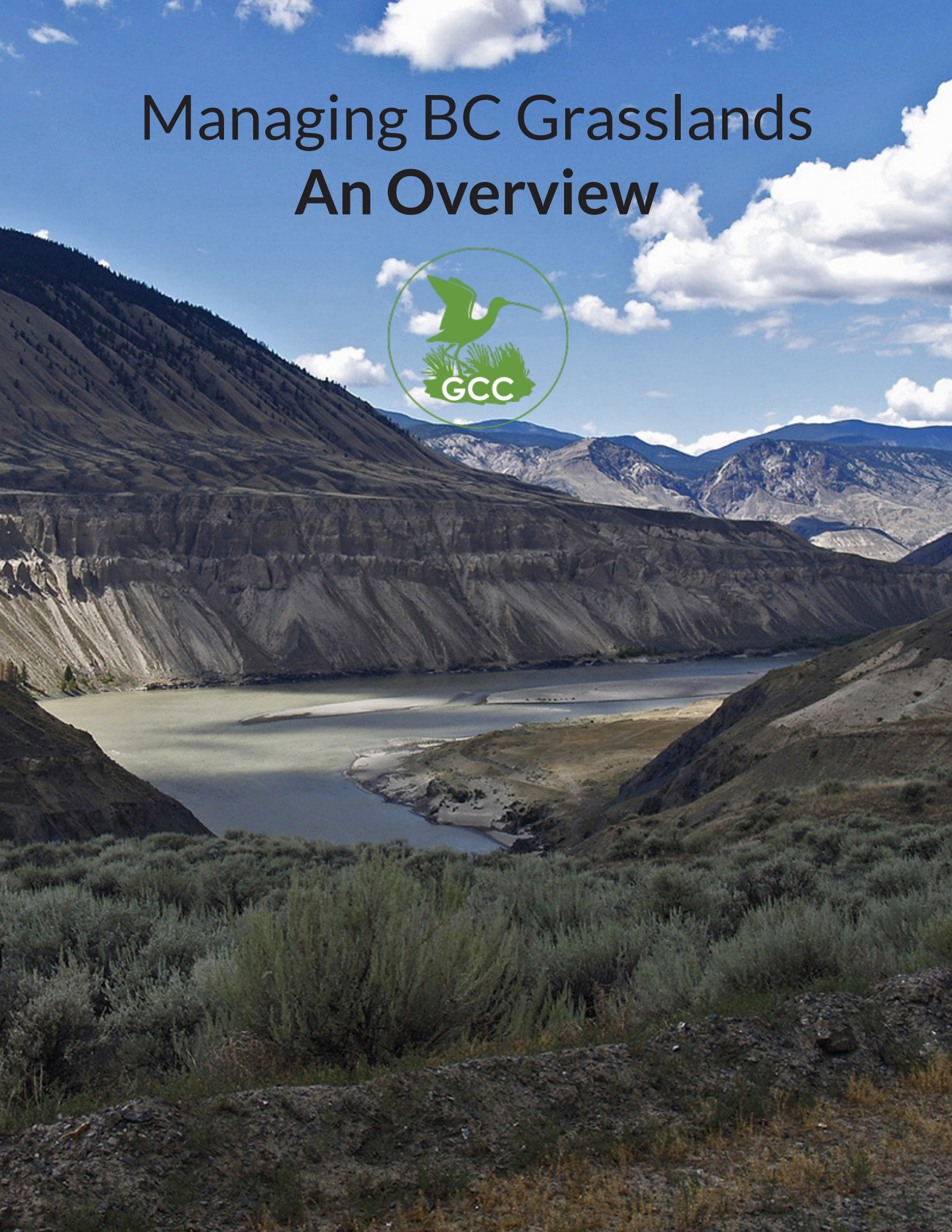
Managing BC Grasslands
An Overview



The Grasslands Conservation Council of British Columbia's mission is to:

- Foster understanding and appreciation for the ecological, social, economic, and cultural importance of BC grasslands.
- Promote stewardship and sustainable management practices to ensure the long-term health of BC grasslands.
- Promote the conservation of representative grassland ecosystems, species at risk, and their habitats.

The GCC acknowledges the contributions of the original authors, artists, and photographers of the material in this e-book: staff members, contractors, and volunteers.

Commonsense solutions for BC grasslands.

bcgrasslands.org

Please note: Most of the content in this document was written in and around 2008, so time references—e.g., *previous 50 years*, *next 20 years*, *currently*, *recently*—should be read with that in mind.

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Grassland Management

Grassland management refers to the manipulation of natural vegetation in order to achieve predetermined goals. Grasslands are often managed to improve productivity and to maximize benefits for human use. An understanding of the relationships between environmental forces and the plants and animals that make up grassland ecosystems is key to ensuring the proper balance of rest and disturbance.

Grassland management science includes the study of the various plants and animals that live in grasslands and the interactions between them. As we gain more knowledge about grassland ecosystems and how they function, we are better able to make management decisions to ensure their long-term health.

Proper grazing management also maintains wildlife habitats, conserves the soil upon which we all depend, and preserves the natural beauty of grassland landscapes.

Ecological Systems

Ecological systems (ecosystems) consist of all the living organisms in an area and their physical environment (soil, water, air). Ecosystems are influenced over time by the local climate, variations in the local landscape, disturbances such as fire and floods, and the organisms that inhabit them.

Grassland ecosystems in British Columbia generally occur in areas where the climate is hot and dry in summer and cool to cold and dry in winter, where the parent material is composed of fine sediments, and in valley or plateau landscapes. The organisms that live in grasslands include plants and animals that have adapted to the climatic conditions in a variety of ways. Differences in elevation, climate, soils, aspect and their position in relation to mountain ranges have resulted in many variations in BC's grassland ecosystems. The mosaic of ecosystems found in our grasslands—including wetlands, riparian areas, aspen stands and rocky cliffs—allow for a rich diversity of species.

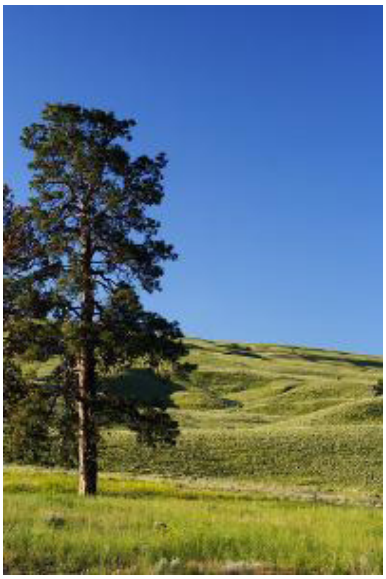
Components of Grasslands

Grassland ecosystems have both biotic and abiotic components. The biotic components of an ecosystem are the living organisms that exist in the system; they can be classified as producers (including grasses, shrubs and trees), consumers (including grazing ungulates, birds and insects) or decomposers (including fungi, insects and bacteria). Abiotic components of the ecosystems are the non-living components on which the living components depend, including climate, soil, and topography.

GRASSLAND VEGETATION

Approximately 1,990 of types of vascular plants are found in plant communities that are dominated by steppe vegetation, which includes our native Bunchgrass Zone. This wide diversity of plant species requires grassland managers to have a thorough understanding of plant physiology and morphology. Plants are generally grouped into six classes:

- Trees
- Shrubs
- Grasses
- Grass-like plants (sedges and rushes)
- Forbs (broad-leaved herbaceous plants)
- Cryptogams (mosses and lichens).



