BEST MANAGEMENT PRACTICES

Streamside Grazing

Canada

Ontario

OFA Ontario Federation of Agriculture

What is a Best Management Practice or "BMP"?

- a proven, practical and affordable approach to conserving soil, water and other natural resources in rural areas

Who decides what qualifies as a BMP?

- a team that represents many facets of agriculture and rural land ownership in Ontario, including farmers, researchers, natural resource managers, regulatory agency staff, extension staff and agribusiness professionals

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- innovative, award-winning books presenting many options that can be tailored to meet your particular environmental concern and circumstances
- current BMP titles are:

Buffer Strips
Establishing Tree Cover
Farm Forestry and Habitat Management
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Fish and Wildlife Habitat Management
Greenhouse Gas Reduction in Livestock Production Systems
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Integrated Pest Management
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Livestock and Poultry Waste Management
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Manure Management
No-Till: Making It Work
Nutrient Management
Nutrient Management Planning
Pesticide Storage, Handling and Application
Soil Management
Streamside Grazing
Water Management
Water Wells
Woodlot Management

How do I obtain a BMP book?

- if you're an Ontario farmer, single copies of each title are available at no cost through the Ontario Ministry of Agriculture, Food and Rural Affairs
- to purchase single or multiple copies and to order complete sets of BMP books, please contact: Ontario Federation of Agriculture, Attn: Manager, BMP, Ontario Agricentre, 100 Stone Rd.W., Suite 206, Guelph, Ontario N1G 5L3. Phone: 1-800-668-3276
- for an on-line order form, go to: http://www.omafra.gov.on.ca/english/products/best.html
- please note that prices vary per title and with quantity ordered

GLOSSARY

ANNUALIZED GRAZING IMPACT – the number of livestock (or Nutrient Units) per unit area averaged over a year (e.g., 10 cow/calf units/ac for 6 months is equivalent to 5 cow/calf units over a full 12 months)

ANSI – or Area of Natural and Scientific Interest is one where the land or water represents significant geological and biological features

BANK – the side or sides of the cut channels of streams, ditches and rivers

BED-LEVEL CROSSING – established at watercourse-bed level

BRIDGE CROSSING – wood or steel bridge adequately designed as crossing

CARRYING CAPACITY – ability of a streamside pasture to sustain the maintenance and production needs of grazing livestock with minimal environmental damage. Those with a high carrying capacity have rich, resilient soils that can provide several growth cycles of forage and withstand livestock access. Poorer and more fragile sites have lower carrying capacity. Integrated or management intensive grazing systems can maximize site carrying capacities.

CONTROLLED ACCESS – involves fencing with openings that permit livestock access to the water for drinking or crossing

DENSITY LEVEL – the number and type of livestock per unit area of grazing

DRAIN – a channelized stream or constructed ditch designed to convey excess subsurface water from cropland

INTEGRATED GRAZING MANAGEMENT PLAN – a grazing management plan that addresses livestock maintenance and production plans while adjusting management practices to the environmental conditions of the local riparian areas

LIMITED ACCESS – allows livestock to reach water for drinking, but doesn't permit crossing

MANAGEMENT INTENSIVE GRAZING (MIG) – a planned sequence of grazing and resting pastures to produce a desired agronomic and/or animal result. May require the use of rotational grazing, fencing, alternative water sources, and adjusted stocking rates.

MID-LEVEL CULVERT – along with concrete, is used to construct bridge-like crossings at mid-bank level

NUTRIENT UNIT – the amount of nutrients that give the fertilizer replacement value of the lower of 43 kg of nitrogen or 55 kg of phosphate as nutrient as established by reference to the Nutrient Management Protocol

OUTDOOR CONFINEMENT AREA – an enclosure for livestock, deer, elk or game animals that has no roof and is composed of fences, pens, corrals or similar structures. Term is used for facilities where livestock are confined, more than 50% of feed requirements are not from pasture, and livestock are confined for more than 200 days and are from a farm operation that generates more than 300 NU/yr.

SAR – or Species at Risk, are wild plants or animals that have been deemed at risk of disappearing from the wild in Canada, and are protected by federal legislation

SLOUGHING – breaking off of part of the bank

SLUMPING – the collapse of an area of the bank

STREAM – a perennial or intermittent watercourse having a defined channel (excluding manmade ditches) that contains flow from surface water and groundwater sources during at least 50 per cent of an average rainfall year

STREAM ORDER – a numerical system (ranking from headwaters to river terminus) used to designate the relative position of a stream or stream segment in a drainage basin. First-order streams are the smallest headwater streams.

URBAN WATER INTAKE – the intake or series of intake pipes at the nearest water treatment plant

WETLAND – land that has a high water table, surface water for part of the year, and water-loving plants

CONTENTS

▶ When you see this symbol  , it means that a recommended practice or approach being discussed may be in violation of the Fisheries Act (see pg. 6 for more information).

