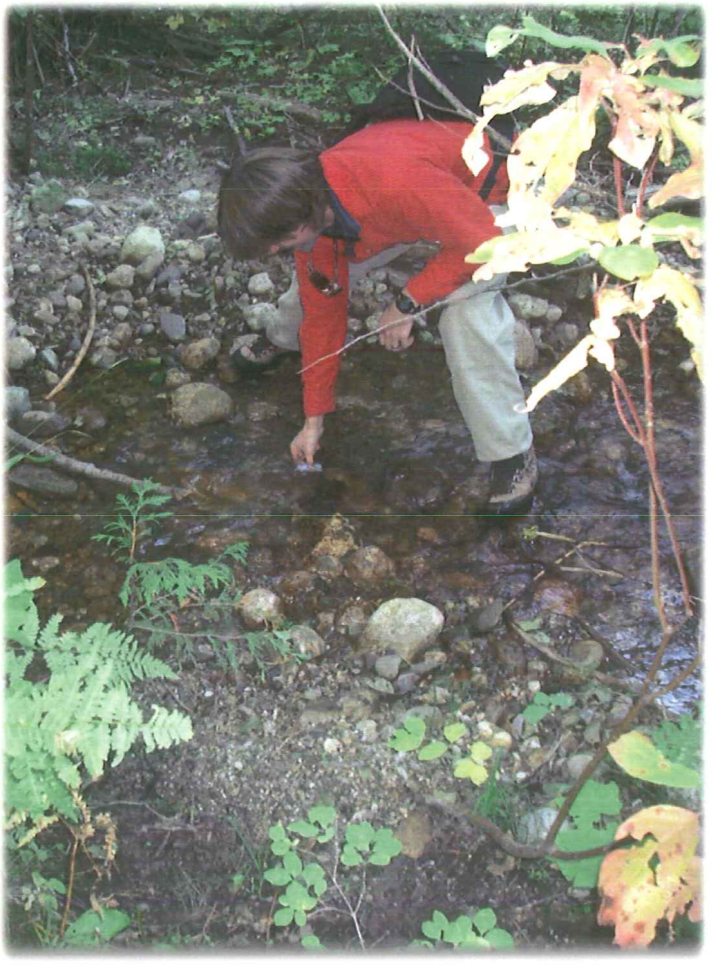
Best Management Practices
on Crown Range in Community Watersheds



Range Branch

Ministry of Forests, Lands and Natural Resource Operations

British Columbia

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Best Range Management Practices on Crown Range in Community Watersheds in British Columbia

Foreword

British Columbia has a long history of multiple uses in its watersheds and there is legislation that protects watershed hydrology and water quality. The province is 94% Crown land and without access to it, the beef cattle, forest, mining, guide-outfitting, and recreation (both commercial and private) sectors would not be viable. The economy of BC and of local communities is dependent on resource industries having ongoing access to Crown land. Livestock grazing has occurred on Crown range for about 140 years and has been regulated since the formation of the BC Forest Service in 1912.

The North American science of range management dates back over 100 years and there is a large body of published research, some of which is specific to BC. Over the past 35 years there has been significant research into livestock impacts on riparian systems and water quality, and Range Branch has been monitoring the health of riparian systems since 1994. The *Forest and Range Practices Act (FRPA)* regulates livestock grazing on Crown range and provides protection of water values.

The government of British Columbia recognizes the importance of water and has embarked on a Water Act modernization process which will deliver a new *Water Act* by 2012. It is important for the Ministry of Forests, Lands and Natural Resource Operations to be engaged in the process because we manage such a large portion of the land in BC and administer thousands of Range, Land, and Forest Act tenures.

In addition to the practice requirements under FRPA, the Range Program has developed and is implementing these best management practices (BMPs) for livestock grazing in community watersheds in co-operation with local health authorities, water purveyors and range tenure holders.

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Ministry of Forests, Lands and Natural Resource Operations

Date

Background

Most communities in British Columbia get their drinking water from surface sources that are susceptible to contamination from overland flow, seepage and direct inputs. Much of the infrastructure (including dams and water intakes) in community watersheds was developed to supply irrigation water many decades ago. Water intakes are commonly found in creeks and open canals that are unprotected from surface runoff and human and animal access. Today the public is expecting this same infrastructure to provide clean drinking water without the necessity of treatment. Although a better long-term solution might be to place intakes deep in lakes and pipe the water to the water filtration plant, this is costly.

Several water borne 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*.

Several boil water advisories were issued in British Columbia during the summer of 2009 resulting in challenges to how range staff and range agreement holders managed livestock in community watersheds. While livestock grazing is an authorized and legal use of these watersheds in British Columbia, it does not necessarily mean that status quo management is acceptable. If livestock use causes long-term changes to background water quality, quantity and timing of flow, there will be pressure to have range use phased-out. This document is intended to provide information on how we manage livestock use within community watersheds.

