from the exact spot where you adjusted your zoom, and uses the same field of view. Stand over the C1 pin, aim towards the photo-point, and place the bottom edge of your viewfinder or photo halfway between the camera point and the photo-point **A** at the 1 meter mark. The top of the viewfinder or photo should be 0.3 meters above the photo-point pin.

Take two photos. Later, you can select the better of the two.

Photo 2

Without adjusting the zoom on your camera, take a second photo from the same point (C1) to capture a landscape view. Stand above the C1 pin and tilt your camera upwards so that the photo-point pin is at the bottom edge of your viewfinder or photo.

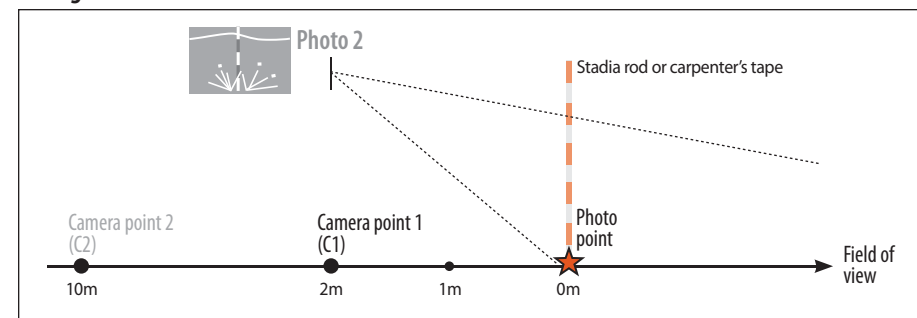
Take two photos here.



Photos 1 and 2 will give you sufficient detail of the plant community to allow comparisons of grassland status over the years.

PHOTOS RICK TUCKER

Taking Photo 2



Taking Photo 3

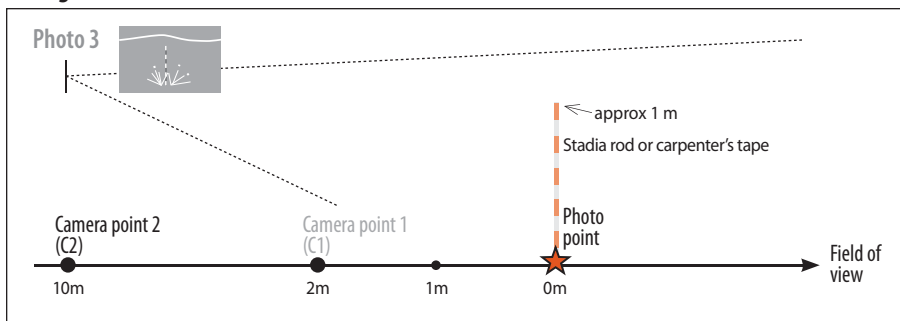


Photo 3

Take your third photo from Camera Point 2 (C2) which is 10 meters from the Photo Point. Stand over the C2 pin and centre the stadia rod in the middle of the image.

Take two photos here.

Step 4

Complete the Photo Information Sheet

When you have successfully taken your photographs, complete filling in the Photo Information Sheet.

Step 5

Fill in the Grassland Monitoring Summary Sheet

Once you have completed photo-point monitoring, accurately enter all information and photos into your Grassland Monitoring Summary Sheet (shown opposite). A template is provided in Tab 8 of this manual. An electronic version of the form can be downloaded from www.bcgrasslands.org

Make 4" x 6" prints from digital photographs. This will protect you from digital data loss and will allow you to store the photos with your record sheets. In the future, hard copy photos will be useful to carry when you return to the field to re-photograph the site.

All photographs and record sheets must be safely stored. Put all information sheets and photos into a binder. Use plastic pages designed to hold photos. If they are in electronic form, keep the Summary Sheet and photos on both a hard drive and a back-up disc or other hardware. Back-ups should be re-burned periodically. CDs may not be reliable for long-term storage.



Photo 3 gives you a broader view, setting your monitoring site in the landscape. PHOTO RICK TUCKER

Grassland Monitoring Summary Sheet

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Grassland Status Assessment

Site Pasture B Date monitoring began May 15, 2009
 GPS Location: N 50° 40' 21" E 120° 20' 21"
 Slope variable, rel. flat Aspect south Elevation 500m
 Grassland Type Big Sagebrush Bluebunch Wheatgrass

Specify year then enter score for each Assessment Question	YEAR 1	YEAR 3	YEAR 5	YEAR	YEAR
2009					
1. What is the composition of your plant community?	10				
2. Do you have the expected plant layers?	6				
3. How much litter do you have on the site?	4				
4. Is there existing or potential erosion on the site?	12				
5. Are invasive plants present on the site?	6				
Total Score	38				
Status	moderately altered				

Grassland Status Reference: 76-100% Slightly Altered 51-75%
 Moderately Altered 26-50% Greatly Altered 0-25%

Grassland Photo Points

Year 1	Year 3	Year 5
	photo 1	photo 1
	photo 2	photo 2
	photo 3	photo 3

Comments and Notes: YEAR 1

Apparent trend is stable. Stability and productivity of site needs to be monitored carefully. Changes in grazing practices may be required and considered. Objective to move toward slightly altered condition.