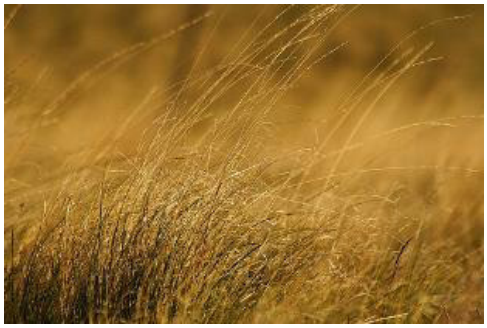
Trees and Shrubs

Trees can be either coniferous or deciduous. Coniferous trees, including Douglas-fir and ponderosa pine, have needle-like leaves and seeds borne in cones. Coniferous trees are often referred to as evergreens because they retain their leaves throughout the year. Ponderosa pine is common as scattered trees on BC's open grassland landscape or as semi-open stands. Douglas-fir is abundant in swales and ravines, or in semi-open stands at higher elevations.

Historically, on the upper grassland slopes, fire kept coniferous trees from encroaching and foresting the landscape. In recent decades, as a result of fire suppression, vast acreages of the upper grasslands have been lost to forest.

Deciduous trees, such as trembling aspen, generally have broad, net-veined leaves and seeds that are produced from flowers. The leaves of deciduous trees usually change colour before they are shed in the autumn. Shrubs, such as saskatoon and snowberry, are woody plants that have shorter, bushier appearances than trees. Aspen groves, or copses, on the open grasslands and shrubby ravines or draws provide valuable food and cover habitat for wildlife and birds. Heavy grazing by cattle on these species competes with wild animals, such as deer, for forage. Cattle preference for browsing small aspen and deciduous shrubs in fall months can occur when protein levels in grasses are low.

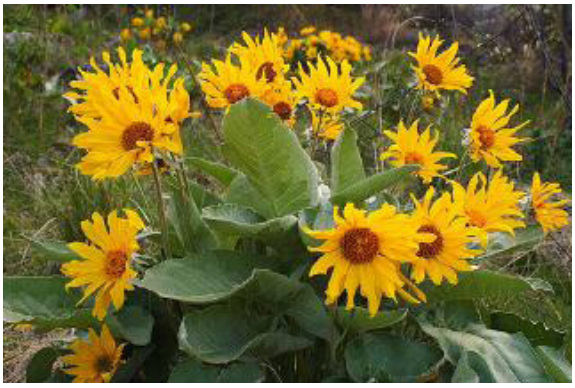
Grasses



Grasses are herbaceous plants, which mean that they die back to ground level each year. The flowers and seeds of grasses can vary greatly and are used to distinguish between different grass species. Bluebunch wheatgrass and rough fescue (found in steppe vegetation of the Southern Interior), pinegrass (found beneath forest canopies throughout central and southern BC) and Altai fescue (found in northern BC) are some common grasses of BC's rangelands. The most palatable grass species for cattle and wildlife are more sensitive to grazing than weedy or annual grass species. Continued, heavy grazing can negatively impact the desirable grasses reducing their ability to compete with ungrazed plants.

Grass-like plants

Sedges and rushes are similar to grasses in that they have slender, parallel-veined leaves, but their stems are unjointed and solid. Rushes have round stems and sedges usually have three-sided stems. Both sedges and rushes are associated mainly with wetlands but a number of sedges are also found in grasslands, forests, and alpine areas throughout BC's rangelands. Grazing values of sedges and rushes are quite high in spring months; however, this timing conflicts with the value of these species in the wetlands for nesting waterfowl habitat.

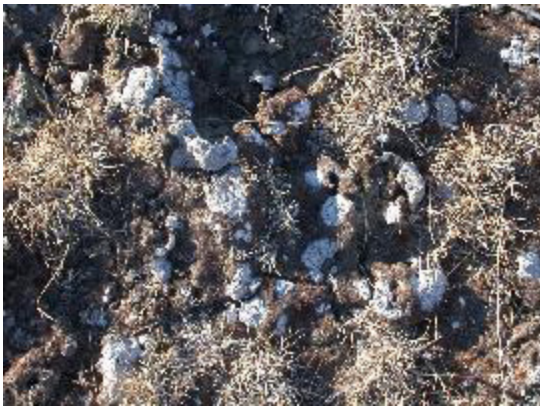


Forbs

Forbs are generally small plants that produce flowers. They flower at different times throughout the growing season and die back after flowering. Forbs are broad-leaved plants with fleshy stems and net-veined leaves. Yarrow, low pussytoes, lupines, arrow-leaved balsamroot, and heart-leaved arnica are some of the common forbs in BC grasslands. The number of forbs on the grassland landscape varies with site aspect, moisture, and elevation. Although a seasonally spectacular when in flower, a high abundance of forbs can indicate that the sensitive grasses have disappeared from overgrazing.

Hazardous Plants

Plants that are either poisonous or injurious to livestock naturally exist in BC's grasslands. Five species are considered to be major poisonous plants in BC: seaside arrow-grass, tall larkspur, low growing larkspur, timber milk-vetch, and Douglas's water hemlock. Poisonous plants are often unpalatable; however, grazing animals sometimes will be addicted to plants such as timber milk-vetch if the animals are hungry and little good-quality forage is available. The best way to avoid livestock poisonings is to be aware of the location and extent of poisonous plants in grazing areas. In addition to their toxic effects, poisonous plants may also injure animals mechanically, such as occurs with the awns (hair- or bristle-like appendages) of cheatgrass and needlegrasses.



Cryptogams

Cryptogams are rather complex and have both visible and microscopic components that grow over the surface of soils. The visible part includes lichens, mosses, and liverworts, while the microscopic component is made up of algae, fungi, and bacteria. Because of this complexity, cryptogams are more commonly referred to as the microbiotic crust of soil surfaces.

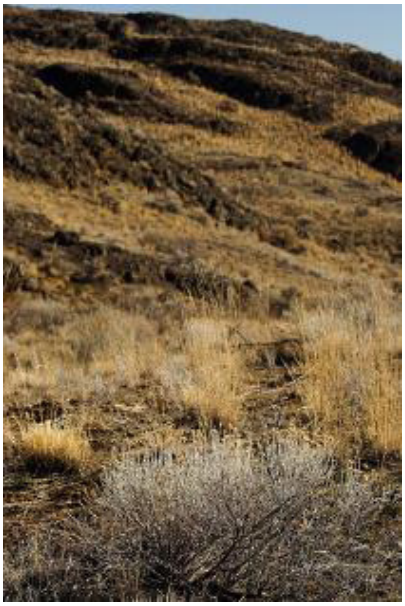
Some common lichens and mosses on BC's bunchgrass ranges include pixie-cup lichens and rusty steppe moss. Crypotrams, or microbiotic crust, is sensitive to disturbance that occurs from motorized and non-motorized vehicles, human foot traffic, and animal hoof action. Overgrazing or recreational disturbances can result in a substantially reduced cover of cryptograms, reducing the soil's nutrient and water functions. A lack of cryptogram crust and evidence of surface soil erosion indicates past soil disturbance or continued heavy use.

PLANT COMMUNITIES

Plant communities consist of groups of plants that are adapted to similar combinations of climatic conditions and soils. Each plant community, either by itself or with other communities, provides a variety of habitats that are used by animals for food and shelter. Vegetation in British Columbia's grasslands is very diverse due to the wide variations in climate, soils and topography throughout the province. Biogeoclimatic zones, defined as the broadest vegetation complexes that reflect the same regional climate, are used for range classification and management. The zones are generally named after one or two dominant plant species that are present over a wide range of conditions.