METRIC-IMPERIAL CONVERSION FACTORS

Convert		To		Metric
%	►	kg/1000 L	multiply by	10
%	►	kg/tonne	multiply by	10
mg/L	►	%	divide by	10,000

Convert		To		Imperial
%	►	lbs per 1000 gallons	multiply by	100
%	►	lbs per ton	multiply by	20
ppm	►	%	divide by	10,000

Note: 1 m^3 = 1000 L

CONVERSIONS – METRIC AND IMPERIAL

Common Conversions

1 gallon	=	4.546 litres	1 acre	=	0.405 hectare
1 gallon	=	1.201 US gallons	1 acre	=	43,560 $feet^2$
1 gallon	=	0.161 ft^3	1 lb/ac	=	1.12 kilogram/hectare
1 US gallon	=	3.785 litres	1 ton/ac	=	2.25 tonnes/hectare
1 US gallon	=	0.833 Imp gallons	1 gal/ac	=	11.2 litre/hectare
1 ton	=	0.907 tonne	1000 gal/ac	=	11200 litre/hectare
1 pound	=	0.454 kilogram	1000 gal/ac	=	11.2 $metre^3$/hectare
1 tonne	=	2205 pounds	1 metre	=	3.28 feet
1 $foot^3$	=	6.229 gallons	1 metre	=	39.4 inches

Application Rate Conversions

Metric to Imperial (Approximate)			Imperial to Metric (Approximate)		
Litres per hectare x 0.09	=	gallons per acre	Gallons per acre x 11.23	=	litres per hectare (L/ha)
Litres per hectare x 0.36	=	quarts per acre	Quarts per acre x 2.8	=	litres per hectare (L/ha)
Litres per hectare x 0.71	=	pints per acre	Pints per acre x 1.4	=	litres per hectare (L/ha)
Millilitres per hectare x 0.015	=	fluid ounces per acre	Fluid ounces per acre x 70	=	millilitres per hectare (mL/ha)
Grams per hectare x 0.015	=	ounces per acre	Tons per acre x 2.24	=	tonnes per hectare (t/ha)
Kilograms per hectare x 0.89	=	pounds per acre	Pounds per acre x 1.12	=	kilograms per hectare (kg/ha)
Tonnes per hectare x 0.45	=	tons per acre	Ounces per acre x 70	=	grams per hectare (g/ha)
Kilograms per 1000 L x 10	=	lbs per 1000 gallons	Pounds per ton x .5	=	kilograms per tonne (kg/t)

Many measurements in this book will be presented in metric values with imperial equivalents in parentheses. However, where common usage, common sense, space limitations or regulatory concerns dictate, one or the other may appear exclusively.

INTRODUCTION

Grazing livestock successfully is all about management. You strive for the best production on the hoof, while sustaining pasture quality and minimizing environmental impact.

Grazing livestock on pastures near water presents particular challenges.

Driving along county roads, you've probably seen the best and the worst when it comes to livestock access to streambanks and other riparian areas. On one side of the road, a modest number of cattle graze in the floodplain of a small creek. The pasture looks green, the banks stable and the water clear.

But on the other side, livestock are in an exercise yard with bare soil, and have free access to the same creek. The impact is obvious.

A key message of this book is that grazing riparian areas can be beneficial when properly planned and managed. This book will help you develop a workable plan that balances production and environmental goals for riparian pastures.

There are only two choices for streamside grazing: exclude or manage!

Developing a grazing management plan or GMP will result in a streamside grazing system that's tailor-made to your operation.

The GMP process involves:

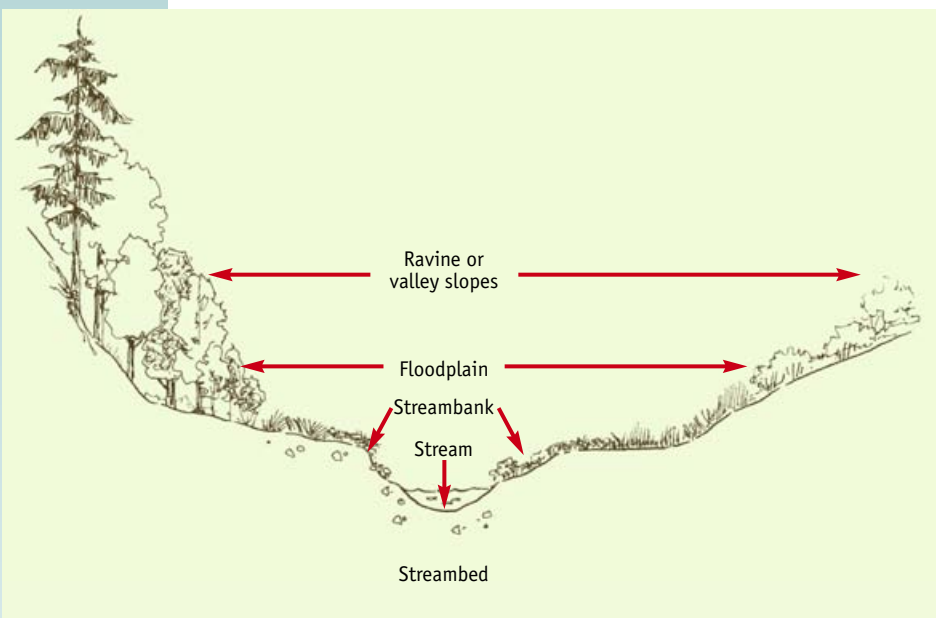
- **assessing risk**
- **planning action**
- **completing an inventory of resources, and**
- **scheduling improvements.**

RIPARIAN AREAS

Riparian areas are the transitional zones between bodies of surface water and upland areas. Riparian areas consist of:

- banks or shores
- the floodplain, and
- near-upland or ravine slopes.

