

Water quality and livestock grazing on Crown rangeland in British Columbia



RANGELAND HEALTH BROCHURE 12



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Citation

Fraser, D.A. 2009. Water quality and livestock grazing on Crown rangeland in British Columbia. B.C. Min. For. Range, Range Br., Kamloops, B.C. Rangeland Health Brochure 12.

URL: <http://www.for.gov.bc.ca/hra>

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Introduction

Livestock grazing has a long history in British Columbia dating back to the 1860s. On Crown range, grazing is authorized under the *Range Act* and regulated by the *Forest and Range Practices Act* (FRPA). In much of British Columbia, livestock are everywhere on the landscape and have a legal right to be there. British Columbia is unique in the relatively small percentage of land that is privately owned. This means that access to provincial Crown land is necessary for both the beef cattle and forest industries and also for recreationists.



Grazing is authorized under the *Range Act*.

Table 1 Land ownership in British Columbia

Land ownership	Provincial land base
Provincial Crown	94 %
Private	5 %
Federal agencies	1 %

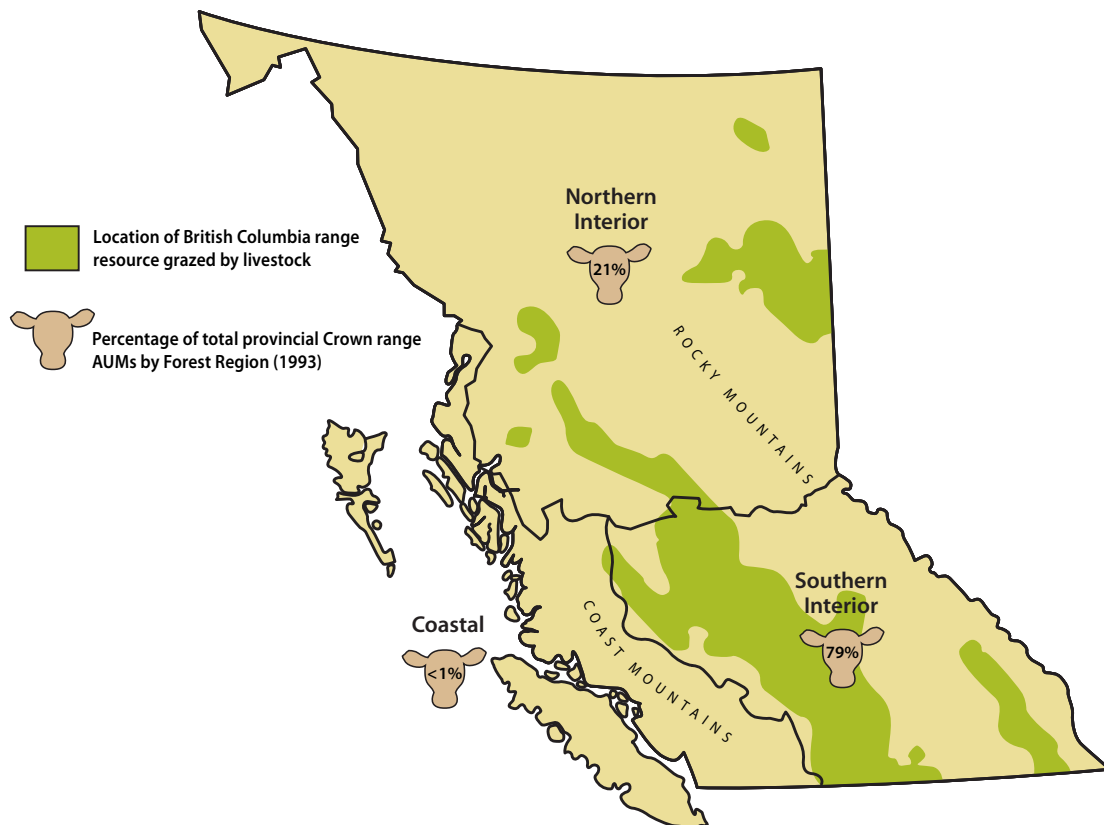


Figure 1 Distribution of British Columbia range resources and AUMs (an Animal Unit Month is the amount of forage consumed by an average cow, with or without a calf, in one month).



An unprotected reservoir and canal providing drinking water to a community.



Erosion along a motorcycle trail introduces sediment to a creek in a community watershed.



Range plans must maintain or improve water resources.

Most communities in British Columbia obtain their drinking water from surface sources that are susceptible to contamination from overland flow, seepage, and direct inputs. Several waterborne disease outbreaks during the past decade have raised the level of concern about management and treatment of community water supplies. In response, the Auditor General released a performance audit on *Protecting Drinking Water Sources* (1999) that raised significant concerns, and in 2001 the British Columbia Legislature passed the *Drinking Water Protection Act*.