The four basic principles of range management apply wherever livestock are grazed:

- Distribute livestock over the range.
- Graze to the right use level.
- Allow enough rest during the growing season.
- Graze at the right time.

Distribute livestock use over the range

Livestock are creatures of habitat and will not typically distribute themselves uniformly over the range, even if topography is not an issue. Bulls-eye grazing patterns are typical on most range areas, with water sources, flat terrain and shaded areas receiving disproportional use. These are referred to as primary range. Unless effort is taken to distribute use through water development, strategic fencing, herding and the use of attractants, these areas of primary range tend to be overgrazed and over-used.

Use level

In the past, 50% of annual forage production was seen as the safe level of use. Recent analysis has shown that this is a poor rule of thumb. On average, late-seral range should be used at no more than 40% of production, mid-seral at 30% and early-seral at 17-25%. Some domestic forages can be used at a higher level because they are adapted to grazing and usually have growing points that are low to the ground and not easily removed by the grazing animal. We have also learned the importance of leaving plant residue to protect the soil from erosion and the evaporative effects of sun and wind. Plant residue is the first step to recovery on early-seral and damaged range.

In addition to grazing at the right levels, it's important to have enough stock numbers to get even use of grass plants. Studies have shown that plant communities respond best with higher stock densities[1] (but lower overall stocking rates[2]), because cattle will not graze as selectively. This translates to more even access to soil moisture and nutrients and an equal opportunity to grow roots, leaves and store food reserves.

Rest

Overgrazing and over-use are not the same thing. Over-use happens when more of the annual growth is removed than is recommended, for example if 40% use is considered safe, and 60% is actually removed. Overgrazing happens when a plant (and a range) is grazed so severely and so frequently that it does not have an opportunity to recover. A plant might be over-used, but if it has a long recovery period during active growth, it's not necessarily a harmful thing.

Specialized grazing systems typically allow growing plants a period or periods of time when they are free from grazing.

On bunchgrass range we find that rest-rotation grazing, where portions of the range are rested for one entire year in and 3 or 4 year cycle work best. Research has also shown that native bunchgrasses cannot be grazed in a twice-over rotation or in a spring and fall pattern during the same growing season. Most native grasses need from 110 to 200 days of actual growth to recover from a single grazing. In some cases, range should be grazed only once in two years. This is especially true at high latitude and at high elevations where the growing seasons are short but intense.

Time

Graze the range at a time when plants and soil won't be harmed and there is enough forage to sustain the grazing animal. There needs to be at least 15 cm of new growth for cattle to graze efficiently. Also it's best not to graze the same fields at the same time each year and to control the length of time cattle have access to the pasture unit.

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[1] Stock density is the number of animals on an area of land at a moment in time. For example, 100 animal units (cows) on 20 ha.

[2] Stocking rate is the number of animals or animal units on an area of land over a time period typically a 30 day month. For example 0.25 AUMs/ha or 4 ha/AUM

Dormant season (winter) use might be a better choice on some lower elevation bunchgrass range. Research shows that dormant season use is less damaging to grass plants and soil. Biological soil crusts (nitrogen fixing lichens) are not damaged by winter use and provide the benefit of evenly distributing and releasing cost free nitrogen at the time when range grasses are ready to grow.

We have expanded and refined the above principles in this document for community watersheds.

What we know

- Coliform bacteria occur naturally in the soil and in decomposing vegetation. Background non-fecal coliforms will be present in most natural riparian systems especially where there is there is decomposing vegetation from roots, leaf fall and woody debris. Total coliforms are a good indicator of water quality and are relatively easy to sample and test. It is very costly to test for parasites such as *Cryptosporidium* and *Giardia*; both parasites are commonly carried by native birds and mammals.
- Pathogens attach to fine sediments. When sediment is disturbed by a storm event, or by people animals or vehicles travelling in or crossing a stream, pathogens can be re-suspended and travel downstream. This is why boil water advisories often occur during times of high turbidity;
- Nature has its own predator-prey relationships. Dung beetles destroy *Cryptosporidium* cysts; many forms of protozoans feed on coliforms such as *E. coli*;
- *E. coli* is killed by direct sunlight and by drying. Cow dung that is deposited in open sunlight in open meadows and grasslands poses less risk than cow dung deposited in a shaded forest understorey.;
- *E. coli* survives best in water at pH 7 or higher;
- A study of four streams in the Vernon area showed that human, wildlife, pets and livestock are all *E. coli* contributors;
- A 450 kg (1,000 lb) cow will defecate 12 times per day at 2.3 kg (5 lbs) /defecation. 95% of the feces directly deposited into a stream will settle within the first 50 m. Bacteria in the sediment may remain active for several weeks or months. Daily input of feces will accumulate as long as livestock have unrestricted stream access, and any disturbance can re-suspend sediment;
- Cattle, themselves, can become infected by pathogens introduced by other warm-blooded animals, and then because of their high feces production, become secondary vectors of the disease;
- Nitrogen, phosphate and potassium can be introduced to riparian systems through livestock feces and urine. These nutrients can promote the growth of algae and pathogens in water. Saturated (anaerobic) riparian soils, especially those dominated by

sedges, have the capacity to capture and neutralize these nutrients and prevent eutrophication of the system;