Biogeoclimatic zones can be further broken down into subzones, which have less climatic variability and narrower geographic distribution than zones. Biogeoclimatic phases are areas within a zone that contain non-zonal ecosystems. In the Southern Interior, the most important zones in terms of area and forage production potential for livestock and wildlife are Bunchgrass, Ponderosa Pine, Interior Douglas-fir and Montane Spruce.

Different communities are present on north-facing slopes as compared with south-facing slopes, and still others in swales as compared with knolls. Some plants are more sensitive than others to factors in the environment, such as grazing pressure. Overgrazing can change the plant species present and total forage production.



Bunchgrass Zone

The Bunchgrass Zone is located in the hot, dry valley bottoms of southern BC. It is found in the Okanagan Valley south of Summerland, the Similkameen River Valley to Keremeos, the Thompson River Valley from Spences Bridge to Pritchard, the Nicola Valley, and the Middle Fraser and Lower Chilcotin River valleys from the Farwell Canyon to Big Bar. In BC, this biogeoclimatic zone usually occurs at lower elevations: 300 to 1,000 metres. In BC, grasslands cover about 1.2 million hectares, but only 300,000 hectares are classified as bunchgrass.

The climate of the Bunchgrass Zone is characterized by hot, dry summers and moderately cold winters, often with little snowfall. Winter moisture is critical to plant growth because of heavy evaporation losses with spring and summer rains. The lowest elevation and hottest grasslands at 300 to 700 metres are typically dominated by wide-spaced bluebunch wheatgrass with big sagebrush.

Antelope-brush survives the slightly warmer winters in the southern areas. At elevations from 700 to 100 metres elevation in the dry warm Bunchgrass Zone, big sagebrush is absent and bunchgrass plants are more closely spaced.

Bluebunch wheatgrass along with big sagebrush are the dominant species found throughout the zone, along with well-developed lichen crusts. Dominant grasses vary with site latitude, elevation, and aspect, with porcupine grass being common at the north end of the zone, while Idaho and rough fescue can dominate on north and east facing slopes in the south. As sites are modified by heavy grazing pressure, other plants that become common include prairie sagewort, rabbit-brush, junegrass, Sandberg's bluegrass, needle-and-thread grass, and yarrow. Past grazing history has influenced the bunchgrass zone in BC, and many hectares are dominated with weedy annual species from disturbance and prolonged misuse. Moisture and range condition cause wide fluctuations in forage production in the bunchgrass zone from 200 to 1,000 kg/ha. Employing cattle grazing practices to ensure proper use and rests are critical in this zone.

Despite the arid climate, a variety of wetlands occur in the bunchgrass. They include cattail marshes, saline meadows, and riparian zones lined with shrubs. These wetlands are important sources of water for livestock as well as habitat for wildlife, supporting a high density and diversity of reptiles, birds, small mammals, and large ungulates.

The majority of the Bunchgrass Zone occurs on private land and is extensively used for cultivated crops or non-agricultural purposes. The remaining grasslands are critical to the livestock industry in BC because they provide spring, fall, and winter range.

Ponderosa Pine Zone

The Ponderosa Pine Zone is characterized by open, savannah-like stands of ponderosa pine with a well developed ground cover of grasses and forbs. This zone occupies 0.3% of the province or about 300,000 ha, and occurs at higher elevations than the Bunchgrass Zone and below the Douglas-fir Zone on the lower slopes and terraces of the driest, warmest valleys of the Southern Interior, typically between 300 to 900 metres. This zone is the warmest and driest forest zone in the province.

The zone most frequently exists as a mixture of open forest and grassland. Plants found under the pine canopy are similar to those found in the Bunchgrass Zone. Ponderosa pine is the dominant tree throughout the zone but Douglas-fir can also be found in the moist areas and gullies, as well as on drier sites in cooler northern areas. Few shrubs are present in the Ponderosa Pine Zone except for big sagebrush and rabbit-brush, and scattered plants of wild rose and saskatoon in swales. Antelope-brush contributes to the understory in the southerly portions of the zone. Bluebunch wheatgrass, big sagebrush, and rough fescue or Idaho fescue dominate sites in good range condition. Fescues may replace bluebunch weheatgrass or become a co-dominant with it in the southern part of the zone. As in the Bunchgrass Zone, grazing history has played a role in determining the composition of plants present. Under heavy grazing, less bluebunch wheatgrass and fescues are present, and more Sandberg's bluegrass, needlegrass, cheatgrass, and low-growing weeds.

The Ponderosa Pine Zone is an important source of early spring and late-fall range for cattle in the Southern Interior Forest Region. In most years there is sufficient fall regrowth to provide supplemental forage. Ponds, which occur in depressions, provide water for livestock and wildlife in the spring, but often dry up during the summer.

These middle elevation grasslands have less big sagebrush and an increased dominance of bunchgrass than the Bunchgrass Zone. Bluebunch wheatgrass is the primary forage plant on excellent condition range in both subzones; it can account for 25 to 65% of the total forage production. Rough fescue and Idaho fescue are also important forage species in some areas. Forage production can range from 480 to over 800 kg/ha, and is influenced by soil type, range condition, and tree canopy closure but.

The Ponderosa Pine Zone has relatively light snowfall and short winters, so it provides winter and spring forage for deer, big-horn sheep and Rocky Mountain elk. The conifers also provide food and cover for many birds and small mammals. Rugged cliffs and talus slopes, which are common to the zone, can provide lambing grounds for bighorn sheep.

Interior Douglas-fir Zone

The Interior Douglas-fir Zone occupies most of the low- to mid-elevation terrain in the Southern Interior plateau, the Southern Rocky Mountain trench and portions of the lee side of the Coast Mountains. Topography varies from nearly level to rolling and steep slopes.

The zone occurs over a wide range of elevations from 350 metres in some valley bottoms to over 1450 metres where it often joins with the Montane Spruce Zone. Cool winters, warm dry summers, and a fairly long growing season characterize the climate of the Interior Douglas-fir Zone. Both moisture deficits and deep frosts during the growing season can limit plant growth. The landscape of the Interior Douglas-fir Zone includes grasslands, savannahs with open canopies and grass understories, as well as closed forests with a ground cover consisting of a mix of shrubs, forbs, and grasses.

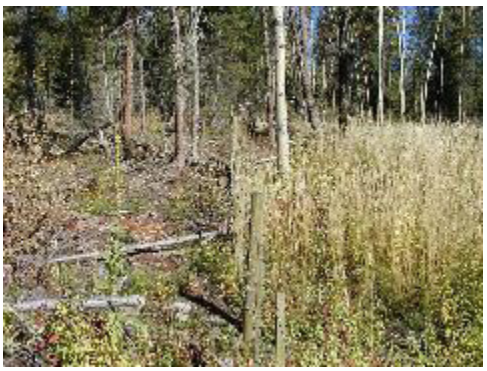
Douglas-fir is the dominant tree species in the forested parts of this zone. Lodgepole pine commonly occurs at higher elevations where it forms even-aged stands after disturbance such as fire. Trembling aspen also occurs, especially on deep, rich soils. Generally the understory is well developed in Douglas-fir forests, but few plants other than saskatoon, birch leaved spirea, pinegrass, and feathermoss occur constantly across all subzones. Common shrubs and forbs include rose, willow, timber milk-vetch, creamy peavine, and lupine.

The upper grasslands, as grassland phases in the Interior Douglas-fir Zone are commonly known, are important forage resources for livestock and wildlife. These grasslands occur due to a combination of soil, topographic conditions, and fire. Grassland plant communities in the Interior Douglas-fir Zone share common species with the lower elevation grasslands in the Bunchgrass and Ponderosa Pine zones. In comparison with the lower grasslands however, they are characterized by the absence of big sagebrush and by having more forbs, taller grass growth, and denser plant cover. Under prolonged periods of heavy grazing, grasses can be replaced by forbs.