Comments and Notes: YEAR 3

Comments and Notes: YEAR 5

Suggested Monitoring Schedule

If you are setting up a monitoring program for the first time, plan to complete photo-point monitoring on the first, third, and fifth years, then repeat every five years. You can alter this schedule to meet your own management objectives.

More frequent monitoring may be necessary if an event occurs which may have a significant effect on grassland status such as fire, invasive plant infestation, control treatment, or a change in grazing practice.

Finding Your Site in Future Years

It is important to record your GPS coordinates. If you do not have GPS, use a reference such as a steel post, an immovable rock, or another distinct feature in the pasture. Preferably, this feature should be within 5 meters of the monitoring site.

Take a photo of the general location. This will be useful for re-locating your site in the future.

Finally, write a detailed description on your photo information sheet, assuming that you will NOT be the one taking the next set of photos. These details will ensure that the directions are clear to future monitors.

Plan to complete photo-point monitoring on the first, third, and fifth years. Then repeat every five years.

7. INTERPRETING RESULTS



PHOTO RICK TUCKER

GRASSLANDS CONSERVATION COUNCIL OF BRITISH COLUMBIA

INTERPRETING RESULTS

The grassland status score is a cumulative evaluation of the five indicators assessed in the survey area. It provides you with an immediate appraisal of the status of the site, and possible impacts of current management practices.

Assessments of the same site over time will tell you whether your management is maintaining or changing grassland status. Depending on the direction of this trend, you may want to continue with your present management system or make changes that will help you achieve your objectives.

The final score of the grassland assessment is out of 100 possible points. Although this score provides an overall rating of site status, do not overlook the importance of the scores for individual indicators, as they can reveal a lot about grassland trends.

Interpreting Scores from Individual Questions

The score from an individual question will allow you to take a closer look at a specific indicators or combination of indicators to help you review or formulate management objectives. Look at the highest possible score for each question, as this will tell you its importance relative to the overall rating.

Question 1 = 40% of the total score

Question 2 = 10% of the total score

Question 3 = 24% of the total score

Question 4 = 16% of the total score

Question 5 = 10% of the total score

For example, a reduction of key bunchgrasses over a period of three to five years will indicate a possible downward trend. Conversely, an increase in bunchgrasses will indicate an upward trend. New signs of erosion combined with bare soil and low litter levels will indicate a clear warning sign that a problem may be arising and you will want to investigate further and take timely action.

Grassland Status Summary Table

Score	The status of your grassland	What does it mean?
Reference Condition (76–100%)	<i>This rating indicates that the site surveyed is essentially the same as the Reference Condition. The composition of the plant community, community structure, soil integrity, nutrient cycling, and hydrological process are effectively stable. Productivity is stable and susceptibility to invasive plants is low.</i>	<i>Healthy Condition, Excellent Job!</i> No changes in grazing practices required. Continue monitoring.
Slightly Altered (51–75%)	<i>At least two of the five indicators scored below the Reference Condition</i> Changes in plant community composition, plant community structure, and litter weight have changed relative to Reference Condition. However, total production, stability, and susceptibility to invasive plants have not changed much from the Reference Condition.	<i>Generally stable and productive grassland</i> Some minor changes in grazing practice may be required. Monitor trends carefully. If your trend is improving, keep up the good work. If your trend is declining, determine factors that are leading to the decline. If grazing practices are a factor, make changes.
Moderately Altered (26–50%)	<i>At least three of the five indicators evaluated scored below the Reference Condition</i> Cover of the dominant bunchgrasses is much lower than the Reference Condition and at least two structural layers have been altered. Litter weight and distribution is insufficient to adequately protect the soil surface and bare soil may be increasing, leaving the site more susceptible to soil erosion and invasive plants. Productivity will be variable depending on species composition and climatic conditions.	<i>Stability and productivity of site is deteriorating</i> Major changes in grazing practice should be considered. Careful monitoring is required. New grazing practices should be adopted to ensure a trend towards a Slightly Altered condition or Reference Condition grassland.
Greatly Altered (0–25%)	<i>All five indicators scored below the Reference Condition</i> The cover of dominant bunchgrasses and plant community structure are significantly altered. Bunchgrass contributes little to ground cover and provides little forage for livestock and wildlife. Bunchgrasses and other dominant species have been eliminated and replaced by low-growing, shallow-rooted, unpalatable native species or by invasive plants. Deep-rooted shrubs may have established in dense, persistent stands. Litter weight and distribution is insufficient to protect the soil against wind and water erosion, and moisture loss from evaporation. Active erosion is evident. The site is susceptible to invasive plants and these may become the dominant plant species. Productivity is significantly lower than the Reference Condition and will be highly variable depending on species composition and climatic conditions.	<i>Stability and productivity of site is at risk</i> Major changes in grazing practice required. Rest from grazing should be considered or a carefully planned rest rotation system should be initiated. Careful monitoring of grazing practices will be required. Adopt grazing practices that will yield a trend towards a Slightly Altered condition. Greatly Altered sites may require many years of effective rest to restore appropriate cover of key bunch grasses and plant community structure.

