

Rangeland Health Brochure 14

A different form of R & R

Giving the range meaningful rest and recovery after grazing



Doug Fraser
Rangeland Stewardship Officer
Range Branch
December 1, 2014

Background

In British Columbia, ranchers commonly graze their cattle on low to mid-elevation bunchgrass or wheatgrass-needlegrass range in early spring then move them to higher elevation pinegrass or bluejoint range, cut-blocks seeded to domestic forages and native sedge meadows in early summer, then back to native bunchgrass or wheatgrass-needlegrass range in the fall.

Research in the Northern Great Plains has shown that native wheatgrasses, needlegrasses and fescues need from **100 to 200 growing days** to recover from a single severe defoliation. This is more time than it takes to grow a wheat crop from planting to harvest. Studies at the Kamloops Research Station show that bunchgrass range declines in productivity (vigour and health) if grazed twice (spring and fall) during a single growing season. This poses a particular challenge where there are also large resident wild ungulate populations, especially elk, but also mule deer and bighorn sheep.

During the spring of 2006, Range Program staff evaluated 42 representative spring turn-out pastures ranging from the south Okanagan to the Peace River. We selected these areas because of their long histories of cattle grazing and planned grazing systems. We focused on true grassland and grassland-shrub communities.



Figure 1. Forage production is low on this early-seral spring turn-out pasture.

Soil compaction was severe enough to restrict plant root growth and water infiltration on almost all sites, regardless of soil texture. Fine textured soils (clays and silts) were the most severely compacted. Range reference areas (RRAs) that had been protected from grazing for twelve to sixteen years were in a recovery mode, but were still slightly compacted at the 10 cm depth.

We found that many turn-out pastures either lacked or had an altered **biological soil crust (BSC)** layer. BSCs are the layer of lichens, mosses and dead plant material between the bunchgrasses that shade the soil, reduce evaporation, and capture atmospheric nitrogen and carbon. They should not be confused with physical soil crusts that form as a result of raindrop impacts on bare soils. BSCs, including lichens and mosses, are important in healthy functioning mineral and water cycles. An absent or altered cryptogam layer means that the carbon and nitrogen cycles are not functioning well. An intact BSC layer will provide a uniform distribution of nitrogen, which is released and available for early spring grass

growth. Native legumes are scattered and deep rooted and cannot provide the same distribution or timely release of nitrogen as BSCs. This is probably why many interior rangelands are nitrogen poor.

Forage volumes (combined new growth and old residue) ranged from a low of 86 kg/ha (11.6 ha/AUM) to a high of 1238 kg/ha (0.5 ha/AUM) on a bunchgrass range that had been rested the previous year. In all cases, **residual cover** from the previous year comprised the majority of dry matter; without it, cattle would not have enough volume, even when new growth had reached a height of 15 cm (6"). Residual cover also protects new tillers from cold winters and warm summers, and helps capture and store water.

The healthiest and highest producing native turn-out pastures had planned rest as part of their grazing rotation.



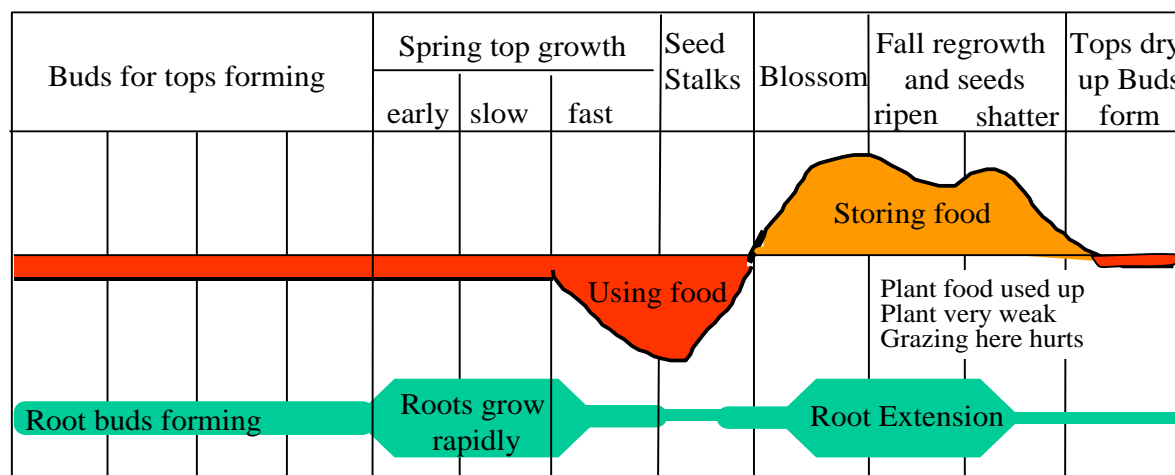
Figure 2. Cattle on a spring turn-out pasture with little new growth and no carryover from the previous growing season.