- During high flows, sediment spills out and settles on the flatter floodplains of lower gradient stream reaches. It is important to have good vegetation cover and stubble to capture and filter this sediment;
- Runoff occurs along trails carrying sediment and fecal contamination into streams, wetland and lakes;
- Reservoir drawdown areas pose particular challenges as livestock often congregate, feces accumulates and then is flooded when water levels rise;
- Off-stream watering alone will greatly reduce (by up to 95%) the time cattle spend in streams.

What we can do

Management efforts are focused and range infrastructure is built with emphasis around reservoirs/lakes and their outflows, along the mainstems of creeks and upstream of water intakes.

1. *Apply Prescription (Rx) grazing*
    - 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;
    - We can safely graze wet meadow riparian zones that are sedge/reedgrass/willow communities; we can safely graze dry adjacent uplands; graze to a prescribed stubble height;
    - Limit time and timing of use so that cattle will not spend excessive time and use too much riparian vegetation;
    - Graze some areas during the cooler season so that cattle will not spend all of their time in the shaded riparian zone. When the air temperature exceeds 32° C, especially with high humidity, cattle will become heat stressed and spend most of their time under shade;
    - Riparian areas are more resilient than dry uplands because their higher soil moisture allows plants to regrow after grazing. Riparian soils are however susceptible to compaction if use is seasonlong and heavy. Apply rest to allow damaged plant communities and compacted soil to recover.

2. *Range developments*
    - Where necessary, prevent livestock access to streams and lakes. Provide buffers by strategic fence and barrier placement near outlets. For example, in Okanagan-Shuswap FD, a 200 m exclusion zone around outlets is the norm.
    - Restrict the time and timing of livestock access to the shorelines and outlets of reservoirs having seasonal drawdown.
    - Create distinct riparian pastures that allow controlled timing and access to riparian features;
    - Limit livestock watering to hardened access points (nose holes) that prevent direct access to a stream wetland or lake;
    - Provide off-stream water using gravity feed systems, nose pumps or sling pumps;
    - Use a float valve, or pipe overflow water back to the water source to prevent fecal contamination in runoff;
    - Exclude livestock from the vicinity of water intakes. The exclusion distance will depend on the stream gradient and the presence or absence of an herbaceous riparian buffer zone. For example, in Okanagan-Shuswap FD, a 1 km exclusion zone upstream of the intake is the norm;
    - Strategic domestic forage seeding of cutblocks can be used to draw livestock use away from sensitive areas.

3. *Management practices*
    - Fecal deposits will increase next to water troughs and attractants. Make sure to place these where run-off won't carry feces into water;
    - Use attractants, such as salt, well away from the riparian zone, and place them in covered leach proof containers;
    - Actively herd to distribute livestock over the range and prevent lounging in the riparian zone;
    - Place rectangular, weed free bails as filters on livestock trails. These work best on sandy, coarse textured soil.

4. *Animal health*
    - Treat sick animals, and remove any animals that are scouring;
    - Do not turn calves under 4 months of age on Crown range within community watersheds (young calve are often *Cryptosporidium* carriers);

- Remove or dispose of the carcasses of dead animals from riparian zones.

5. *Make changes where coliform counts become high*
    - Pick up and dispose of feces if accumulation is a problem;
    - Move livestock to another pasture in the rotation.

What we can't do

1. Fence out all riparian areas. Logistics, costs, and hazards to people and wildlife make this an unrealistic option.
2. Prevent all potential water contamination by livestock. It may be impossible to manage cattle and prevent water contamination where a stream is within a narrow canyon and cattle travel is restricted to a narrow riparian zone. In these cases, fecal deposits adjacent to the stream, soil trampling and sedimentation may be unpreventable. Streams that are steep gradient, without floodplain access and lacking filtering vegetation are especially susceptible to livestock impacts on water quality; livestock exclusion fencing may be the only reasonable remedy.
3. We can't eliminate natural coliforms from any stream or wetland system.
4. We can't prevent wildlife and human use of community watersheds.

Appendix 1 Link to Rangeland Health Brochures

http://www.for.gov.bc.ca/hra/Publications/index.htm