SCORE SHEET QUESTIONS 1 & 2

Combined, account for 50% of total score

KEY BUNCHGRASS COVER & PLANT COMMUNITY STRUCTURE

What is the composition of your plant community?
Do you have the expected plant layers?

Plant community composition and community structure, are the most important indicators. Combined, they account for 50% of the total score.

High scores here will contribute most to a high grassland status rating.

Low scores indicate a large negative impact on the function of the grassland. A major change in management will be required, such as lighter stocking, longer and more effective rest periods, and improved rotational grazing. Greatly altered sites may require many years of effective rest to restore a healthy cover of key bunch grasses and all plant layers.

SCORE SHEET QUESTION 3

Accounts for 24% of total score

NUTRIENT AND HYDROLOGICAL CYCLING

How much litter do you have on site?

The amount of litter on the site (litter weight) and litter cover scores provide insight into moisture retention functions of the site.

High scores mean moisture is being retained and 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 few years.

Low litter scores mean that little moisture is being retained, setting the stage for increased bare soil and soil erosion. Low litter and increased erosion will trigger other impacts, such as an increased number of invasive plants.

SCORE SHEET QUESTION 4

Accounts for 16% of total score

SITE STABILITY

Is there existing or potential erosion on site?

Any human-caused bare soil and erosion signals a warning which requires immediate attention and action. Allowing erosion processes to accelerate will have significant impact on the condition and function of the grassland.

SCORE SHEET QUESTION 5

Accounts for 10%
of total score

INVASIVE PLANTS

Are invasive plants present on this site?

Invasive plants are another early warning sign that your grassland may be under stress and that both invasive plant control measures and management changes are required.

Changes in management, such as lighter grazing and more rest will increase plant vigor, improve cover of the desirable plants, and will result in more litter and less bare soil, resulting in fewer opportunities for invasive plants to establish.

Grassland Assessments – A Tool for Adaptive Management

Monitoring grassland status and trend over time is most accurate when you use a combination of the grassland assessment score sheet (scoring the five key indicators) and photo-point monitoring. This dual approach ensures that all indicators of grassland status are assessed and recorded.

Repeated grassland assessments will help you to ensure that livestock stocking rates are sustainable, and will allow you to fine tune your management system. Combined with photo-point monitoring, this tool will help you manage through drought cycles and identify early signs of declining grassland condition.

Interpreting Your Photos

Photos are an important part of monitoring. The comparison of your photos over three to five years, along with your written notes and grassland assessment score, will provide useful information about the status of your grassland. Is the health of your grassland community improving? Is it stable? Is it deteriorating?

Photos will document changes in the vegetation and will provide you with an objective, visual documentation of the plant community, its general species composition and structure.

When interpreting your photos, compare current photos to previous photos and assessment scores. Look for answers to the questions below, which are based on the five key indicators.

- What is the composition of your plant community?
- Has the cover and/or composition of your key bunchgrasses changed?
- Do you have the expected plant layers?
- Have the plant layers changed?

- How much litter do you have on site?
- Has litter cover or the amount of litter changed?
- Has bare soil increased or decreased?
- Is there existing erosion on site?
- Has erosion increased, decreased or has it remained the same?
- Are invasive plants on site? Are they increasing or decreasing?

Document your observations clearly on your summary sheet **A**.

