

Designing and Managing Riparian Pastures

Grazing Management Guide

Key Factors to Consider

- Pasture and/or paddock size
- Ratio of riparian to upland
- Vegetation (plant community)
- Practicality of fencing, access, time of use
- Season of use

Introduction

Riparian areas are the transition zone between upland areas and water courses (rivers, streams, wetlands, lakes, etc.), with the vegetation and soils strongly affected by the seasonal presence of water (annual flooding or elevated water table). These areas are particularly sensitive in wetter seasons (e.g. spring and fall.) They require additional consideration when it comes to grazing management, such as different rest and rotational requirements, and temporal access, as grazing during high moisture conditions will negatively impact soil and bank stability. These areas are highly attractive to livestock, as they are often sources of water, have highly palatable vegetation, and have features that provide shade and cooling. Riparian areas require special management to avoid trampling, erosion, compaction, and overuse by livestock.

Grazing systems that allow continuous access with no riparian protection often lead to damage and/or loss of riparian function, and can negatively affect the hydrology of that landscape, including water quantity and quality for livestock. Using fencing to create a riparian pasture, or the use of livestock exclusion areas, should be incorporated into a grazing management plan, with the strategy being determined by a current health assessment of the riparian area (see the appropriate region [BC Riparian Management Field Workbook](#)) and specific management objectives identified.

Grazing plans should be informed by a recent (within 5 years) Riparian Management Plan, which can be developed with support through the Environmental Farm Plan (EFP) program and Beneficial Management Practices (BMP) funding.

Why manage riparian areas carefully?

Riparian areas play important environmental roles, including protecting water quality, reducing erosion, improving forage availability, supporting pasture resilience, and providing habitat for fish, wildlife and aquatic organisms. Overuse of vegetation (shrubs, trees, grasses, grass-like, and forbs) can alter the plant community reduce biodiversity, and harm riparian health and function.

Pasture and/or paddock size

Pasture size is one of the factors to be considered when designing a riparian pasture. Size of the pasture needs to be determined on the physical area available, the ratio of riparian area to upland area, vegetation types in each area, and herd size/stocking rate.

Smaller Pastures

Smaller pastures tend to be more precisely managed and easier to monitor than larger pastures, as there is usually less variation of landforms and vegetation in a smaller area. However, pasture size also needs to be related to herd size, as pastures that are too small may suffer from negative effects very quickly if too many animals are present when compared to available forage. For example, high intensity, short duration grazing is not generally recommended for riparian areas as it increases the risk of excessive bank damage from trampling, and possibly over utilization of riparian shrubs.

Larger Pastures

Larger pastures that contain riparian areas can be difficult to manage, as grazing selectivity may result in over utilization in some areas, and underutilization in others. For example, if the grazing system is managed to fully utilize the forage over the entire area, there is likely going to be significant over utilization in preferred areas which are often the riparian area(s). Larger pasture areas relative to herd size may also encourage livestock trail formation with negative consequences for stream bank stability, pugging, and soil compaction.

Pasture size needs to be small enough to allow for precise management of grazing impacts on plants. Key indicator plants should be monitored (e.g. preferred forage and shrub species) so that livestock can be moved as soon as the planned level of use is reached, and trampling damage is minimized.

Riparian pasture size should allow for the desired forage utilization, as determined by the planned grazing period. Too long of a grazing period with low stock density often results in selective grazing with less uniform removal of plant species and potentially more use of shrubs than desirable. Too short a period of use is also often undesirable since small pasture size and frequent livestock movement is often not practical for many operations.

Livestock exclusion areas

Riparian pastures are appropriate for areas that have existing, relatively healthy riparian vegetation present, in which managed access and grazing will enable the maintenance and/or improvement of riparian function over time. However, in situations in which there is limited or no riparian vegetation and functioning, it may be more appropriate to install livestock exclusion areas. Exclusion areas, potentially in conjunction with planting/seeding appropriate species, will be necessary to allow for recovery of the riparian area or to protect species or habitats at risk. The ability to adjust exclusion areas back into a riparian pasture could be considered if deemed appropriate after future riparian health assessments indicate that it is appropriate.