Range Program staff and range agreement holders are experiencing some challenges in their management of livestock in community watersheds. While livestock grazing is an accepted use of these watersheds in British Columbia, it does not necessarily mean that status quo management is acceptable. All efforts must be taken to mitigate livestock-caused changes to water quality, water quantity, and timing of water flow. This brochure is intended to provide some guidance to range practitioners and statutory decision-makers.

The Forest and Range Practices Act (FRPA)

Water is one of the 11 values identified in FRPA. The minister responsible for the *Land Act* and the minister responsible for the *Wildlife Act* may, respectively, designate community watersheds and establish water quality objectives under the Government Action Regulation (GAR).

Under the Range Planning and Practices Regulation (RPPR) the government objectives for water are to maintain or improve: water resources, healthy riparian and upland areas, riparian vegetation providing shade, and desired plant communities. Range plans must be consistent with these objectives. In addition, range practices must not compromise water quality, damage waterworks, or result in a failure to meet water quality objectives. There are also limitations on range developments within community watersheds and



Cattle with free access to a creek can degrade water quality.



Livestock tend to congregate in these areas and can deposit feces in and adjacent to the stream.



Steep topography combined with overuse can allow the flow of contaminants into a water body.



provisions regulating range practices as they might affect riparian areas, uplands, fish habitat, and resource features. Before approving a range plan or plan amendment, the Ministry of Forests and Range (MFR) District Manager should ask specifically how the proposal will achieve the desired outcomes.

Risk assessment

MFR Districts are expected, as part of their risk management framework, to evaluate the level of risk to FRPA values associated with livestock grazing on Crown range. The Compliance and Enforcement Branch has a risk assessment model that can be used.

Table 2 Factors that elevate the risk of livestock contaminating a water supply through overland flow or percolation

- Steep topography close to streams or wetlands
- Soils that are coarse textured or shallow to bedrock that do not provide filtering and denitrifying
- A sparse riparian buffer (vegetation that is early seral, or where riparian vegetation has been replaced by shallow-rooted upland species)
- Livestock use close to water intakes
- Overgrazing and over-utilization
- Season-long grazing with minimal management
- High runoff during the time of livestock use
- Water runoff and feces accumulations along livestock trails leading to water bodies
- Range development and/or management that encourages or concentrates livestock use near water bodies and in riparian zones
- Calves less than 4 months of age, which are potential cryptosporidium carriers

Salt, minerals and cattle oilers should not be placed in the riparian zone. This moveable, covered container protects the minerals from rainfall and prevents their leaching into the soil.



A healthy stream with an intact riparian plant community. The sedge zone acts as a filter, and the saturated anaerobic soil captures and converts nitrates to nitrogen.

Considerations

It is important to maintain a healthy upland and riparian plant community that can capture precipitation, stabilize soils, and act as a filter for sediment and contaminants. Grazing at the right time and at an appropriate level, followed by planned rest, will allow plant communities to remain healthy and productive. There is no substitute for a healthy plant community.

Small streams and wetlands are generally at greater risk from livestock impacts than are large rivers and lakes. Small streams that flow through fine-textured soils are typically dependent on vegetation and woody debris for stability—these streams are the most susceptible to livestock impacts.

Researchers in Oregon showed that water supplies are at greatest risk of contamination when livestock are allowed to defecate in or within 1 m of the water body. They also found that when drinking-water access points were narrow, livestock would drink and then back out, thereby reducing the likelihood of their defecating in the water body.

Some pre-FRPA guidelines that are still relevant recommended that a 30-m riparian strip be managed for “light occasional use,” meaning that practices and developments should not encourage cattle to remain within this buffer strip. The intent was not to exclude livestock, but to manage them to prevent an accumulation of feces, trampling of soils, and severe and continuous defoliation of forage and shrubs within the riparian buffer (sound range management recommendations).

Fencing the riparian zone to exclude livestock should be considered only as a last resort because of the hazards and logistical problems associated with fencing. A better choice is to create a riparian pasture that allows better control of livestock.

Road networks and recreational trails often occur within streamside riparian zones. These travel corridors are large sources of sediment and pollution to water bodies. Pathogens



An ATV crossing on a creek.



Pumps used in combination with water troughs can eliminate direct livestock use of water bodies.



A sling pump operates on stream energy. Its propeller (impeller) is turned by water flow in the stream.



Fencing can be used to control livestock distribution and access to water sources.

that are deposited in water bodies will attach to fine sediments and settle to the bottom. These pathogens are mobilized and can move downstream if the sediment is disturbed by vehicles, people, or animals travelling in or across the water body. Low-level stream crossings are potential problems in community watersheds. If a low-level crossing is the only alternative to a bridge, avoid cattle use in the area.