Grassland Monitoring Summary Sheet

Grassland Status Assessment

Site Pasture B Date monitoring began May 15, 2009

GPS Location: N 50° 40' 21" E 120° 20' 21"

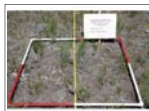


Slope variable, rel. flat Aspect south Elevation 500m

Grassland Type Big Sagebrush Bluebunch Wheatgrass

Specify year then enter score for each Assessment Question	YEAR 1	YEAR 3	YEAR 5	YEAR	YEAR
1. What is the composition of your plant community?	10				
2. Do you have the expected plant layers?	6				
3. How much litter do you have on the site?	4				
4. Is there existing or potential erosion on the site?	12				
5. Are invasive plants present on the site?	6				
Total Score	38				
Status	moderately altered				

Grassland Status Reference 76-100% Slightly Altered 51-75%
Moderately Altered 26-50% Greatly Altered 0-25%

Grassland Photo Points

Year 1	Year 3	Year 5
	photo 1	photo 1
	photo 2	photo 2
	photo 3	photo 3

Comments and Notes: YEAR 1

Apparent trend is stable. Stability and productivity of site needs to be monitored carefully. Changes in grazing practices may be required and considered. Objective to move toward slightly altered condition.

Comments and Notes: YEAR 3

Comments and Notes: YEAR 5

Monitoring Trends

Your main method for assessing trends is to compare your grassland assessment scores and photos from one survey period to another. Repeated assessments tell you if your management practices are supporting your objectives. As well, repetition allows you to fine-tune management decisions and activities in response to the changes you have recorded about your grassland.

A higher score indicates a grassland that is moving towards the Reference Condition while a lower score indicates a grassland that is moving away from reference condition. If you have photo-monitored the site, repeated photos will visually complement the survey scores.

Assessing Apparent Trend

Trend Feature	Declining	Stable	Improving
Recruitment of key bunchgrasses is occurring on the site.		•	•
Vigour of key bunchgrasses is high as indicated by normal color, and seed production. Plants remain as intact bunches.		•	•
Key bunchgrasses have dead centers or are dying.	•		
Visible browsing on shrubs is common.	•		
Surface soil movement is evident.	•		
Eroded surfaces and gullies are covered with vegetation.		•	•
Lichen lines on stones extend to the soil surface.		•	

Changes in indicators over time may suggest a trend, either for a specific indicator (such as plant community composition) or for the total ecosystem, based on all indicators. The most important single indicator of change is a decline in cover of the dominant bunchgrasses and an associated increase in cover of small grasses, forbs, and sometimes shrubs. Low-growing bunchgrasses and forbs, such as Sandberg's bluegrass and pussytoes are often more abundant as disturbance increases.

Trends in Grassland Status



PHOTOS BRIAN WIKKEEM

TREND

A common management goal is to provide sufficient forage for livestock while having a small but acceptable impact on the environment. Ideally, if you have a mosaic of grassland states, such as a few Moderately Altered, many Slightly Altered, and some in the Reference Condition, you are likely managing appropriately.

Evaluating Your Scores on Large Pastures

In a large pasture with variable terrain where several sample areas have been established, interpreting results can be challenging. Consider the following:

- Vegetation will be different in swales, depressions, gullies or at the toe of a hill. This is mainly due to higher moisture availability. Plant communities on wetter sites will recover more rapidly from grazing pressure than drier sites, such as ridges, rocky outcrops and south facing slopes.
- Uneven distribution of livestock and grazing pressure throughout the pasture will result in areas with differing amounts of use, and consequently, different impacts to the plant community.
- The interpretation of monitoring results will depend on consistency of where, how, and when you monitor.

Storing Records

Once you have filled out the Score Sheet(s) for each site and recorded the final score (the total of all five questions) on the Summary Sheet, your information should be carefully stored in a three-ring binder. Electronic information should be backed up to a storage device, such as a CD, DVD, or an external hard drive.

All photos collected from your photo-point assessment should be accurately labelled with location, date, and any details that will help with future monitoring and interpretation. Photos, score sheets, summary sheets, and relevant notes should be kept together for future reference in a binder or file folder. Careful recording and proper storage of your assessment information is critical for future comparison and provides a legacy to your ranching operation.

Score Sheets and Templates

The next tabbed section contains blank templates for all monitoring forms.

- Grassland Assessment Score Sheet
- Photo Information Sheet
- Photo Identifier Card
- Grassland Monitoring Summary Sheet

All of these forms can be photocopied from the templates provided or downloaded from www.bcgrasslands.org.