Riparian Health Assessment

Riparian Health Assessments are critical to determining whether the site can support a riparian pasture design or should have livestock exclusion areas. Over time, the site should be re-assessed to determine if the actions have maintained, improved, or declined riparian health. Grazing and other management practices should be adjusted accordingly.

Pages 6 and 7 suggest three examples of dealing with riparian areas.

Ratio of riparian area to upland area

The ratio of riparian area to upland area is often a critical factor for management of riparian pastures. If the upland area has a much larger carrying capacity than the riparian area, managing to meet forage removal targets on the upland will often result in overuse of the riparian area. Conversely, if the pasture is managed to meet riparian objectives, much of the upland area may be under-utilized, thus reducing returns to the agricultural operation.

Ideally, the carrying capacity of the riparian area will be equal to or greater than the carrying capacity of the upland area. In order to achieve this, it is necessary to conduct an assessment of both areas to determine the approximate capacity of each area. Since these assessments are often difficult to conduct it is recommended that temporary electric fencing be used initially when designing a riparian pasture. This allows you to adjust your pasture size more easily until the correct ratio of riparian area to upland area is determined by grazing and monitoring of the results. If practical, an ideal “riparian pasture” will be dominated by riparian forage and contain as little of upland forages as possible.

Vegetation

An assessment of the vegetation both within the riparian area and on the upland area is necessary when designing a riparian pasture, as it is the vegetation that will determine the carrying capacity of the respective area. In addition, the type of vegetation present will affect livestock grazing behaviour. Palatable species of grasses and forbs will attract livestock. If most of these species are in the riparian area, that is where the livestock use will be concentrated. If the riparian area has primarily shrubs and trees, and the upland has more palatable grasses and forbs, the pressure on the riparian area will be reduced. If the riparian area is the preferred area within the pasture, your grazing management should be determined by the use of the vegetation in that area. For example, when the targeted level of use on the riparian vegetation has been reached, livestock should be removed, regardless of whether the level of use on the upland vegetation has been reached.

Independent of the grazing and browse resources, overuse of the riparian area can also result from animal loafing, if the trees and shrubs provide shade and shelter relative to more open conditions in the upland area.

One way to assess impact is to monitor browse utilization by livestock as an indicator of livestock impact. Woody plants are essential in healthy functioning riparian areas; while light to moderate utilization will maintain woody plant vigour, over utilization results in a reduction of vigour, and a potential long-term trend of eliminating preferred woody plants and increase in disturbance and/or weed species.

Browse utilization is typically classified in the following way:

| Browse Utilization (%) | Description | Management Note* |
|------------------------|----------------|---|
| 0-5% | Incidental use | No concern |
| 5-25% | Light use | Acceptable; continue to monitor |
| 25-50% | Moderate use | Watch for increasing pressure on shrubs |
| >50% | Heavy use | Change grazing timing or duration; recovery may be needed |

Table 1. Browse utilization classification format.

Management notes should be used for private “deeded” lands. For Crown use, please refer to their guidelines and consult your [Natural Resource District](#) and Range Officer prior to implementation.

In general, heavy use (>50%) of preferred species signifies the need for a change in grazing management. The Riparian Management Field Workbook provides details about assessing browse. Depending on your climate, preferred trees include cottonwoods, trembling aspen, maples, birch and conifers, and preferred shrubs include beaked hazel, pin cherry, chokecherry, highbush cranberry, black twinberry, willows, red-osier dogwood, buffalo berry, elderberry, ninebark, mock orange, oceanspray, gooseberry, raspberry, alders, Saskatoon, and Douglas spiraea.

A **Riparian Management Plan**, as developed by a qualified professional (e.g. an appropriate registrant with BC Institute of Agrologists), should outline regional-appropriate key browse species to be monitored, as well as other key monitoring factors, such as trampling damage, manure present, physical or structural damage, characteristics of riparian soil moisture, soil erosion or bare ground, fish and wildlife habitat, as well as diversity, structure, and vigour of herbaceous vegetation, etc. See *Factsheet #4 Components of a Grazing Management Plan*, *#11 Monitoring Grazing Lands*, and *#12: Monitoring Strategies for Management Intensive Grazing*, for more information.