Figure 3. A healthy (late-seral) bluebunch wheatgrass spring range with new growth and residual cover from the previous year.

How can the lower elevation wheatgrass-needlegrass and fescue ranges be grazed to provide adequate rest and recovery time?

Our native grass species are survivors. In our climate, they experience cold winters, hot summers, frequent drought, severe rain events, fire, and competition from other plants, all while being grazed. Though not visible to the human eye, grass plants undergo major physiological events throughout the calendar year (Figure 4). Even when appearing dormant, they are forming root and top buds and using stored energy just to stay alive. A grass plant replaces about 30% of its root system each year, and this natural process of root senescence and replacement is what has created the rich brown to black chernozemic soils common to rangeland systems. Grazing that removes more than half of a grass plant's leaf area will cause it to stop its root growth as it reallocates energy to growing more leaves; if this occurs year after year, the plant's root system will become shallower, and it will eventually die.



Major physiological events during the year for a typical range grass plant for an area with a cold winter and a dry summer. This diagram shows three things going on in a plant during the year: (1) top-growth (top line of diagram). (2) The rate at which the plant uses or stores food that it manufactures (curved heavy line), and (3) root growth. The rate of root growth is shown by the width of the strip just above the months of the year. Plants are most easily injured by grazing when their food storage is used up in the building of tops and roots. (Source: Parker 1969).

Figure 4. The yearly calendar of plant growth and dormancy in the dry bluebunch wheatgrass zones.
(From the *Remedial Measures Primer*. Version 3.0. Range Branch. 2001.)

Conventional rest rotation grazing (RRG) (Figure 5.) was developed for Idaho fescue range and timed to the phenological stages of flowering and seed ripe. It was premised on a four year cycle with a **high stock density** to reduce selective grazing and a 50% use level, with 25% of the range rested each year. Deferred rotation grazing (DRG) is similar to RRG except that it is based on a three year cycle without a full year of rest. There have been mixed results from RRG and DRG systems because the grazing periods are often too long, allowing livestock to regrow rapidly growing plants, and the turn-out pasture is often low in forage volume, even if grazing is held off until the 4-leaf stage.

In practical terms, if you could limit grazing time to about 20 days in each pasture unit during the growing season it might (through a planned grazing rotation) be possible to get the 100+ days of

recovery before an area and its plants are grazed again. This would likely require additional infrastructure (fencing and water development) and /or a rethinking of how the range is managed. In some cases, herd consolidation (recognizing breeding issues) and cooperative management by range licensees might provide the higher stock densities, better distribution and the labour pool needed to make this feasible.

See Appendix 1 for some calculations.

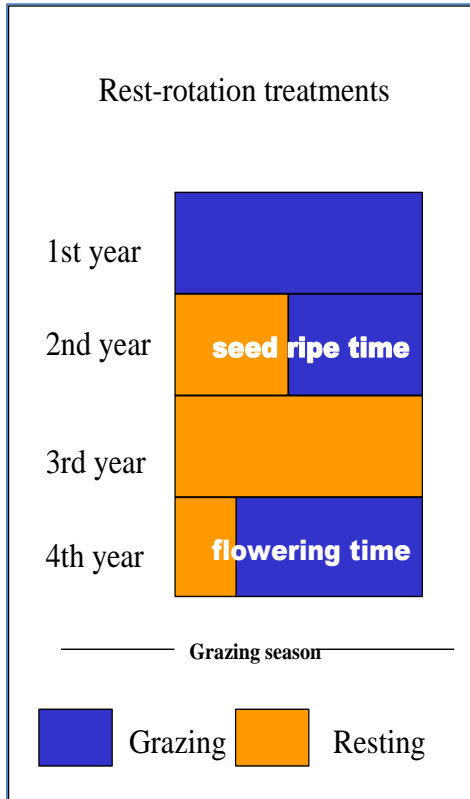


Figure 5. Conventional rest-rotation grazing was designed around the phenology of Idaho fescue. Grazing in year two was timed to seed ripe so that animals would trample seed into the soil, allowing it to germinate. Rest in year three and deferral of grazing to year four was intended to allow new grass seedlings to establish before they could be grazed.