8. SCORE SHEETS AND TEMPLATES



PHOTO RICHARD DOUCETTE

SCORE SHEETS AND TEMPLATES

Contents

Grassland Assessment Score Sheet pages 60-61

Photo Information Sheet page 62

Photo Identifier Card page 63

Grassland Monitoring Summary Sheet page 64

All necessary monitoring forms for use with this manual can be photocopied from the templates provided or downloaded from www.bcgrasslands.org.

Score Sheet – Page 1

Grassland Assessment Score Sheet ...PAGE 1

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

1. Key Bunchgrass Cover (Booklets page 6) Use EITHER line *a.* OR line *b.* according to your Reference Condition Value or booklet number.

<input type="checkbox"/> Booklet 1, 2, 5: Reference Condition >50%		Assessed Cover Value	>50%	35-50%	20-34%	<20%	SCORE	
<input type="checkbox"/> Booklet 3 or 4: Reference Condition >60%		Assessed Cover Value	>60%	40-60%	20-39%	<20%		
Assessed Cover Value		%	Points	40	25	10		0

2. Plant Community Structure (Booklets page 11)

Layer	Reference Condition	Assessed Cover Value	Altered Layers		
Shrubs	%	%	YES NO		
Tall Grasses and Forbs	%	%	YES NO		
Medium Grasses and Forbs	%	%	YES NO		
Low Grasses and Forbs	%	%	YES NO		
Biological Crust	%	%	YES NO		
Total Number of Altered Layers	0	1	2	3	4 or 5
Points	10	6	2	1	0

3. Nutrient and Hydrological Cycling (Booklets 1–4 page 16; Booklet 5 page 18)

Litter Weight							
Reference Condition _____ kg/ha	% of Reference	>100%	50-99%	25-49%	<25%		
Assessed Litter Weight _____ kg/ha	Points	14	8	2	0		A
Litter Cover and Biological Crust Cover							
Assessed Litter Cover _____ %	≥75%	25-74%	25-74%	<25%	<25%		
Assessed Biological Crust Cover _____ %	0-100%	>25%	<25%	>25%	<25%		
Points	10	8	4	2	0		B
4. Site Stability (Booklets 1-4 page 21; Booklet 5 page 23)							Total A + B =

4. Site Stability (Booklets 1–4 page 21; Booklet 5 page 23)

Bare Soil: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Bare Soil Cover _____% Points	8	6	3	0	A
Erosion Features: Reference Condition <5%	<5%	5-10%	11-20%	>20%	
Assessed Erosion Cover _____% Points	8	6	3	0	B
Total A + B					=

5. Invasive Plants (Booklets 1–4 page 24; Booklet 5 page 26)

Reference Condition 0%	0	<1%	1-10%	>10%	A
Assessed Cover _____ %	5	3	1	0	
Assessed Distribution	None	Single patch or a few scattered individuals	Multiple Patches	Continuous	B
Points	5	3	1	0	
Total A + B					=
Add scores from all five categories (= grey boxes) to get TOTAL SCORE					

Add scores from all five categories (= grey boxes) to get TOTAL SCORE

Grassland Status (circle one):	Reference 76-100%	Slightly Altered 51-75%	Moderately Altered 26-50%	Greatly Altered 0-25%
Apparent Trend (circle one):	Upward	Downward	Stable	Unknown

Score Sheet – Page 2

Grassland Assessment Score Sheet ...PAGE 2

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Plant Community Work Table

Plant Community Work Table	
Shrubs Identified	Estimated Percent Cover
	%
	%
	%
	%
Total Cover (All Shrubs Combined)	%
Tall Grasses & Forbs	
	%
	%
	%
	%
Total Cover (All Tall Grasses and Forbs Combined)	%
Medium Grasses & Forbs	
	%
	%
	%
	%
Total Cover (All Medium Grasses and Forbs Combined)	%
Low Grasses & Forbs	
	%
	%
	%
	%
Total Cover (All Low Grasses and Forbs Combined)	%
Biological Crust	Total Biological Crust Cover
Invasive Plants	
	%
	%
	%
	%
Total Cover (All Invasive Plants Combined)	%

Comments

Photo Information Sheet

Grassland Monitoring Photo Information Sheet

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Grassland Community: _____

Site: _____

Observer(s): _____

Date: _____ Time: _____

Name of Photographer: _____

Plot Location/Site (GPS): _____

Pasture Name: _____

Photo Number: _____ Comments (s): _____

Photo Number: _____ Comments (s): _____

Photo Number: _____ Comments (s): _____

☐ YES

I have completed the Grassland Assessment Score Sheet (Ensure that you have referenced the site appropriately, as you will want to keep the photo points with the assessment results.)