Picture the areas adjacent to streams, drains, rivers, lakes, ponds and wetlands, and you recognize that riparian areas – healthy ones at least! – feature diverse vegetation. They support a variety of plant forms such as grasses, sedges, rushes, forbs (broad-leaved herbs), shrubs and trees. This is due to their above-average soil moisture, fertility, and soil organic matter levels.



Riparian areas consist of banks or shores, floodplains, and ravine slopes. In many riparian areas, the boundaries between them are not sharply defined. Instead, there is a gradual transition from one "community" to the next.

In North America, most areas with an abundance of grassed riparian vegetation evolved with grazing wildlife having unlimited access to the palatable lush plants, shade and water. Although the original grazers were deer, moose and caribou (ungulates) rather than cattle, horses, sheep and goats, the dynamic was the same. After a period of grazing or disturbance, most native riparian plant species regrew.

Some riparian areas suffered when graziers displaced wildlife with continuously grazing livestock. Dense numbers of domestic grazing livestock, when limited to a confined area and with little stimulus to move from one area to another, would trample streambanks, congregate in the shade and cool breezes next to streams, and overgraze the vegetation.

Today, the challenge for graziers with streamside pastures is to manage for production while reducing the impact of access.

Recent research indicates that livestock prefer alternative water sources to water from ponds, wetlands, streams and creeks.

Agricultural settlement often followed surface waters and riparian areas. With time, high-density livestock access led to overgrazing and trampled streambanks.

THE ROLE OF RIPARIAN AREAS

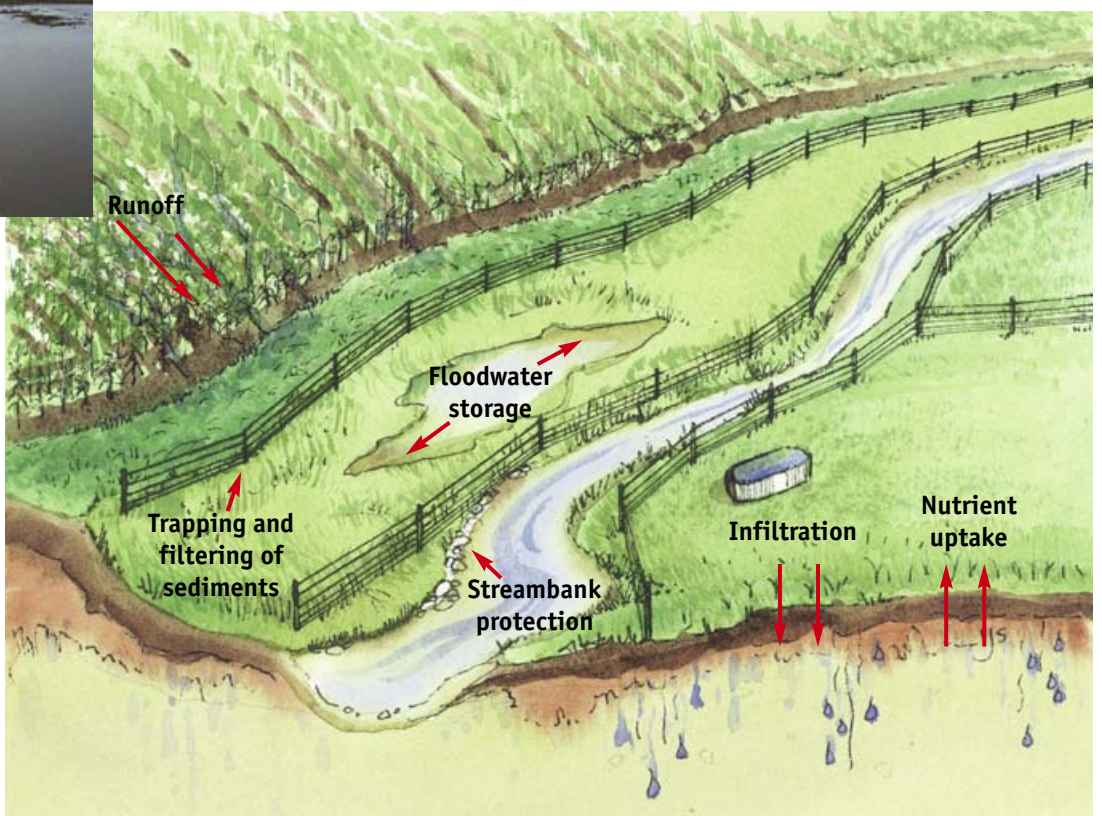
Although riparian areas often constitute a small portion of the landscape, they perform many valuable functions, including:

- recharging aquifers
- storing water
- reducing the impact and frequency of floods
- filtering sediments
- improving water quality
- increasing bank stability and reducing erosion potential
- providing habitat for many insect-eating birds.

The quality of vegetation largely determines the effectiveness of riparian areas. Healthy, lush vegetation, for example, can take up more nutrients, such as nitrate and phosphate, from upland runoff.

Riparian areas perform important ecological functions. A key one is storing water, which reduces the impact of flooding.

An understanding of riparian areas will form the basis of your management plan for streamside grazing. We'll take an in-depth look at them in the following chapter.