The following are some alternatives that **limit grazing time to about 20 days during the growing season**, maximize rest between grazing events and allow earlier spring use in the pasture that was rested for the entire previous year.

Option 1. A four pasture rotation on lower elevation wheatgrass, needlegrass and fescue range (lower grasslands, ponderosa pine/middle grasslands) where spring growth begins in mid to late March and ends in late June to early July.

Table 1. A four-pasture rotation incorporating complete rest every fourth year. Livestock would move to higher elevation range for the summer and fall, and then return home without passing through these pastures again. The pasture grazed first in spring has been rested during the previous year. The sequence repeats itself starting again in year five.

Pasture number	Year one	Year two	Year three	Year four
A	1 st	2 nd	3 rd	Rest
B	2 nd	3 rd	Rest	1 st
C	3 rd	Rest	1 st	2 nd
D	Rest	1 st	2 nd	3 rd
Cut-blocks or pinegrass	Grazed June to mid- September every year			

What does this mean in effective rest for a lower to middle grassland grazing unit? (Appendix 1 for details).

Assuming an early-summer dormancy period for lower elevation bunchgrasses, there are about **105 growing days** in the calendar year from mid/late March through to late June/early July. Regrowth might occur during the summer season if there is timely rainfall and the temperatures are moderate, but we should not bank on rains that might come, so let's ignore that possibility. Summer rains that break dormancy can place plants under risk of being regrazed if cattle remain on pasture or there are large numbers of wild ungulates. Over the **four year cycle** (with bridging of rest from the previous calendar year) we have a **minimum of 105 days to a maximum of 150 days of growth** to recover from livestock grazing.

In the upper grasslands spring growth begins a week or two later, but the higher elevation and better effective precipitation to evaporation ratio means that mid-summer dormancy (if it occurs) happens in late July to early August and plant growth is minimal until mid-April the following year. **To be on the safe side, we should not assume more than 105 days of effective growth in a year.**

What about Northern Range where there is no mid-summer dormancy?

Now let's see what happens if we can ignore mid-summer dormancy as may be the case on some of our more northerly range. Let's assume there are about **120 growing days** in the calendar year from early May until the end of August. With this type of rotation (with bridging from previous years), pastures receive a minimum of 120 days of effective rest from grazing during the growing season. During the rest year, a pasture will receive a bridged 160 days of rest followed by an additional 20 days of spring growth before the onset of grazing.

Option 2. Rest and partial deferral to allow fall use of one pasture per year.

Some bunchgrass and mixed grass ranges are in dormancy by mid-September. It's a bit risky calling this a true dormant season grazing, because fall rain can break dormancy and allow grass plants to start new growth. That said dormant season fall grazing may be an option in some areas that do not typically get fall rains. After weaning and separating calves from the herd, it's often possible to turn the main cow herd back on dormant fall grass for a few weeks before freeze-up. Here is how it can work.

Table 2. A four pasture rest and partial deferral grazing schedule allowing fall (dormant season) use of one pasture per year. Pastures are grazed for about 20 days during the growing season. The sequence repeats itself beginning in year five.

Pasture number	Year one	Year two	Year three	Year four
A	1 st (May 1)	2 nd (May 21)	3 rd (Fall)	Rest
B	2 nd (May 21)	3 rd (Fall)	Rest	1 st (May 1)
C	3 rd (Fall)	Rest	1 st (May 1)	2 nd (May 21)
D	Rest	1 st (May 1)	2 nd (May 21)	3 rd (Fall)
Cut-blocks or pinegrass	Grazed June to mid- September every year			

Livestock would graze from May 1 to about June 10 on two lower elevation pastures, then move to pinegrass and cut-blocks until mid-September. The herd would then be moved back to the third pasture for three weeks of fall grazing before going home. The fourth pasture would be rested for the entire growing season, and then be grazed first in sequence the following year. The fall grazed pasture would be rested in the next year. This translates to a **minimum of 105 days and a maximum of 275 days** of growth after grazing during the four year cycle.