☐ NO

I did not complete the grassland assessment

Photo Identifier Card

Grassland Monitoring Photo Identifier Card

GRASSLAND MONITORING MANUAL FOR BRITISH COLUMBIA

Ranch:

Pasture:

Transect #:

Photo #:

Date:

Time:

Grassland Monitoring Summary Sheet

Grassland Monitoring Summary Sheet

Grassland Status Assessment

Site _____ Date monitoring began _____

GPS Location: N _____ E _____

Slope _____ Aspect _____ Elevation _____

Grassland Type _____

Grassland Photo Points

Year 1	Year 3	Year 5
photo 1	photo 1	photo 1
photo 2	photo 2	photo 2
photo 3	photo 3	photo 3

	YEAR 1	YEAR 3	YEAR 5	YEAR
Specify year then enter score for each Assessment Question				
1. What is the composition of your plant community?				
2. Do you have the expected plant layers?				
3. How much litter do you have on the site?				
4. Is there existing or potential erosion on the site?				
5. Are invasive plants present on the site?				
Total Score				
Status				

Grassland Status	Reference 76-100% Moderately Altered 26-50% Slightly Altered 51-75% Greatly Altered 0-25%
------------------	--

Comments and Notes: YEAR 1

Comments and Notes: YEAR 3

Comments and Notes: YEAR 5

9. APPENDIX



PHOTO BRIAN WIKEEM

APPENDIX 1

IDENTIFICATION OF KEY BUNCHGRASSES

These bunchgrasses are used in the manual to assess bunchgrass cover.

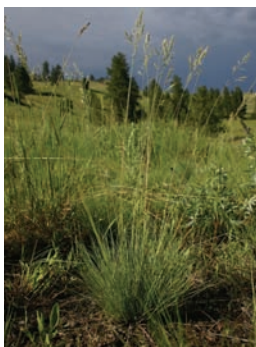
BlueBunch Wheatgrass



Rough Fescue



Idaho Fescue



Short-awned Porcupinegrass



Spreading Needlegrass



For identification of other grasses and plants, refer to the following guides:

Plants of Southern Interior British Columbia, Edited by Parish, Coupe, Lloyd. Printed 2006. ISBN 1-55105-057-9

or

The Eflora website: www.eflora.bc.ca

APPENDIX 2

COLLECTING PLANT SPECIMENS FOR LATER IDENTIFICATION

Grasses

Collecting a grass sample for proper identification:

- 1 Record date and location of collection site, as well as any habitat features you can note such as "moist streamside" or "dry south-facing slope."
- 2 Record growth form. Does the sample appear to be growing in a defined "bunch" or does it appear to be growing throughout a given area forming "sod-like structure?"
- 3 Carefully remove a portion of the grass with several intact leaves, seed heads and roots, if possible.
- 4 Roll the grass sample loosely in a newspaper tube and tape the ends off or place in a plastic bag. DO NOT PRESS THE SAMPLE. This is very important for proper keying and identification of grass samples. If the sample is too long for the paper tube or bag, gently fold it in half before placing it in a tube or bag. It is best to identify samples as soon as possible. However, if this is not possible, allow the sample to dry in the tube or bag and key out at the earliest convenience.

Note: Pressing or squashing grass samples will alter features required for keying and identification.

Other Plants

Collecting other plant samples for proper identification:

- 1 Record date and location of collection site, as well as any habitat features you can note such as "moist streamside" or "dry south-facing slope."
- 2 Record or note flower color. The colour often fades when drying sample.
- 3 Carefully remove a portion of the plant with intact leaves, flower head, and some roots if possible.
- 4 Gently place sample in a plastic bag. If not identified immediately, press sample between pieces of paper in a large book (an old telephone book works well) and weight it down. Make sure to change the paper to prevent mold if the plant is moist or succulent. Keep in a dry place out of direct sunlight until it can be keyed out at a later date.

APPENDIX 3

PREPARING LITTER SAMPLES

Litter includes residual plant cover from previous year's growth (dead plant material) and may be found standing next to current growth, or on the ground. Material on the ground may be freshly fallen material or material that is partially broken down.

Please note:

- Litter samples in pre-weighed bags are not a requirement to complete your field assessment. However, litter bags that represent key litter weight thresholds are an easy reference in the field and will assist you in determining litter scores.
- Once prepared, Litter samples in ziplock bags will last for years!