Bluebunch wheatgrass can be the sole dominant species on dry grassland sites throughout the zone, but with different moisture conditions it often co-dominates with rough fescue, Idaho fescue, or needlegrasses.

Many of these grasslands are like those found at lower elevations as they contain plant communities altered by past grazing practices. Species composition on these sites generally includes less bluebunch and rough fescue, more Kentucky bluegrass, and smaller bunchgrasses such as needle-and-thread, junegrass, and Columbia needlegrass.

The Interior Douglas-fir Zone is one of the most important zones for cattle and wildlife in BC. The open grasslands provide important range for livestock grazing in spring and fall months, as well as extensive grazing in semi-open forests and cut blocks in the summer. Pinegrass comprises 40 to 60% of the ground cover under the forest canopy and provides 50 to 65% of the available livestock forage. In open forest stands and grasslands, bluebunch wheatgrass, rough fescue or Idaho fescue can be the principal forage speices. Forage yields can range from 270 to 800 kg/ha in forest, and up to 1,120 kg/ha in grasslands.



Plant Responses to Grazing

Rangeland plants have evolved with a long history of grazing and browsing, although there are considerable differences in resistance to grazing among species. Plants have either positive or negative responses to grazing depending on the intensity of defoliation. Studies have indicated that degree and season of defoliation are the primary indicators that determine the level of damage.

Proper grazing management can stimulate plant growth, enhance nutritive value, remove excessive litter, and accelerate nutrient cycling. Positive impacts are typically associated with light to moderate grazing. Grasses that have been lightly defoliated usually show increased tillering and leaf growth. They tend to be shorter but leafier and cover more ground surface than ungrazed grasses. The new leaves also have higher nitrogen and nutritional content than those of ungrazed grasses.

The effect of defoliation on forage plants also depends on the season of grazing. Generally, plants are little affected if defoliation occurs during dormancy because photosynthesis has already ceased. Plants may also quickly recover from defoliation early in the growing season because there is still time for the plant to produce new growth while moisture and temperature levels remain favourable. Browsing of shrubs removes the terminal bud causing an increase in the growth of lateral buds. This leads to increased sprouting and bushier shrub growth. Antelope-brush that has not been browsed shows a decline in annual branch and leaf growth. The amount of forage and nutrient content of forage plants can often be enhanced with certain levels of grazing.

Negative Impacts of Overgrazing

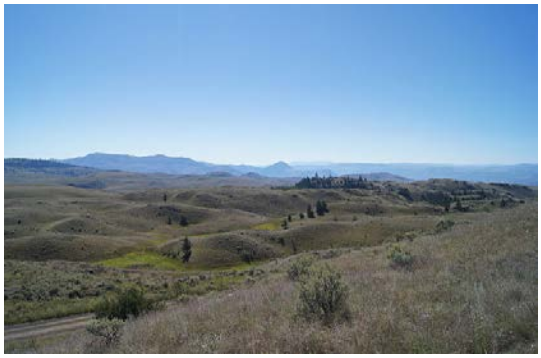
Heavy grazing negatively impacts range plants by causing decreased photosynthesis, reduced root growth and seed production, and a reduced ability to compete with plants that are ungrazed. Plants are considered to be most vulnerable to grazing damage when carbohydrates in the roots are not sufficient to initiate regrowth. With intense defoliation, the entire root system becomes smaller, shallower, and less branched. This affects the plant's ability to absorb water and nutrients from the soil. Eventually, with continued heavy grazing, the plant's health declines to the point where death may occur.

The most critical time for defoliation of grasses usually occurs just before the plants begin flowering and setting seeds. This is because carbohydrate stores are still recovering from winter dormancy, and the rapid part of the growing season is coming to an end because of declining soil moisture. If heavy defoliation occurs every year during early bloom, bluebunch wheatgrass decreases as a proportion of the plant cover, and may virtually disappear from the plant community after only a few years.

This illustrates how changes in the plant community will occur if heavily grazed in spring months year after year. Grazed plants are replaced by weedy species that are more resistant to grazing. These weedy plants are generally less productive and palatable than those with low grazing resistance. This overgrazed state generally reduces the value of grasslands for forage, livestock, and wildlife production. Overgrazed plant communities also bring about changes in the physical micro-environment of forage plants. As there is less plant leaf material to intercept rain and trap snow, more moisture is lost to the system by runoff and erosion.

Effects on Succession

Succession is the replacement of one plant community by another. The changes may come about as a result of the natural development of a community or as a result of disturbance caused by animals or humans, or climate and soil changes. Overgrazing can force the grassland to shift the successional pattern and move down in productivity. The goal of the grassland manager is to maintain or restore the desirable plant species.



Proper Range Management

BC's grasslands are valuable spring and fall forage grazing areas. Proper range management commonly focuses on two objectives: leaving sufficient leaf area for plants to photosynthesize, and maintaining carbohydrate reserves of perennial forage plants. These goals can be achieved with a variety of techniques:

- Graze the previous year's forage production early before spring growth begins.
- When used in spring, graze for short periods so that leaf re-growth occurs afterwards.
- Make sure grazing is stopped while there is sufficient leaf material to maintain photosynthesis.
- Avoid grazing spring ranges in the autumn to allow for fall re-growth so that carbohydrate reserves continue to build.

Wild Animals

Grasslands have evolved with grazing. Even before European settlement, native herbivores such as deer, elk, pronghorn, and bison applied grazing pressure. Some wildlife species require grazing for their existence. A prime example of this is the endangered burrowing owl, which prefers shorter vegetation so it can see predators.

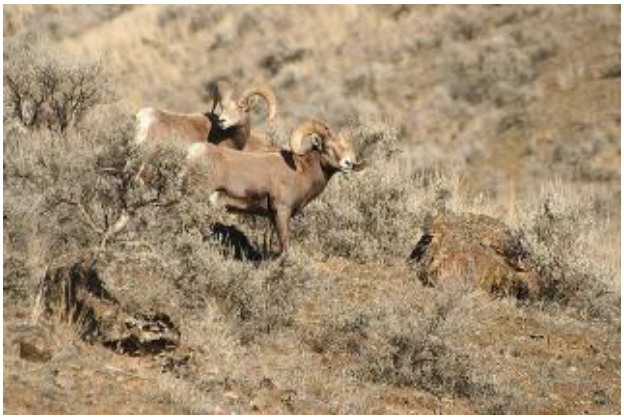
Historically, Rocky Mountain elk were in much greater abundance than they are today. Elk numbers dropped dramatically during the late 1880s, possibly due to very severe winters. Elk began to increase in the Kootenays by the turn of the century but remained sparse and scattered in the Okanagan and Thompson River areas, and the Central Interior.

Elk feed extensively on a variety of grasses, forbs, sedges, and ferns. When these preferred foods are unavailable or in short supply, they turn to shrub species and deciduous tress such as willow, red-osier dogwood, trembling aspen, alder, and Douglas maple. Nearby coniferous forests provide cover from harsh winter conditions and protection from predators. Elk require low-elevation open parkland containing deciduous tree/ grassland associations for feeding in winter and spring months, frequently sharing the same ranges as cattle. Competition for food between elk and cattle requires integrated wildlife and cattle management in elk-populated grasslands, as in the Kootenays.