Fall use comes with a caution. Riparian shrubs such a willow and red-osier dogwood, and upland shrubs such as rose, snowberry and Saskatoon become increasingly attractive to cattle as grasses dry and become less palatable. Browsing use levels need to be monitored and livestock use limited so that shrubs maintain their vigour and height, especially where they provide winter browsing for wild ungulates.



Figure 6. Fall grazing on a mixed wheatgrass-needlegrass range in the BC Peace Region.

Now let's think about true dormant season winter use.

Option 3. Including winter grazing in the rotation

Winter grazing of bunchgrass range (with protein supplementation) is a common practice in the Northern Great Plains of the USA, but less common in Canada. Winter grazing has the potential to allow low impact grazing while shortening the feeding season (and reducing feeding costs) in some areas of BC where snow cover is typically low, and where limited surface water makes conventional spring and summer use infeasible.

Some guide-outfitters in northern BC, and ranchers in the Chilcotin have practiced winter grazing of open sedge meadows for decades. Horses typically aren't hampered by snow accumulations and are able to access tall dormant sedges under snow cover. Cattle don't in general "crater" for forage, but in areas where snow cover is, on average low, can typically get plenty of roughage from tall dormant sedges. Cattle will need protein supplements on this type of range.



Figure 7. Guide-outfitter horses grazing a sedge meadow in early winter.



Figure 8. Cattle grazing lower elevation bunchgrass range in winter may require protein supplements.

Winter grazing has been practiced on portions of the bluebunch wheatgrass range in Empire Valley (now Churn Creek Protected area) since the late 1960s. Cattle graze these largely snow-free areas from January to early March prior to spring green-up. Enough residual cover must be left to insulate and

protect growing points from cold temperatures and drying winds. I was skeptical when I first heard of winter grazing of bunchgrass range until I visited the site and measured the rangeland health, levels of use, and assessed the plant community seral stage. These sites were in a better overall health than areas grazed during the active growing season. Here are photos of winter grazed bluebunch wheatgrass range with a close-up of lichens in the centre.



Figure 9. Spring regrowth of bluebunch wheatgrass range after winter grazing (left). A close-up of lichen cover (centre). A close-up of health bluebunch wheatgrass plants (right).

Table 3. Rest along with winter use.

Pasture number	Year one	Year two	Year three	Year four	Year five
A	1 st (April 15)	2 nd (May 7)	3 rd (Fall)	4 th (Winter)	Rest
B	2 nd (May 7)	3 rd (Fall)	4 th (Winter)	Rest	1 st (April)
Cut-blocks or pinegrass	Grazed late May to mid- September every year				
C	3 rd (Fall)	4 th (winter)	Rest	1 st (April)	2 nd (May 7)
D	4 th (Winter)	Rest	1 st (April)	2 nd (May 7)	3 rd (Fall)
E	Rest	1 st (April)	2 nd (May 7)	3 rd (Fall)	Winter

There are several benefits to true dormant season grazing:

- The soil is not damaged because it is frozen or dry;
- Plants are dormant and won't be dislodged by grazing or hooves;
- Grazing during dormancy does not cause a reduction in the grass plant's roots or carbohydrate reserves;
- Selective or preferential grazing of grass species is reduced leading to more even use and a reduction in wolf plants;
- The lichen crust is not damaged by hooves at this time of year. Research from UNBC has shown this to be highly effective way of protecting the lichen cover. Lichens having cyanobacteria (once known as blue-green algae) are able to capture nitrogen from the air;
- Nitrogen is released to grass plants at the time needed for new growth. This is free nitrogen that can be more evenly distributed by lichen cover than by nitrogen fixing shrubs and forbs.

Winter grazing also comes with some cautions. Grazing must leave enough stubble to insulate new grass tillers and growing points from cold temperature and return residue (litter) to the soil surface. If the area is a formal ungulate winter range, there will be an obligation to partition the forage resource (grass and browse) between domestic livestock and bighorn sheep, elk or mule deer.