Steps for Preparing Litter Samples

- 1 Preparing your litter samples must be done well in advance to completing your field assessment. Plan on a week or two prior to your planned monitoring date.
- 2 You will require up to six large ziplocks bags and a black permanent pen to label bags. You will also need a weight scale. A decent digital kitchen scale will work.
- 3 Collect litter. Outside of your monitoring site, find a grassland area with ample litter. Hand-rake and fill six large ziplock bags with litter. Ensure you hand-rake dead plant material only.
- 4 Take litter bags home and empty contents on a flat surface indoors in a warm dry place.
- 5 Dry litter for a minimum of two days to ensure all moisture has evaporated. If samples are moist or wet, dry for an additional two days or oven dry samples (at low heat).
- 6 Using dry litter only, prepare four litter bags with the following weight thresholds. The weight thresholds are based on the booklet you are using in the field for the grassland community you are assessing:
Booklet 1
 - 1) For 750 kg/ha make a litter bag with 18.75grams of litter
 - 2) For 600 kg/ha make a litter bag with 15 grams of litter
 - 3) For 300 kg/ha make a litter bag with 7.5 grams of litter
 - 4) For 150 kg/ha make a litter bag with 3.75 grams of litter

Booklet 2

- 1) For 1500 kg/ha make a litter bag with 37.5 grams of litter
- 2) For 1000 kg/ha make a litter bag with 25 grams of litter
- 3) For 500 kg/ha make a litter bag with 12.5 grams of litter
- 4) For 250 kg/ha make a litter bag with 6.25 grams of litter

Booklets 3, 4 and 5

- 1) For 2000 kg/ha make a litter bag with 50 grams of litter
- 2) For 1000 kg/ha make a litter bag with 25 grams of litter
- 3) For 500 kg/ha make a litter bag with 12.5 grams of litter
- 4) For 300 kg/ha make a litter bag with 7.5 grams of litter

The litter weight thresholds above (i.e., 750 kg/ha) are addressed in Question 2 of each booklet.

- 7 Once the four bags are weighed, label each bag with the corresponding litter weight threshold (i.e., 750 kg/ha).
- 8 Each ziplock bag represents the corresponding threshold and will help you decide which litter weight category you fit into.
- 9 You are now ready. Don't forget to take your samples into the field!

When completing your assessment in the field, you will compare the amount of litter you collected from your plot to the litter sample bags. This will help you estimate your litter weight category.

APPENDIX 4

TRAINING

Training is an essential first step for all first time users of the *Grasslands Monitoring Manual for British Columbia: A Tool for Ranchers*. Training will ensure the appropriate application of this tool and it will assist you in selecting monitoring sites, using the booklets and score sheets, and will assist you in interpreting your results.

For More Information about Training or Upcoming Workshops

Please visit the GCC website at: www.bcgrasslands.org (click link to Grassland Monitoring Manual), or contact the Grasslands Conservation Council of British Columbia at 250-374-5787 or email GCC@bcgrasslands.org

APPENDIX 5

RIPARIAN MONITORING AND OTHER REFERENCES

Riparian Monitoring

- 1 Fraser, D.A. 2006. *Range Resources Assessment Procedures*. Ministry of Forests and Range, Range Branch, Kamloops, B.C. Rangeland Health Brochure 9.
On website: www.for.gov.bc.ca/hra/publications/brochures/RangelandHealthBrochure9.pdf
Or: www.bcgrasslands.org (click link to Grassland Monitoring Manual). Directions for Riparian Function Checklist – Lakes, Ponds, and Wetlands: go to Appendix 1, page 12.
- 2 Fitch, L., B.W. Adams, G. Hale. 2001. *Riparian Health Assessment for Streams and Small Rivers – Field Workbook*. Lethbridge, Alberta: Cows and Fish Program. 90 pages.
On website: www.cowsandfish.org/riparian/health.html
- 3 Ambrose, N., G. Ehlert, K. Spicer-Rowe. 2004. *Riparian Health Assessment for Lakes, Sloughs, and Wetlands – Field Workbook*. Modified from Fitch, L., B.W. Adams, and G. Hales, 2001. *Riparian Health Assessment for Streams and Small Rivers – Field Workbook*. Lethbridge, Alberta: Cows and Fish Program. 90 pages.
On website: www.cowsandfish.org/riparian/health.html

Other General References

Range Management in BC

- 1 Fraser, D.A. 2006. *Range Resources Assessment Procedures*. Ministry of Forests and Range, Range Branch, Kamloops, B.C. Rangeland Health Brochure 9.
On website: www.for.gov.bc.ca/hra/publications/brochures/RangelandHealthBrochure9.pdf
- 2 Ministry of Forests and Range. 2006. *Range Management in British Columbia: Under the Forest and Range Practices Act and other Legislation*.
On website: www.for.gov.bc.ca/hfd/pubs/bro.htm

Plants General

- 1 Parish, R., R. Coupe, D. Lloyd. 2006. *Plants of Southern Interior British Columbia*. Lone Pine Publishing.
- 2 Eflora website: www.eflora.bc.ca
- 3 Looman, L. 1990. *Prairie Grasses: Identified and described by Vegetative Characteristics*. Canadian Government Publishing Centre. Agriculture Canada.