Table 3 Some possible range management measures

- Herd and salt to keep cattle away from the riparian zone
- Create separate riparian pastures in order to control time and duration of use
- Manage to a prescribed stubble height in riparian zones (10 cm for bluegrass, 20 cm for riparian sedges)
- Create off-stream watering sources to discourage direct access to water bodies
- Temporarily rest damaged riparian communities to allow shrubs and forage plants time to recover
- Eliminate season-long grazing and institute grazing schemes that allow return of animals based on plant growth, not calendar days
- Limit fall grazing of the riparian willow/sedge community. Fall use is especially detrimental to willows.
- Delay spring grazing in riparian areas until forage reaches 15 cm (6 in.) in height.
- Restrict grazing during times of peak water flow or saturated soils.



Stubble height can be used as an indicator of when to move livestock from a pasture.

How we monitor



The presence of mayflies and caddisflies indicates good water quality.



Stream temperature can be a good indicator of water quality. This well-shaded stream has a temperature of 8 C, ideal for rainbow trout.



Testing water for waterborne coliforms and fecal coliforms.

Monitoring methods are detailed in Rangeland Health Brochures 9 and 10 and in the *Rangeland Health Field Guide*. Levels of use and functionality assessments are used primarily by Range Program staff. In the Range Assessments checklists, pay particular attention to attributes such as riparian shade, riparian vegetation, riparian soil moisture conditions, bank and channel stability, sedimentation, macro-invertebrates, and algal blooms.

Water temperature is an important parameter, especially for streams, and can be an indicator of water quality. Coliform bacteria are also useful indicators of water quality and possible contamination. LaMotte¹ has developed quick test for detection of waterborne coliforms and fecal coliforms. A water sample is poured into a gel medium containing a dye and then is placed in a petri dish. The sample is then incubated under a 40-watt light bulb for 12–24 hours. Coliform and fecal coliform bacteria will show as pink and purple colonies, respectively. A quick scan and count of colonies will give an indication of potential problems.



Coliform colonies from above and below the same road crossing.

1 Coliquant EZ is a methodology of LaMotte Company, Chestertown, Md.
www.lamotte.com



This water body has been fenced to exclude livestock except at a narrow drinking water access point.



A damaged stream with heaving grazing use.



Calves under 4 months of age can carry the protozoan *Cryptosporidium parvum*, which is often the cause of scouring.

Another method

The Forest and Range Evaluation Program (FREP) has also developed a monitoring protocol that can be used by those without advanced range training. The checklist focusses on a few key attributes that can serve as early warning signs of potential problems that may require immediate management actions, remediation treatments, or more detailed evaluation.

Yes	No	
Condition of Plant Community		
<input type="checkbox"/>	<input type="checkbox"/>	1. Riparian vegetation absent or highly modified by grazing or trampling
<input type="checkbox"/>	<input type="checkbox"/>	2. Herbaceous stubble height < 10 cm noted (from 10 samples over 100 m)
<input type="checkbox"/>	<input type="checkbox"/>	3. Browsing of > 70% of leaders noted (from 10 samples over 100 m)
Condition of Ground Surface		
<input type="checkbox"/>	<input type="checkbox"/>	4. Bare soil and compaction common (10% of component by area)
<input type="checkbox"/>	<input type="checkbox"/>	5. Recent pugging and unvegetated hummocks common (10% of component by area)
Condition of Stream Bank and Channel		
<input type="checkbox"/>	<input type="checkbox"/>	6. Bank erosion/collapse apparent, resulting from heavy cattle use
<input type="checkbox"/>	<input type="checkbox"/>	7. Evidence of cattle standing in streambed
<input type="checkbox"/>	<input type="checkbox"/>	8. Macro-invertebrates indicate degraded water quality
<input type="checkbox"/>	<input type="checkbox"/>	9. Algal mats occur in receiving waters
<input type="checkbox"/>	<input type="checkbox"/>	10. Water runoff along livestock trails
Presence of Livestock Dung		
<input type="checkbox"/>	<input type="checkbox"/>	11. Livestock feces noted within 3 m of water's edge, or on trails, ditch lines, or other surface drainage features leading to water
Specific Range Management Practices		
<input type="checkbox"/>	<input type="checkbox"/>	12. Livestock drink directly from water source
<input type="checkbox"/>	<input type="checkbox"/>	13. Absence of cattle-control structures limiting access to water source
<input type="checkbox"/>	<input type="checkbox"/>	14. Observed presence of calves (< 4 months old) in or adjacent to water source
<input type="checkbox"/>	<input type="checkbox"/>	15. Salt, minerals, or oilers within 100 of water body

Figure 2 FREP checklist of range indicators potentially affecting water quality.



This stream has a healthy riparian area.

Conclusion

Water is perhaps the most important product of rangelands. Range users can do their part to ensure a safe and constant supply of water by following these recommendations.



Stoneflies and caddisflies (examples of macro-invertebrate) are indicators of good water quality.



Amphibians are good environmental indicators.



This stream channel is embedded with sand, gravel and finer sediments. It cannot support a diversity, or large numbers of macro-invertebrates because of low oxygen availability.



Algal blooms on surface water are often an indication of excessive nutrient inputs. Blue-green algae produce toxins that are harmful to anything drinking the water.