Deer are known to be grazers of grasses and forbs in early spring months, but are primarily browsers throughout the year feeding extensively on aspen, willow, saskatoon, snowbrush, red-osier dogwood, antelope brush, and big sagebrush. They utilize shrubby ravines and aspen copses on the grasslands for forage and cover, and populate the fringe areas between grassland and dense coniferous forest.

Mule deer are plentiful in the mixed grass and open forests of the Interior and the Kootenays. They prefer grasslands and low-elevation shrublands close to cover, open forests of ponderosa pine and Douglas fir, and aspen parklands. Mule deer also thrive in logged forests where blocks of mature timer remain adjacent to early successional stages of shrub, grass, and forb vegetation. The critical areas for mule deer are the low-elevation winter ranges. Mule deer remain on their winter ranges until early spring green-up occurs on nearby grasslands. Heavy grazing, particularly in fall or winter months, can cause livestock to switch from grass to shrubs directly competing with mule deer. Managed cattle grazing may benefit mule deer if the growth of palatable shrubs is stimulated or where the mature growth of large bunchgrasses is removed to make new growth available.

White-tailed deer are numerous in the Kootenays and Peace River regions, and, because they are migratory, are spreading through much of the Southern and Central Interior. White-tailed deer are more adaptable than mule deer, co-existing with humans and agriculture, and making greater use of dense forests for wintering. As with mule deer, heavy cattle grazing during late fall and winter may reduce the available forage for white-tailed deer, but alternatively, heavy spring use of grass by white-tails, such as in cultivated fields, may result in a shortage of forage for cattle.



Wild sheep are primarily grazers and rely more on grasslands than any other wild ungulate. Historically, wild sheep were important to the First Nations diet, their mythology, and in tool-making. Today, the majority of Rocky Mountain bighorn sheep are found in the southern Rocky Mountains and Rocky Mountain Trench east of the Columbia River. Successful transplants have resulted in small bands from Castlegar to Kamloops and Spences Bridge.

California bighorns are present in scattered herds on the mountains and grasslands of the Similkameen and Okanagan, and in the Fraser basin north of Lillooet. Sheep numbers fluctuate due to die-offs from disease. Competition with domestic livestock for forage and disease transfer from domestic sheep have been concerns to wildlife managers over the last century.

Winter range is critical to maintaining bighorn sheep numbers. In the winter, the majority of bighorns move to low-elevation grasslands on south- and west-facing slopes with relatively warm temperature and little snow. Preferred foods are grasses, particularly bluebunch wheatgrass, and several species of bluegrasses and fescues. Heavy cattle grazing, and any other disturbance that impacts the abundance of these species, affects the value of the grassland to wild sheep.

Domestic Grazers

Horses arrived in BC in the late 1700s. They became prominent for transporting furs after 1821 and later in the mid-1800s in the mining areas, for road, trail, and railway construction. Although horse numbers in the 1800s is poorly documented, there were a reported five or six thousand head at Fort Kamloops alone by the 1948. Horse numbers in the last half of the nineteenth century and the first few decades of the twentieth century likely contributed to overgrazing the grasslands. Between 1950 and 1970, ranchers and the BC Forest Service made a concentrated effort to remove horses from Crown land. Horses are presently used by most cattle ranchers, guides, and outfitters and for recreational riding, but are mostly confined to private lands.

Following horses, cattle and domestic sheep were introduced into southern BC about 1840 by the Hudson's Bay Company. The first large imports of cattle were the result of the Cariboo Gold Rush. Between 1858 and 1868, approximately 22,000 head of cattle entered BC from the United States at Osoyoos. Most of these cattle were destined for consumption by the gold miners, but some became the nucleus of ranches that sprang up between Osoyoos and Quesnel. Another gold rush at Wild Horse Creek in the East Kootenay in 1864 resulted in cattle being driven there from Montana. Cattle numbers in BC increased very rapidly after 1860, as did the establishment of the ranching industry.

In early days, cattle grazed lower elevation grasslands year round. Since the introduction of fencing in the early 1900s, grasslands are used primarily for spring and fall grazing, with cattle utilizing higher elevation forested ranges on Crown land in summer months.

Sheep arrived in the Southern Interior a few years after cattle. Sheep numbers increased in the 1920s with the use of high elevation alpine ranges for summer grazing. Following decades of a reduced sheep industry, numbers have again risen in parts of the province and are frequently used on forested Crown lands to remove shrub and vegetation from tree plantations.

System Responses to Humans

Throughout human history, people have interacted with grassland ecosystems. For thousands of years before European settlement, BC's grassland ecosystems provided food, clothing, fuel, and shelter for aboriginal people. From the 1800s through the 1900s, grasslands provided forage to support livestock for growing communities and the building of BC's ranching industry. Today, pressures from population growth are impacting our remaining grasslands.

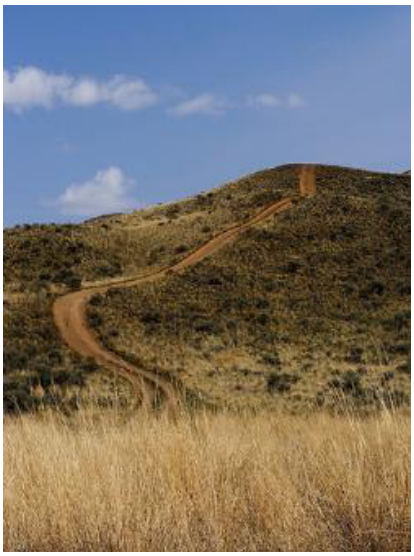
An additional 70,000 people are predicted to move into the Central Okanagan over the next 20 years. Steady growth is also predicted for the North Okanagan, Thompson, and Nicola regions. As communities grow, they expand onto adjacent grasslands. Housing and development results in loss of the grassland land base, and fragmentation of remaining grassland parcels impede wildlife travel and isolate wildlife populations. Urban sprawl is only part of the problem— fragmentation of grassland for development of recreational properties, resorts, or other tourism developments also impacts grasslands. Along with community growth and property development on grasslands comes increased recreation on adjacent grassland parcels, expanding the human footprint even further.

Mapping underway by the GCC will show the location and extent of remaining priority grassland areas. With development pressure on remaining natural ecosystem being intense and increasing, this mapping information will be of use to local governments struggling to find a balance between managing growth and protecting natural values. The majority of land use decisions in areas of human settlement are made at the local government level, and local governments have been empowered in recent years to enact legislation to protect sensitive ecosystems within their jurisdictions.

Recreation

BC's grasslands offer great opportunities for recreation, from bird watching to all terrain vehicle (ATV) use. In more recent years, mountain biking through grasslands near communities has increased. Every time people travel off-trail or build new networks of trails, the grassland ecosystem is impacted. Soil disturbance and trampled microbiotic crust lead to erosion, weed infestations, and reduced forage production.

Some recreational uses have minimal impact on the grassland ecosystem, but heavy foot or mechanical traffic can cause changes to the cryptogrammic crust, individual plants and animals, and ultimately threaten plant communities.