Invasive Plants

- 1 Cranston, R., D. Ralph, B. Wikeem, 2005. *Field Guide to Noxious and Other Selected Weeds of British Columbia*. Province of British Columbia.
On website: www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm
- 2 *Weeds BC: Identification and Management*. Ministry of Agriculture and Lands.
On website: www.weedsbc.ca

Grasslands of British Columbia

- 1 Wikeem, B.M., S.J. Wikeem. 2004. *The Grasslands of British Columbia*. Grasslands Conservation Council of British Columbia
On website: www.bcgrasslands.org
- 2 Grasslands Conservation Council of British Columbia Website: www.bcgrasslands.org

References: Grassland Monitoring Manual

- 1 Adams, B. W., G. Ehlert, C. Stone, D. Lawrence, M. Alexander, M. Willoughby, C. Hincz, D. Moisey and A. Bogen. 2003. *Rangeland Health Assessment for Grassland, Forest and Tame Pasture Field Workbook*. Publication Number T/044. Alberta Sustainable Resource Development, Public Lands Division, Lethbridge, AB.
- 2 Campbell, C.W., and A.H. Bawtree. (eds.). 1998. *Rangeland Handbook for BC*. BC Cattlemen's Association. Noran Printing, Kamloops, BC.
- 3 Dyksterhuis, E.J. 1949. *Condition and Management of Range Land Based on Quantitative Ecology*. Journal of Range Management.
- 4 Dyksterhuis, E.J. and E.M. Schmutz. 1947. *Natural Mulches or "Litter" of Grasslands: With Kinds and Amounts on a Southern Prairie Ecology*.
- 5 Grasslands Conservation Council of British Columbia. 2004. *A Conservation Risk Assessment: Final Report*. Grasslands Conservation Council of BC, Kamloops, BC.
- 6 Hall, F.C. 1997. *Ground-Based Photographic Monitoring*. USDA Forest Service. Portland, OR.
- 7 Hutchinson, D.E. and H.W. Pritchard (ed.). 1972. *Resource Conservation Glossary*. Soil Conservation Society of America. Ankeny, Iowa.
- 8 Kothmann, M.M. (Chairman). 1974. *A Glossary of Terms Used in Range Management*. Society for Range Management. Denver, CO.
- 9 McLean, A. and L. Marchand. 1968. *Grassland Ranges in the Southern Interior of British Columbia*. Canadian Department of Agriculture. Publication No. 1319. Ottawa, ON.
- 10 Ministry of Forests. 2004. *Invasive Plants Regulation*. BC. Reg. 18/2004.
- 11 Osborn, B. 1954. *Effectiveness of Cover in Reducing Soil Splash by Raindrop Impact*. Journal of Soil and Water Conservation. 9(2):70-76.
- 12 Pyke, M., D.A. Herrick, P. Shaver, J. Pellant. 2000. *Rangeland Health Attributes and Indicators for Qualitative Assessment*. Journal of Range Management. 55(6): 584-597.

- 13 Range Inventory Standardization Committee. 1983. *Guidelines and Terminology for Range Inventories and Monitoring*. Society for Range Management.
- 14 Wikeem, B.M., S.J. Wikeem. 2004. *The Grasslands of British Columbia*. Grasslands Conservation Council of British Columbia. Kamloops, BC.
- 15 Wikeem, B.M., A. McLean, A. Bawtree, D. Quinton. 1993. *An Overview of the Forage Resource and Beef Production on Crown Land in British Columbia*. Canadian Journal of Animal Science. 73:779-794.
- 16 Wikeem, B.M., R.F. Newman, A.L. van Ryswyk. 1989. *Effect of Fertilization Date and Litter Removal on Grassland Forage Production*. Journal of Range Management. 42(5):412-415.
- 17 Willms, W.D., S. Smoliak, A.W. Bailey. 1986. *Herbage Production Following Litter Removal on Alberta Native Grasslands*. Journal of Range Management. 39:182-186.

APPENDIX 6

ABUNDANCE RATINGS

The following abundance ratings are used in the manual and are meant as general guides only.

Abundance Rating

Trace	Infrequent	Common	Frequent	Abundant
1 – 5%	6 – 20%	21 – 40%	41 – 60%	61 – 100%