Riparian pasture design considerations

It is important to select the approach that is best suited to your pasture health, site objectives, infrastructure options, and operational capacity. Below is a series of examples of how different designs may be implemented on the same piece of land. Note: the examples below do not show a fully functional rotational grazing system but instead focus on riparian pasture design options.

Continuous grazing

It is difficult to manage this pasture to get good utilization of the upland areas without excessive impacts on the riparian area. When the upland plants have become very dry (e.g. late summer) the green growth in the riparian area becomes more attractive and thus is at risk of being over utilized. This pasture however does reduce the amount of fencing required.



Figure 1. Image shows grazing plan prior to considering riparian areas. The red outline indicates upland fencing.

Riparian pasture

The majority of the forage is in the riparian area, with only a small amount in the upland. This allows for better grazing management based on plant phenology and makes it possible to rest this area when required.



Figure 2. Image shows grazing plan with upload fencing. The yellow outline indicates riparian pasture.

Livestock exclusion area

Exclusion areas eliminate the impact of livestock on the riparian area, but complete removal of grazing is not always desirable and could be considered a “last resort” option for severely degraded sites. Apart from the loss of forage for livestock production, no grazing may create problems, including weeds, fuel build- up, and increased cover for predators.

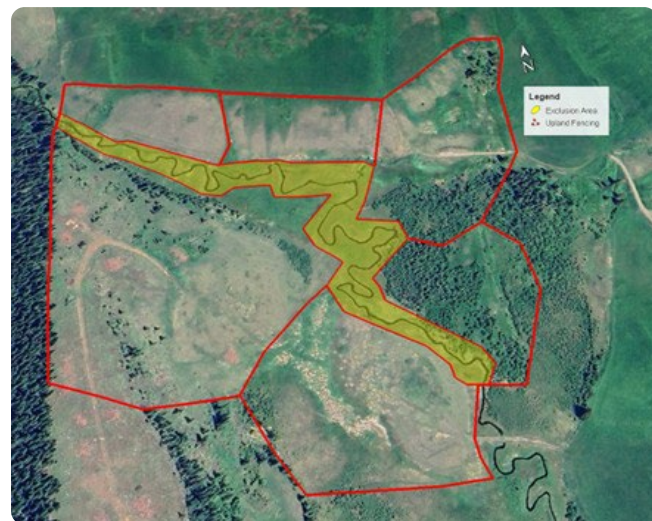


Figure 3. Image shows grazing plan with upload fencing. The painted yellow is the exclusion area.

When considering pasture design, it is important to know that grazing can be used to help promote desirable riparian vegetation by appropriate timing and use levels. For example, the exclusion area in this photo could be changed and managed as a riparian pasture if objectives and strategies are carefully defined and achieved. The design selected must reflect the current health condition of the riparian area.

Fencing considerations

When designing riparian pastures, it is important to consider practical issues such as fence lines, number of corners, access to water and season of use. Fences work best when built in a straight line, but creeks often meander, so a compromise is often required. Any reductions will reduce fence construction costs and maintenance costs. Building the fence as straight as possible however may include more upland area than desired within the riparian pasture.

This will have management implications, as described above. It is also important to note that each pasture needs to be designed independently as standard setback distances rarely result in the best design for a riparian pasture. Ensure your riparian boundary is correctly assessed before fencing, as many stream or river systems are dynamic with active natural erosion and deposition that can move the stream channel. This natural movement of the watercourse can undercut fencing if placed too close to the aquatic zone. You must follow practice requirements and objectives set by government in the [Range Planning and Practices Regulation](#).

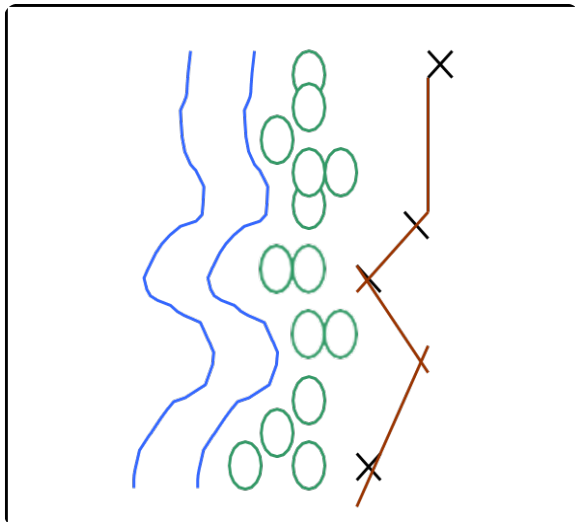


Figure 4. Non-linear fences are difficult to build and maintain.