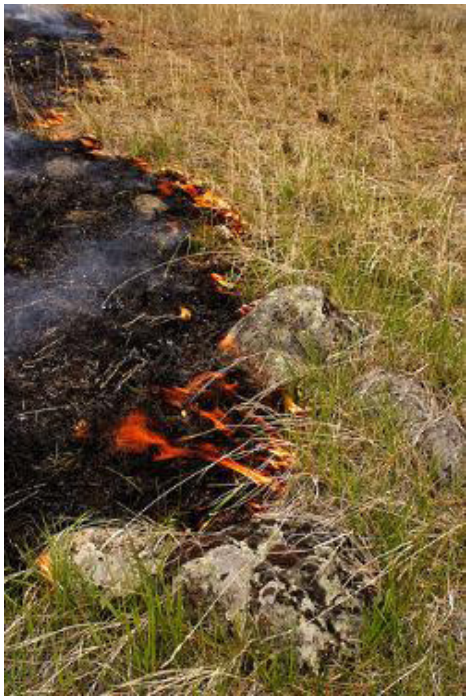
Grassland recreation is becoming increasingly popular as more people settle in grassland communities. Well-managed recreational activities can minimize impacts to sensitive grasslands and the species they support. In order to ensure that grasslands are used in a sustainable manner, recreationists must take responsibility for grassland stewardship and adopt appropriate management practices. The GCC, in partnership with the Ministry of Environment, developed the *Best Management Practices for Recreational Activities on Grasslands in the Thompson and Okanagan Basins* document. Developed with input form more than 40 organizations, this comprehensive code of practices was created by the user, for the user.

Agriculture

Cultivation of grasslands and removal of native plant communities results in loss of natural values and long-lasting modification of soil and ecosystem function. In the late 1800s and early 1900s, significant grassland acreages were cultivated by European settlers. Many acreages remained in hay production throughout the 1900s to support the ranching industry by producing winter feed. Throughout the South and Central Okanagan, orchards and vineyards have increased agricultural pressures on the grassland parcels that are left. Much of the grassland landscape dominated by antelope brush in the South Okanagan is known also to be ideal for grape production. Most remaining grassland parcels in this region are fragmented too, limiting their habitat value for threatened wildlife populations.

Fire

Fire, or the absence of fire, has affected the extent of BC grasslands. Aboriginal people traditionally used fire to remove brush for improving travel and attracting wild game to new growth. By the late 1960s, the BC Forest Service had begun to control large wildfires. The absence of periodic fire has allowed forest vegetation to creep into grasslands and replace bunchgrass with Douglas-fir and lodgepole pine.



Before European contact, BC's Interior forests and grasslands experienced frequent, low intensity fires, possibly every five to 20 years, many probably set by the native inhabitants. In the twentieth century, preventing fires was taken more seriously because of the economic value of forests and ranches, and the increasing threat to public safety that fire posed.

The GCC supports a balanced approach to restoring and maintaining grassland and dry open forest ecosystems. The GCC's position with respect to fire as a management tool is as follows:

- Prescribed fire is an important tool for restoring and maintaining grassland and dry open forests.
- Prescribed fire should be applied with clearly defined ecological and social objectives, and in combination with other appropriate tools.
- Fire science should continue to improve our understanding of the historic role of fires in BC and simulate, as much as is feasible, its past role in restoring and maintaining our grasslands and dry open forests

Grassland Monitoring

Change is part of every ecosystem. Fire, grazing, disease, drought, and earthquakes are examples of forces that cause change. Grassland vegetation changes over time in response to these forces. However, grassland managers are primarily interested in successional changes, which are changes to the plant community that may have resulted from a management action. Assessment and monitoring are required to understand the impact of use and management on changes in grassland ecosystems.

In 2009, the GCC, in partnership with other non-government and government organizations, published an assessment and monitoring tool that would provide a basic level of grassland evaluation. While the procedure is primarily intended for ranchers to use on their private land, the tool is intended to be consistent with government objectives and can be applied to grasslands anywhere. *Grassland Monitoring Manual for British Columbia: A Tool for Ranchers* is available on the GCC website.

WHAT IS GRASSLAND ASSESSMENT & MONITORING?

Grassland assessment is simply a process for comparing the present condition of a site to its ecological potential. Monitoring is a process of collecting information from several assessments to detect changes over time. Both assessment and monitoring provide valuable information that determines if management programs are achieving their goals and objectives.

Most grassland assessments compare the present condition of a site to a reference that would exist with little or no disturbance. Generally, the climax plant community, which is primarily controlled by climate, soils, and topography, serves as the best benchmark for a site. These communities represent the most stable combination of plant, water, and soil factors, and are only minimally disturbed by outside influences.

Depending on their intensity, frequency, and duration, disturbances such as fire, grazing, and recreational activities sometimes cause significant changes in plant communities. Such events can not only change the composition and structure of plant communities, but they can also affect hydrology and soil stability.

HOW IS GRASSLAND STATUS ASSESSED?

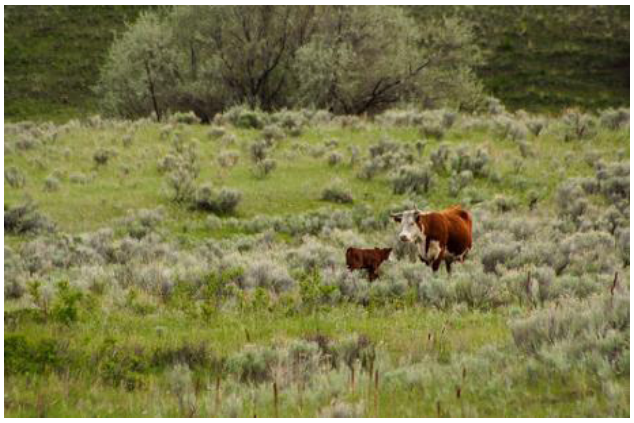
Ecological changes in grasslands are often complex and difficult to measure. Therefore, easy-to-observe indicators are often used to describe the status of an ecological factor or process that must be verified through scientific measurement as it cannot be seen or measured easily.

In order for these indicators to be effective, they must be easily observed; their present condition must be simple to describe; and changes in their condition must be conspicuous. The following five indicators are used to make grassland assessments:

- Species composition of the plant community
- Plant community structure
- Amount of litter present on the site
- Stability of soils and potential for erosion
- Presence and distribution of noxious weeds and invasive plants.

Assessments of grassland sites evaluate each of the five indicators to determine how close, or how far, a site is from the reference condition. Changes to each indicator are determined using thresholds that relate the conditions on the site to a set of standards. Each indicator is evaluated and scored independently against the threshold information provided. The sum of the scores for each of the five indicators produces an overall score for the site. The relative status of the site is finally established by comparing this score to a set of standards as follows: Reference Conditions (75-100 percent), Slightly Altered (51-75 percent), Moderately Altered (25-50 percent), and Greatly Altered (<25 percent).

Trends in grassland condition can also be evaluated using this method by making assessments over time. Monitoring for trend also uses a series of photographs that accompany the visual assessments to provide photographic documentation of conditions on the site over time.



Grazing Practices

Grazing management can improve and maintain the health and functions of grasslands if proper grazing strategies are implemented. All grasslands require particular planning and management considerations that, when applied, should ensure high yield, high quality, and sustainable utilization. However, each management plan must be developed as a specific treatment designed to accomplish a particular management objective.

The basic principles to be followed when developing a management plan for grazing include:

- What is the current health condition of the plant communities?
- What are the natural values and sensitivities, including the existence of rare species?
- What is operationally feasible?
- What will optimize the value of grassland resources?
- How will the grasslands be monitored to assess vegetation response?

The following terminology is commonly used in grazing and grassland management:

Animal unit months (AUM): The amount of dry forage resources required for one animal unit for one month. One animal unit is defined as a 1,000 lb (450kg) beef cow with a calf.

Carrying capacity: Expressed in animal unit months, carrying capacity reflects forage productivity and pasture size. It is the pasture's ability to produce forage to meet the requirements of grazing animals.

Stocking rate: The number of animals on a pasture during a month or grazing season, usually expressed in animal unit months per unit area. Using a stocking rate too high for the land to support over a period of time can result in overgrazing.