Well-managed streamside pastures serve the same function as vegetated buffer strips: protecting natural areas from the cumulative effects of upland management practices.

THE BENEFITS OF GRAZING MANAGEMENT

Well-managed riparian areas can yield many economic and environmental benefits. Here are 12, just for starters:

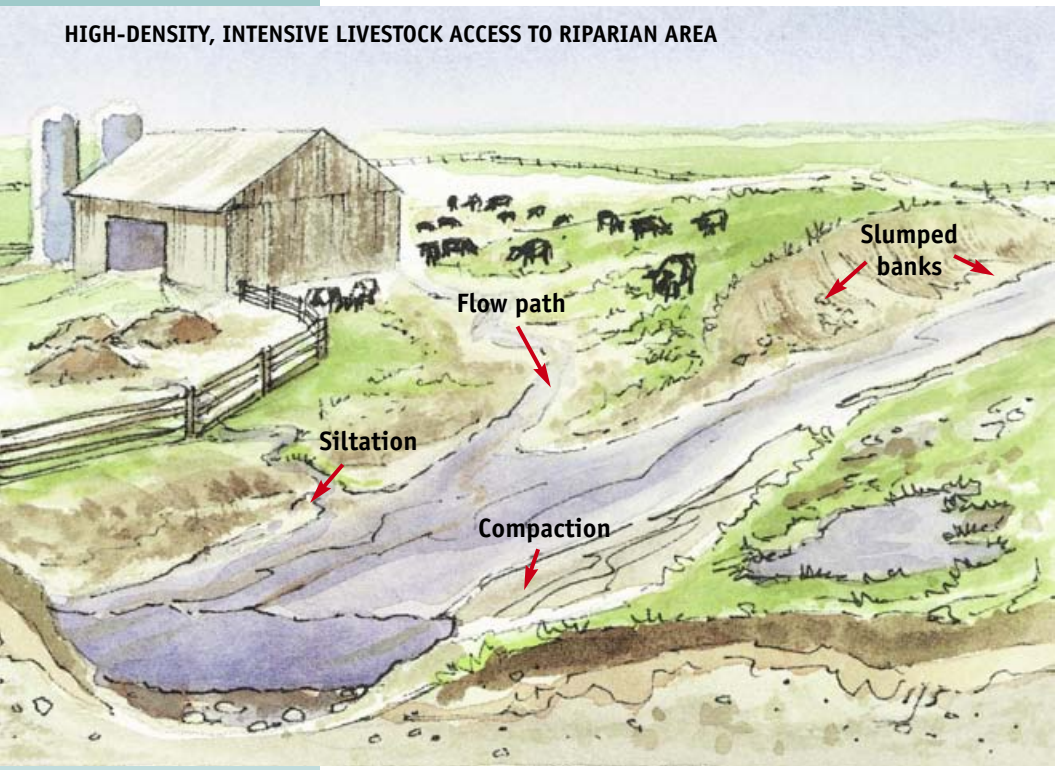
- ► reduced soil erosion potential – less disturbance means less erosion and runoff
- ► improved filtering ability – well-vegetated riparian areas are more effective filters for runoff
- ► increased flood control – more vegetation translates into better storage of floodwaters
- ► improved water quality and quantity – healthier riparian areas yield better quality water
- ► better livestock health – because reduced access makes for less mud and fewer cases of foot-rot and injury
- ► higher forage production – through improved pasture and grazing management
- ► greater animal gains – more palatable forage means improved livestock performance
- ► increased forage utilization efficiency – improved management means improved forage use
- ► better brush and weed management – managed pastures have fewer weeds
- ► enriched wildlife habitat – managed pastures provide better fish and wildlife habitat
- ► higher economic value of the land – managed pastures provide greater returns
- ► improved recreation opportunities and aesthetic value – there's more to enjoy!

Implementing best management practices for intensive pasture and grazing will increase your production of high quality forages.

THE ENVIRONMENTAL CHALLENGES OF GRAZING

Livestock access can impair riparian functions. The nature and extent of livestock's impact vary with the sensitivity of the grazed riparian area, the intensity of access (i.e., number of livestock in a given space), and the duration and timing of access.

HIGH-DENSITY, INTENSIVE LIVESTOCK ACCESS TO RIPARIAN AREA



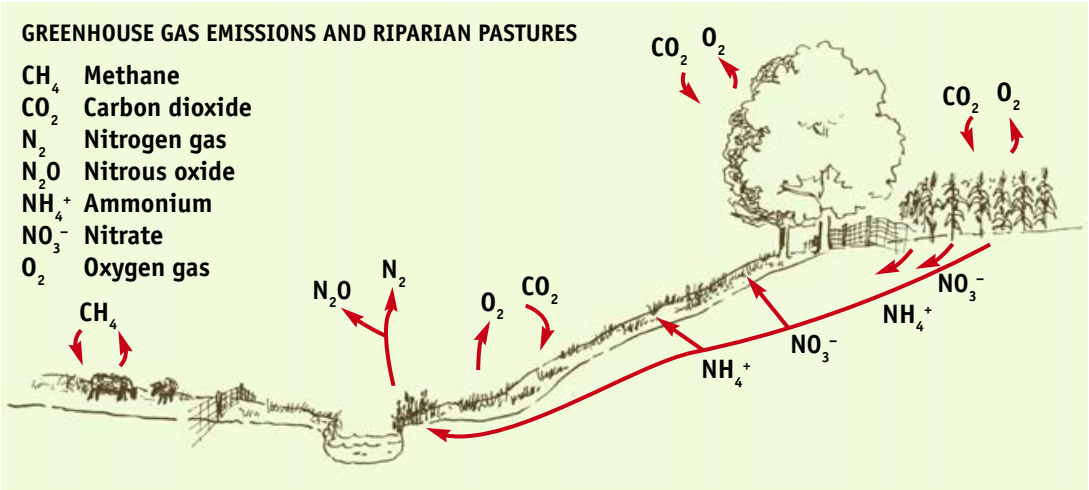
Livestock will eat accessible and palatable vegetation. Over time, they'll graze most existing vegetation, damage what can't be eaten, and trample the roots of trees and shrubs. This will diminish the area's filtering ability and wildlife value.