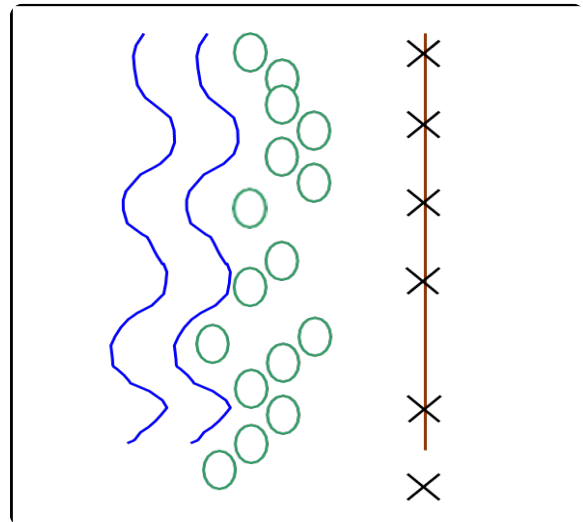


Figure 5. Straight fence is easier to build and maintain.

Utilization of portable electric fencing is also an option. Portable electric fencing units make it easy to restrict access to riparian areas during sensitive times, as well as adjust mid-rotation in response to grazing impact. For example, if the riparian area becomes more attractive and utilization indicates it is time to move livestock out of the area, but the upland portion of the riparian pasture is still under-utilized, electric fencing could be used to temporarily concentrate livestock to uplands (excluding the riparian area) prior to moving to the next paddock. There are still considerations and situations in which electric fencing may not be as effective (e.g. flooded areas, on frozen ground, etc.), which need to be considered when determining appropriate action. Electric fencing in riparian areas may also require additional ground points and maintenance as tall wet vegetation can come into contact with the hot wire.



Figure 6. Portable electric fencing. Virtual fencing technologies are also an effective management tool that may be considered.

When to graze riparian pastures

Determine grazing period based on riparian vegetation, not upland vegetation. Avoid grazing during wet shoulder seasons or flood conditions.

Riparian Pastures will be composed of both upland and riparian vegetation, and the diversity in vegetation type will impact the potential grazing period within the pasture. Seasonal sensitivities (timing) when determining grazing use is the primary consideration. Frequency, Intensity, Opportunity (FIO) principles are still important in determining riparian pasture use and rotation. Determining when livestock will enter into a pasture and subsequently be moved to the next pasture should be based on riparian vegetation, even if the associated upland area appears under-utilized. As already mentioned, ongoing monitoring is essential to adjust plans to reflect current growing conditions.

Monitor for regrowth, bare ground, and changes in species composition to determine whether a riparian area needs more rest. Livestock must be removed from areas in which there is flooding or where flooding is imminent. Riparian areas are particularly vulnerable in wet, shoulder seasons and should not be grazed during these times of high moisture.

Livestock water considerations

Water forms up to 50-80%* of an animal's live weight and is an essential nutrient. Cattle tend to prefer clean, cool water – when it's easy to access.

While off-stream water sources for livestock are often preferred, direct access to the natural water source is also possible under well-managed conditions. It is important to note that Section 64 of the Agricultural Environmental Management Code of Practice ([AEM CoP](#)) regulates that in seasonal feeding, grazing and temporary holding areas, that:

- A person responsible for a grazing area, seasonal feeding area or temporary holding area in which livestock or poultry have direct access to a watercourse must ensure that effective controls are in place to minimize:
 - Trampling and erosion of soil into the watercourse, and
 - Contaminated runoff, leachate and solids entering the watercourse.

Riparian pastures that have relatively short periods of use (e.g. 4 to 10 day graze period), and with good livestock distribution across the unit, are unlikely to suffer

from damage caused by livestock. In many situations, improved access points for drinking, (e.g. gravel or geogrid to stabilize the bottom) may be advisable/necessary. See [Livestock Watering Handbook](#).