Conclusions

Rest/recovery is one of the four principles of range management¹. Rangelands can be safely grazed outside the conventional grazing times if we consider the following:

- Stock the range conservatively, balancing livestock numbers to the forage supply, remembering to leave enough residue (litter and stubble) to protect the soil, plant growing points and new grass tillers;
- Whatever the forage base, plan rest and recovery time into the grazing rotation;
- Limit grazing time to no more than 20 days per pasture during the growing season. Strategic fencing and water development and/or herd consolidation and cooperative management might be necessary;
- Don't graze the same pasture twice during a growing/grazing season. Grass plants need from 100 to 200 days of recovery after grazing;
- The spring turn-out pasture should be rested during the previous growing season to allow the plant community to restore its vigour. Residual grass from the previous year provides important roughage to supplement new grass growth on the turn-out pasture;
- Done properly, fall dormant season grazing (after weaning and separating the calves) and winter dormant season grazing can reduce winter feeding time and bills substantially, with the added benefit of improving the native plant community;
- Don't forget wildlife in your planning.

It's time to rethink how we manage our Crown range grazing resource. R & R is not optional.

¹ The Four Principles of Range Management. Rangeland Health Brochure 13. Range Branch. 2013.
DURT = Distribution, Use level, Rest (recovery) and Time (when and how long)

Appendix 1. Calculating days of recovery time.

Option 1a. Southern bunchgrass and ponderosa pine rangelands with summer dormancy.

Table 1a. Days of grazing and rest on pasture A during the four year cycle assuming April 15 as the start date, and a summer dormancy beginning in early July.

Year one April 15- May 4 Rest/Graze/Rest	Year two May 5 – May 25 Rest/Graze/Rest	Year three May 26-June 14 Rest/Graze/Rest	Year four No grazing Rest/Graze/Rest
120 + 30 / 20 / 55	55+ 50/20/35	35+ 70/20/ 15	15/ 0 / 105
Rested for 150 days before grazing (120 days previous years + 30 days of spring growth)	Rested for 105 days before grazing (55 days previous year + 50 days spring growth)	Rested for 105 days before grazing (35 days previous year + 65 days spring growth)	Rested for entire growing season 105 days + 15 days previous year for a total of 120 days

Option 1b. Northern grassland range with no summer dormancy

Table 1b. Days of grazing and rest on pasture A during the four year cycle.

Year one May 21- June 10 Rest/Graze/Rest	Year two June 10 – 30 Rest/Graze/Rest	Year three July 1-20 Rest/Graze/Rest	Year four No grazing Rest/Graze/Rest
160 + 20 / 20 / 80	80 + 40/20/60	60 + 60/20/ 40	40/ 0 / 120
Rested for 180 days before grazing (160 days previous years + 20 days of spring growth)	Rested for 120 days before grazing (80 days previous year + 40 days spring growth)	Rested for 120 days before grazing (60 days previous year + 60 days spring growth)	Rested for 160 days (40 days previous year + 120 days current year)

Option 2. Rest and partial deferral to allow fall use of one pasture per year.

Table 2a. Days of grazing and rest on pasture A during the four year cycle.

Year one May 1-20 Rest/Graze/Rest	Year two May 21 - June 10 Rest/Graze/Rest	Year three dormant season use Mid-September to mid-October Rest/Rest /Graze	Year four No grazing Rest
260 + 15/20 / 70	70 +35/20/50	50 + 105/20	105
Rested for 275 days (no grazing during the growing season during year 3 and total rest in year 4 + 15 days spring growth)	Rested for 105 days before grazing (70 days previous year + 35 days spring growth)	Rested for 155 days before grazing (50 days previous year + 105 days current growing season)	Rested for the entire growing season, 105 days

Option 3. Including winter grazing in the rotation

Table 3a. Days of grazing and rest for pasture A in a five year cycle.

Year one April 15-May 5 Rest/Graze/Rest	Year two May 6 – May 26 Rest/Graze/Rest	Year three Sept 24- Oct 15 Rest/Rest /Graze	Year four Winter grazing Rest	Year five No grazing
210 + 20/20 / 65	65+ 45/20/40	40 + 105/20	105	
Rested for 230 days before grazing (No grazing during the growing season during years 4 and 5 + 20 days new growth)	Rested for 110 days before grazing (65 days previous year + 45 days spring growth)	Rested for 145 days before grazing (40 days previous year + 105 days current growing season)	Rested for the entire growing season, 105 days	Rested for the entire growing season, 105 days