Hooves can compact soils, especially when conditions are wet, and soils can take years to rehabilitate. Infiltration rates decrease; runoff increases.

Hoof pressure above banks and shores can cause bank failure and slumping. This leads to more erosion, flooding and channel widening – making it more hazardous to livestock.

Livestock access to the streambed can stir up silt and deposit livestock wastes directly in the stream. Water can become contaminated as a result, posing a risk to both human and herd health, and degrading fish habitat.

This symbol indicates that a recommended practice or approach may be in violation of the federal Fisheries Act, which forbids the deposit of manure and other "deleterious substances" in streams or other water bodies that act as fish habitat. For a complete copy of the Act, go to: http://laws.justice.gc.ca/en/F-14/index.html



Unmanaged pastures can be a net source of greenhouse gas emissions. Grazing ruminants and poorly drained pasturelands produce methane. Deposited manures and soils release ammonia and nitrous oxide.

The good news is that greenhouse gas emissions can be reduced. Using BMPs, pastures can become a net "sink" for carbon dioxide and nitrogen compounds. Here's why...

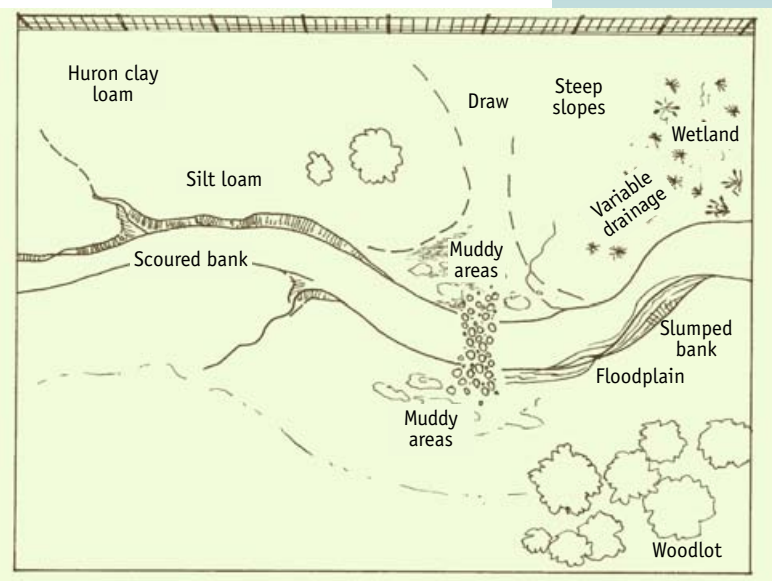
Improved and well-managed pastures yield higher quality forages. Higher quality forages generate less methane from ruminants and a more efficient feed-to-product ratio.

Well-managed pastures are more nitrogen-use efficient and will lessen the anaerobic conditions that promote emissions.

Higher forage productivity will result in a larger root mass and thus increase the amount of carbon stored in the soil.

THE GRAZING MANAGEMENT PLANNING PROCESS

Grazing management is a process with a purpose. The process is designed to help you reach your goals as they relate to production, and economic and environmental sustainability. It follows the logic of knowing what you have, knowing what you need and want, setting a schedule, getting the resources, and following the plan.



This map shows natural and management features that indicate site-suitability of BMPs and/or limit management options.

PLANNING PROCESS	
STEP	**DETAILS (see pp. 66-95 for in-depth info)**
1. SET GOALS	• balance production needs with local conditions • aim for production, and economic and environmental sustainability
2. TAKE INVENTORY OF STREAMSIDE-GRAZING AREA	• list and describe soil features, soil types, sensitivity and production, as well as potential for leaching and runoff based on soil type and slope • list and describe sensitive features: bedrock outcrops, wetlands, shallow water tables • list current management practices
3. CONDUCT A RISK ASSESSMENT	• assess the physical, management and off-site risks to the grazed riparian area
4. DETERMINE FORAGE REQUIREMENTS	• calculate in detail the forage requirements and expected paddock yield throughout the season
5. ANALYZE, INTERPET, AND SELECT A MANAGEMENT SYSTEM	• consider and select the most suitable grazing management system to meet goals set in Step 1
6. DEVELOP ACTION PLAN	• specify action, date, resources, approvals, costs and follow-up • design layout and fencing • list management inputs and considerations • address sensitive areas with plans to mitigate impact or to restrict access
7. IMPLEMENT THE PLAN	• get advice, get permits, and get going!
8. MONITOR AND UPDATE THE PLAN	• check on pasture response to BMPs • update plan accordingly

A key step in the grazing management planning process for streamside pastures is inventory. Knowing your soils, slopes and location of sensitive areas leads to more effective planning.