Proper Stocking Rate: Range managers ensure that the amount of forage required by livestock does not exceed what an area can provide, while also leaving enough residue to protect the soil, reducing erosion and increasing moisture retention.

Proper Distribution of Grazing: Grazing pressure should be distributed to ensure that no one area is under more pressure than another. This can be accomplished through salt and mineral placement, water developments, fencing, herding, and density.

Proper Season of Use: Grazing should be scheduled to minimize relative impacts on grassland plants. Plants are most susceptible to damage from grazing early in the season during the latter half of the rapid growth period. Grazing systems such as deferred rotation allow for a mosaic of conditions across the landscape and ensure grassland sustainability.

Proper Rest for Recovery: Plants require a rest period after being grazed to replenish growth reserves, roots, and vigour. Without adequate rest, plant health may be diminished.

Grazing Systems

Continuous, or year-long, grazing with no provision for winter feed was the system used in BC in the 1800s. Preferred areas became overgrazed by horses and cattle. In the late 1890s and early 1900s, grazing systems were implemented to reserve winter grazing and feeding. Grazing systems are now used to manage the health of BC's grasslands. Each grazing system is unique and focuses on the requirements of the particular area to be grazed, forage production, season of use, and duration of grazing. Numerous factors must be considered when implementing the type of grazing system including: types of animals to be grazed, availability and distribution of water, topography, and the level of forage utilization desired.

There are many different types of grazing systems commonly used in BC's ranching industry, including the following five systems.

SEASONAL GRAZING

Seasonal grazing entails grazing animals on a particular area for only part of the year. Many grassland acreages in BC are commonly grazed by cattle either in spring or fall months. Very dry bunchgrass ranges are particularly suited to winter grazing. Late summer and fall use of grassland pastures is frequently restricted by water availability. Higher elevation forested ranges on Crown land are typically used for late spring and summer grazing.

ROTATIONAL GRAZING

This type of grazing involves dividing the range into several pastures and then grazing each in sequence throughout the grazing period. This type of grazing can improve livestock distribution and the use of forage that might otherwise not be grazed, and allow for periods of rest on preferred areas. Wildlife or waterfowl sensitivities can also be incorporated into rotational grazing systems by deferring grazing in specified pastures until nesting or other activity requiring protection is completed.

REST-ROTATION GRAZING

This system involves dividing the range into at least four pastures. One pasture remains rested throughout the year and grazing is rotated amongst the residual pastures. This system is particularly useful for sensitive grassland or alpine ranges that require periods of recovery.

DEFERRED-ROTATION GRAZING

This system involves at least two pastures with one not grazed (deferred) until after seed-set. This system provides opportunity for grasses to achieve maximum growth and seed production during the critical growing season on the deferred area. Pastures are grazed under this system at a different stage of growth during consecutive years. This system can be appropriate for grassland ranges used during the spring and fall.

RIPARIAN AREA GRAZING MANAGEMENT

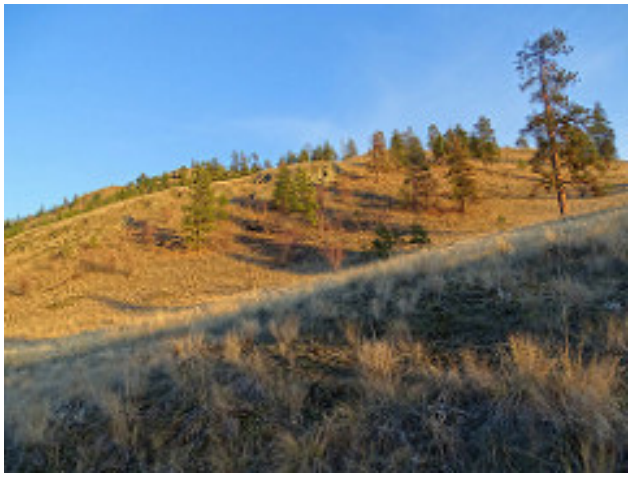
Cattle and many wildlife species tend to congregate along stream areas and around wetlands due to the higher availability of water, shade, shelter, and forage quality. Fencing can be utilized to eliminate livestock use or defer grazing until after sensitive wildlife or waterfowl periods. It is also possible to manage a limited amount of grazing use within the riparian pasture for a defined period to utilize cattle browsing to stimulate deciduous shrub and tree suckering.

Grazing Distribution

Livestock behaviour plays a key role in the relationship between grazing and plant communities. Factors that impact grazing behaviour and grassland management are the abundance of forage, the topography of the land and availability of water, season of use, and class of animal.

Cattle that have access to abundant, good quality forage will graze for about nine hours during a 24-hour period. Grazing time can be lengthened under high stocking rates, low forage availability, or when the quality of feed is reduced. The daily grazing period may also be extended when cattle graze vegetation of mixed quality and growth such as shrubs and grasses.

Livestock have inherent responses to natural phenomena, including their ability to seek out the best forage. This ability has developed from generations of natural selection under range grazing conditions; individuals that were capable of selecting superior forage and being able to utilize it efficiently were more likely to survive.



When left to their natural habits, cattle graze readily accessible areas first, which means that forage may be underutilized on less accessible range. Unless these habits can be overcome, preferred areas may be overused while other areas are passed up. On rangeland with variable topography, such as in the BC Interior, cattle prefer areas with the least slope gradient, to the extent that gently sloping or flat rangeland usually receives the highest grazing pressure. This preference is pronounced where water is more abundant or the forage type more attractive, such as in valley bottom lands. Areas of low topographical relief, particularly around watering areas, are generally heavily grazed relative to steeper slopes or acreages further from water.

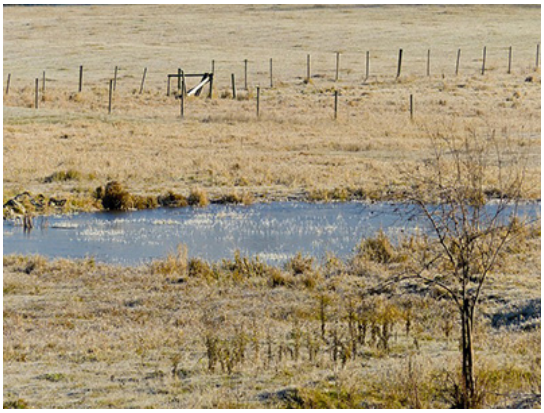
All livestock demonstrate different behaviour during different seasons, particularly when grazing on range with variations in elevation and vegetation types. Cattle generally tend to prefer immature over mature plants, leaves over stems, and plants with fine stems over coarse-stemmed plants. Seasonal shifts from one preferred species to another often occur when plant species mature at different times throughout the grazing season. Grass re-growth is highly preferred and, when continuous grazing occurs throughout the season, this can lead to overgrazing of plants grazed earlier in the year.

Such seasonal forage preferences tend to be associated with plants higher in protein and other nutritive parameters. Cattle inherently return to familiar areas. Older animals (cows with their calves) become familiar with certain routines throughout the year. Younger, un-bred animals (yearlings) will utilize range with rougher topography and steeper slopes, traveling further from water. Bulls will travel a greater distance from water and utilize extreme areas of the range, but may isolate themselves in the fall months and be difficult to find.

Tools to Distribute Livestock

Cattle distribution is managed to ensure effective use of grassland resources. The following practices are commonly used to improve the distribution of cattle across their range:

- Development of watering sites on un-grazed and/or lightly grazed areas to increase use
- Placement of salt in areas that will encourage greater use of lightly grazed areas or attract livestock away from sensitive areas such as waterfowl habitat or tree plantations
- Fertilizing to improve forage quality and encourage grazing of the area, or to attract them away from a nearby sensitive area
- Fencing to enable following a grazing rotation or rest system, or to prevent grazing in wildlife or waterfowl sensitive areas
- Herding to promote cattle movement to lightly grazed or ungrazed areas.