Access to water is a major consideration and potential challenge when developing a grazing plan and developing effective off-stream watering is one realistic solution that will provide livestock and environmental benefits. Studies across Canada suggest installing off-stream watering alone that is without fencing can reduce cattle effects along the water course and riparian areas from between 20-80%, depending on livestock numbers and placement of the off-stream watering system. While rebuilding riparian health takes time, moderate improvements will occur within just a few years after installing off-stream watering, and these improvements can lead to additional forage being available for cattle to graze over time. Studies do suggest that generally cattle prefer drinking from an off-stream waterer to a water course itself, but preference is influenced by the proximity of the off-stream waterer to the water course, forage quality, and palatability in the area, ease of access, water quality, water temperature, and other environmental factors (Miller et al 2018; Rawluk et al 2014; [BC Livestock Watering Factsheet: Offstream Watering to Reduce Livestock Watercourses and Riparian Areas](#)).

Portable solar water buggies increase the ability to provide off-stream watering points when grazing riparian pastures (or any pasture). These systems can be moved along with livestock between sites (or portable pumps, with a series of permanent troughs), which reduces infrastructure costs. Solar power can be a challenge in BC during certain months; having a water sensor, or game camera, attached to the trough to monitor water levels is suggested. There is also a need to manage the risk of freezing water in late fall. Tall shrubs and trees in the riparian zone can also reduce the solar input below the necessary levels to drive solar pumping.

Off-stream watering systems are not a solution in and of itself to reducing negative impacts from livestock overuse, as managed and controlled grazing are still required to be implemented alongside water infrastructure improvements.

Section 11 of the [Water Sustainability Act](#) states that an authorization may be required for works in and [about a stream](#): Confirm with Front Counter BC prior to any work happening.

Ratio pasture best practices summary

Do's:

- Use riparian health assessments to guide grazing decisions.
- Prioritize appropriate timing when determining grazing use.
- Design pastures with smaller riparian zones to improve control and monitoring.
- Provide off-stream watering sources to reduce pressure on watercourses.
- Use portable electric fencing or virtual fencing for flexibility in pasture layout.
- Monitor livestock distribution and browse pressure regularly.

Don'ts:

- Don't graze riparian areas during wet or saturated soil conditions.
- Don't manage riparian pastures based on upland vegetation.
- Don't allow unrestricted livestock access to sensitive banks or degraded vegetation.
- Don't assume a one-size-fits-all approach—adjust designs to site-specific needs.

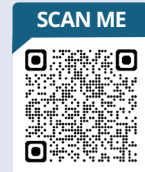
Disclaimer: contact Front Counter BC prior to any work around the Riparian Areas to ensure all relevant regulations are followed. Provide all required notifications and obtain all necessary permissions from the BC Ministry of Water, Lands, Resource Stewardship, BC Ministry of Forests Fisheries and Oceans Canada and any other requirements before commencing any work in or about the stream.

Find more information:

BC Livestock Watering Factsheet: Offstream Watering to Reduce Livestock Use of Watercourses and Riparian Areas:



[Brown, Lance \(BC Ministry of Agriculture and Lands\). 2006. *BC Livestock Watering Factsheet: Offstream Watering to Reduce Livestock Use of Watercourses and Riparian Areas.*](#)



Influence of off-stream watering systems on cattle behaviour adjacent to Lower Little Bow River in Southern Alberta:



[Miller, J.J., T. Curtis, D. Rogness, W.D. Willms and D.S. Chanasyk. 2018. *Influence of off-stream watering systems on cattle behaviour adjacent to Lower Little Bow River in Southern Alberta.* Applied Animal Behaviour Science. Vol 209, pp. 14-21.](#)

Off-stream watering systems and partial barriers as a strategy to maximize cattle production and minimize time spent in the riparian area:



[Rawluk, A., G. Crow, G. Legesse, D. Veira, P. Bullock, L. Gonzalez, M. Dubois and K. Ominski. 2014. *Off-stream watering systems and partial barriers as a strategy to maximize cattle production and minimize time spent in the riparian area.* Animals. 4, pp. 670-692.](#)

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