ABOUT THIS BOOK

The first part of the book is reference information regarding best management practices for streamside grazing.

The middle section explains how to develop a grazing management plan (GMP) – its components, process and assumptions.

This is followed by a workbook, including the GMP risk assessment and action plan. More reference information can be found at the back of the book to help plan and implement your GMP.

KEY CONCEPTS

This book concerns the science and management of pasture management in the vicinity of surface water and riparian areas. The working definition of **pasture** is a managed area and system of forage management for grazing livestock. Pastures require careful oversight to sustain the forage needs of grazing livestock without need of regular supplementing with additional feeds.

Pastures are normally associated with low livestock densities or moderate levels of density with intensive rotational grazing systems.

Outdoor confined areas with high livestock densities and regularly supplemented feeds are referred to as **yards**, **drylots** or **loafing areas**. Livestock should be excluded from surface water in these areas.

In riparian areas, the BMP for intensively grazing livestock is exclusion – especially with high-density stocking rates.

The BMP for low-density areas is to exclude where evidence warrants, according to the results of your risk assessment.

Otherwise, the strategy for low-density grazing near riparian areas should be to mimic exclusion by using a suite of BMPs. Use the risk assessment and GMP to pinpoint where access-related problems exist and which BMPs would be best to address them.

Complement these measures with a well-planned grazing system, high quality pasture, a suitable fencing system, and non-fencing approaches such as alternative water sources.

We'll explore all of these concepts and practices in the rest of this book.

PRINCIPLES AND PRACTICES

TYPES OF RIPARIAN AREAS

Before you assess risk and devise a plan, familiarize yourself with the different types of riparian pastures. Riparian areas are often categorized according to the water body they're directly connected to, such as a watercourse, a lake or a wetland. While these types seem obvious, it's helpful to know more specific characteristics of each one, like soil conditions, riparian vegetation, functions, and real-life examples from around Ontario.

Bear in mind too that many of these riparian types are connected. For example, wetlands, ponds and small creeks and streams feed ever-larger watercourses as water flows to its destination – a lake, in the illustration below.

The following illustrations and descriptions should help you get site-specific with your property as you select BMPs that best suit your circumstances and intentions.

Depicted above are common types of riparian areas and streamside pastures found in an agricultural watershed in southern Ontario. The drainage system moves from sources of the upper "reaches" of the watershed in the upper-right corner (wetlands, ponds, creeks) to the lower reaches that empty into a lake found in the lower left. Generally speaking, natural areas and extensive grazing practices are more common at the top of the watershed, whereas management intensive grazing practices are more common in the lower reaches.

The types of riparian areas found in the distinct components of this watershed are described over the next few pages.

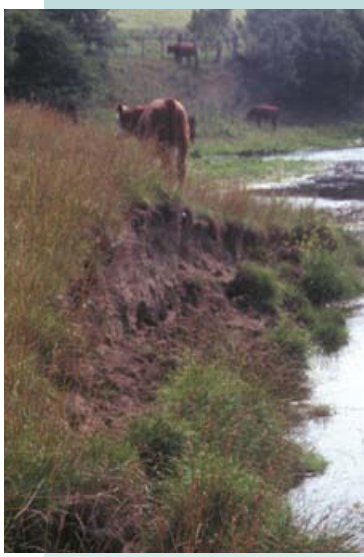
STREAMS AND CREEKS – NARROW CHANNELS

Streams and creeks in the upper reaches of watersheds often form narrow channels through level landscapes dominated by clay or sandy soils.

In the upper parts or reaches of many watersheds, you'll find natural watercourse riparian areas adjacent to streams or creeks in level landscapes. They're characterized by narrow, shallow valleys and deep channels (1–2 metres [3–6 ft] or deeper if in clays). Typical soil types range from fine sands to clays found in sand and clay plains.

Streamside pastures in these areas require prudent management to prevent long-term bank damage. Otherwise, exclusion – permanent or with management-intensive grazing systems and controlled access – is recommended.

Bank erosion and damage at access points on the upper reaches of rivers can be reduced with BMPs for controlled and restricted access.