WATERING SYSTEMS

Water availability on grasslands often dictates the grazing season and the number of livestock that can be grazed. BC's grasslands are often deficient of stock water in late summer and fall months. When water sources are scant, excessive utilization of forage may occur adjacent to watering sites. In addition, more watering sites are required on rough or steep terrain than on level or rolling terrain.

There are various types of water developments available, and the site conditions usually indicate which are appropriate. Fencing to restrict livestock access to a portion of a natural water body can reduce the damage potential along the reserved shoreline, but can concentrate any impact to a smaller area. It is often desirable to completely fence off sensitive riparian areas, as well as to provide an alternative water source.

SALT

The consumption of salt by cattle is variable and may be due in part to the amount available from natural sources. Cattle graze as they travel between salt and watering sites, and salt placement can be used to encourage grazing in under-utilized areas. Salt is normally placed well away from water and preferred grazing areas, wildlife- and waterfowl-sensitive habitats, and tree plantations. The location of salting grounds, and the appropriate distance between them, depends on water location and terrain.

FERTILIZER

Fertilizer can be effective for improving cattle distribution and forage production. The application of fertilizer to small areas enhances grazing use of the fertilized and adjoining unfertilized range. Fertilizer usually enhances the palatability and nutritional value of growing plants by increasing their protein content and succulence; however, large-scale application of fertilizer to BC's rangelands is usually not feasible due to product and application costs.

FENCING

A well-maintained fence is the prime management tool for controlling cattle and confining them to a particular grazing area for an appropriate time. In the majority of BC's grasslands, fences are required to implement a grazing system. Fences require significant resources for annual maintenance.

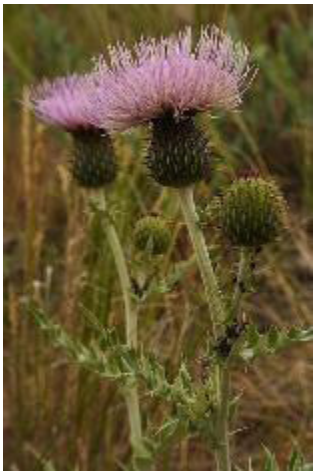
RIDING

Herding is required to distribute cattle over the rough terrain of BC's grasslands. Frequent riding to remove cattle from preferred areas to less utilized areas improves forage utilization across the pasture and, generally, cattle weight gains as well.

Weed Management

Undesirable plants, or plants growing in locations that are not consistent with the land use objectives, are referred to as weeds. Weeds have an economic, ecological, and aesthetic implication on BCs grasslands. Weed management is developing a response to weed infestations or to prevent weed encroachment of currently weed-free communities.

Noxious weeds are usually non-native species introduced to BC through human activities. The BC Weed Control Act and its regulations require control of noxious weeds. Invasive species are non-native plants that have been introduced to an area where their natural controlling agents such as insect predators and plant pathogens do not occur. They are aggressive and have the ability to spread and thrive. Invasive plants are undesirable to humans either because they have no obvious beneficial qualities or because they interfere with our land management objectives.



Effects of Weeds

Many hectares of native plant communities in BC have been overtaken by plant species that are referred to as invasive. Knapweed is an invasive weed of considerable concern with respect to BC's grasslands. Both spotted and diffuse knapweed are highly competitive and capable of invading grassland sites to the exclusion of native vegetation. Knapweed species have been causing major environmental deterioration and reduced forage production in BC's Southern Interior for more than 50 years.

Weeds are responsible for reductions in forage yield and quality and lead to ecological degradation through modification of plant communities and destruction of animal habitat. To the ranching industry, the economic impact of weeds on grasslands is a sum of the direct losses associated with reduced forage yield and quality, animal performance, and stocking rate, plus the costs incurred in managing or controlling the infestation.

Weed Control

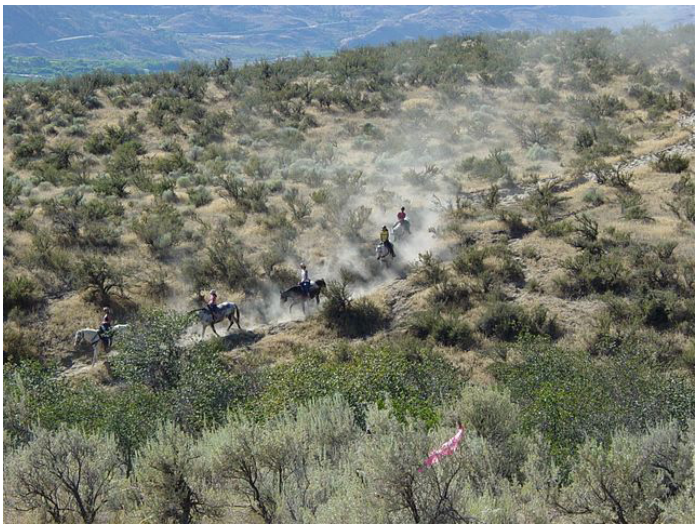
Weeds become established from improper grazing practices weakening the plants, soils disturbance arising from motorized and non-motorized vehicles, and dispersal of seed from humans and animals.

Weed control requires a high level of management. Ideally, the resource is managed to prevent weeds from invading. Once weeds are established, an approach potentially using a variety of tools may be required to eliminate the infestation or control its spread. Cultural and mechanical control, which include cultivation and mowing, are not generally feasible on natural grasslands. Manual control, such as hand pulling, can be very effective for small areas, but generally impractical on large scale grassland ecosystems. Biological control is commonly thought of in terms of the effect specific insects have on noxious weeds, such as urophora flies on knapweeds. Chemical control with herbicides has been conducted on BC grasslands since the 1950s. Some herbicides are effective in the selective control of broad-leafed plants, including knapweeds.

Integrated Weed Managment

Integrated weed management includes techniques that focus on prevention rather than eradication. Integrated weed management must be an essential part of the ongoing maintenance program for any property. This strategy is a balanced approach to resource management and must include the following processes for long-term results:

- Managing the grassland resource to prevent weeds from invading
- Identifying the invasive weed species and its growth habits
- Mapping the weed populations and recognizing the damage they cause
- Making control decisions based on knowledge of potential damage, cost of control method, and environmental impact of the weed and the control option
- Using control strategies that may include a combination of methods to reduce weed population to an acceptable level
- Monitoring the effectiveness of weed management efforts and adjusting efforts as necessary.



Research & Education

Range research started in the western US about 1900. Early research on grasslands in BC included seeding trials and erecting exclosures on grasslands to exclude grazing. Some of those exclosures have been maintained to this day and provide valuable information on plant succession.

Grassland research in BC has included studies of plant identification and species characteristics, relationships between soil and vegetation types, plant succession, grassland health, and weed control. All these studies help determine ecosystem management techniques for sustaining plant communities for optimal forage production and wildlife values.

Communicating the results of these research programs through extension is the GCC's strategy for educating landowners and organization, and assist them in applying new information and knowledge in their day-to-day activities.

Extension is best defined by the following actions:

- Bring together the required people, knowledge and other resources to achieve desired goals.
- Facilitate the flow and dissemination of information.
- Encourage organizations, groups, and individuals to work on problems and develop new opportunities.
- Offer specific ideas for change through demonstration.
- Inform planning and decision-making processes.