STREAMS AND CREEKS – WIDE CHANNELS

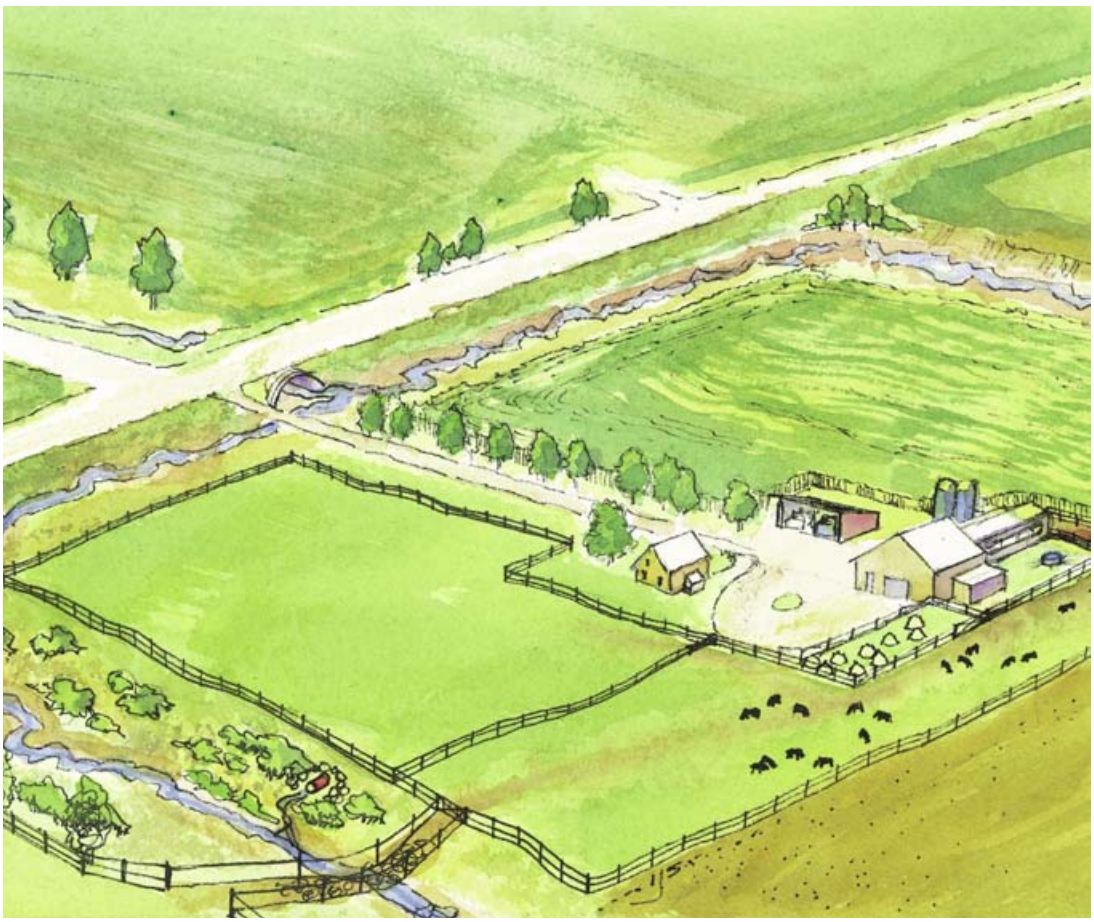
In the rolling topography of upper reaches, you'll find wide channels with cobbly or bedrock-controlled streambeds.

In extensively grazed shallow channels, it's the habitat functions that are most negatively affected. BMPs such as controlled access, delayed grazing and alternative water sources are effective in minimizing impacts on riparian habitat.

At the watershed level, upper parts or reaches are dominated by rolling landscapes, rivers with steeply sloping valleys, and medium-width (10–30 metre [30–90 ft]) shallow channels. Bank and bed materials are usually cobbly or bedrock-controlled. Typical soils are stony or gravelly sandy to loamy soils. In parts of northern Ontario and parts of central and eastern Ontario, these areas are often shallow to bedrock.

Livestock density is rarely high in these areas but can be a source of bank erosion where access is localized and concentrated.

CONSTRUCTED WATERCOURSES – DRAINS AND CHANNELIZED STREAMS



Constructed watercourses and open drains have been shaped to help convey surplus water safely from agricultural lands.

Constructed watercourses are open drains or channelized streams designed and constructed (or altered) to convey water from tile-drained lands, field surfaces and upstream surface waters.

Grazed livestock should be kept out of most constructed watercourses. Provide alternative water, salt and shade away from the watercourse.

STEEP RIVER VALLEYS AND EXTENSIVE FLOODPLAINS

Riparian areas in the middle-reach zone of rivers have steep valleys and broad floodplains.

Riparian areas in the middle-reach zone of rivers have steep valleys and broad floodplains. These valleys have slopes of over 10 per cent, i.e., 10-metre (30 ft) drops over 100-metre (300 ft) distances. Slopes are even steeper through clayey soils or bedrock faults (gorges).

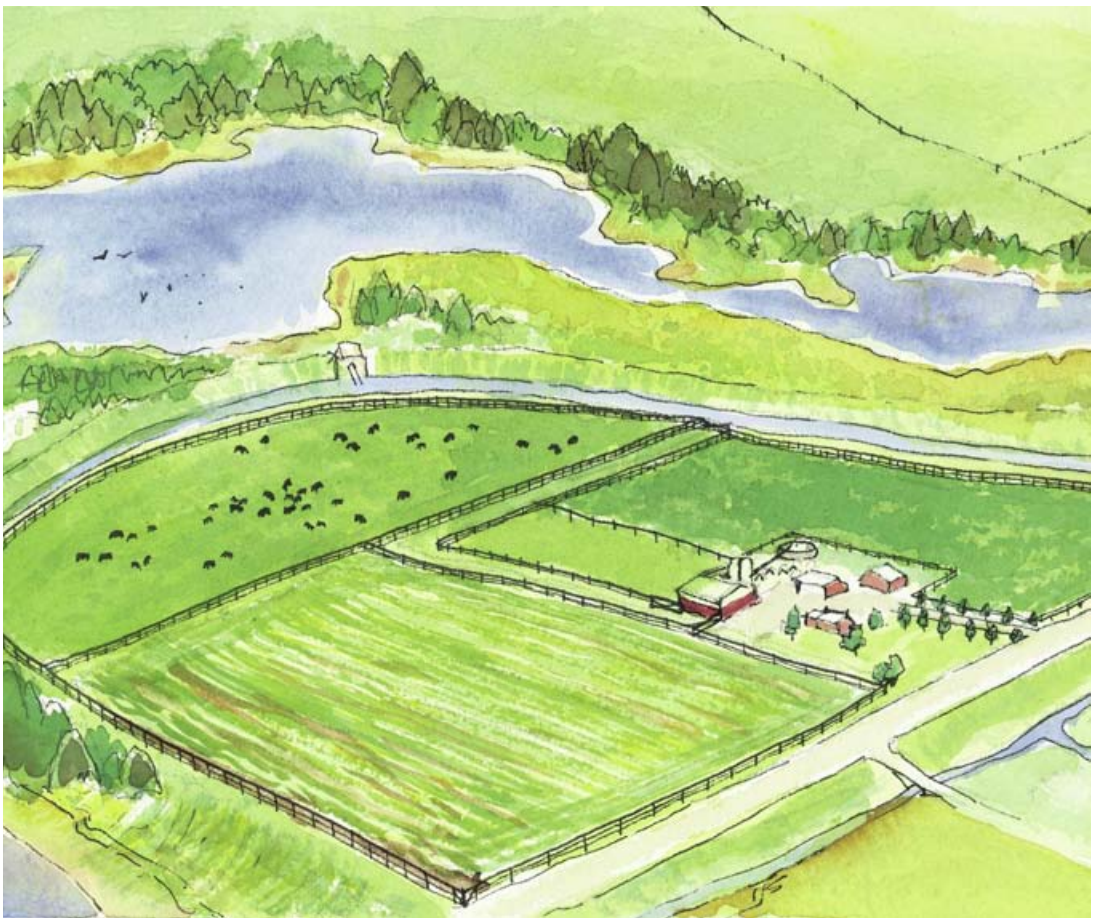
The floodplains are often wide (30–500 metres [90–1500 ft]) with shallow, meandering channels.

In both medium and wide floodplain areas, a combination of woody shrubs, grass and broadleaf vegetation is very important to counteract the sheer stress of floodwaters on the banks. Grass roots alone cannot do it.

These areas are prone to flooding and channelling.

On fragile, steep ravines, livestock exclusion with permanent or temporary fencing at the top of ravines is recommended. Ravine slopes can be planted to trees and shrubs. On less sensitive sites, ravines can be selectively grazed for short periods during the driest times in the summer grazing season.

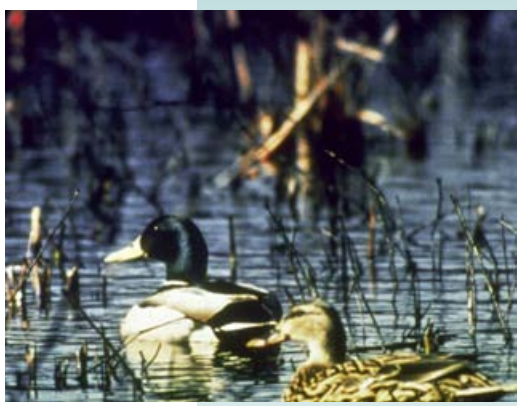
DELTAS AND BROAD FLOODPLAINS



Deltas are fragile areas found at the mouths of major rivers.

Riparian areas near the river mouth feature a mix of broad, deep and shallow valleys, a wide channel, broad floodplains, and as they approach the mouth, delta "islands" and braided streams.

Soils in the floodplain and deltas consist of silty and fine sand materials. Natural vegetation is most often grass and wetland species, with small pockets of ravine bottomland forest.



Delta areas are important habitat for fish, waterfowl and other wildlife.

LAKES – BEACHES, BLUFFS AND BEDROCK-CONTROLLED SHORELINES

The suitability of grazing near lakeshores is very site-specific. Beaches, bluffs and lakeside wetlands are not suitable. However, bedrock outcrops can withstand hooves' action when accessed.

Beaches are particularly prone to habitat destruction.

Lakes are also riparian areas. There are three main types.

Beaches, usually found in lake bays, consist of sandy, gravelly or stony materials. Riparian-area grazing near beaches is uncommon as these areas are at risk of habitat destruction and water quality problems.

Bluffs are shorelines with sizable elevation drops (5–50 metres [15–165 ft]) from the top to the water's edge. Some are formed from bedrock, like the lakes in the Canadian Shield or limestone bluffs in the Lake Ontario–St. Lawrence River Valley. Others, such as Lakes Erie, Ontario and Huron, are formed from silty and clayey materials. Clay bluffs are prone to severe shore and gully erosion.

Between bluffs, points and bays on lakes in the Canadian Shield, you'll find **bedrock-controlled shorelines**. In their natural condition, these riparian areas are dominated by forest cover in uplands and wetland vegetation in lower areas.

Low-density lakeside grazing has little impact on shorelines dominated by exposed bedrock outcrops.

WETLANDS AND NATURAL PONDS

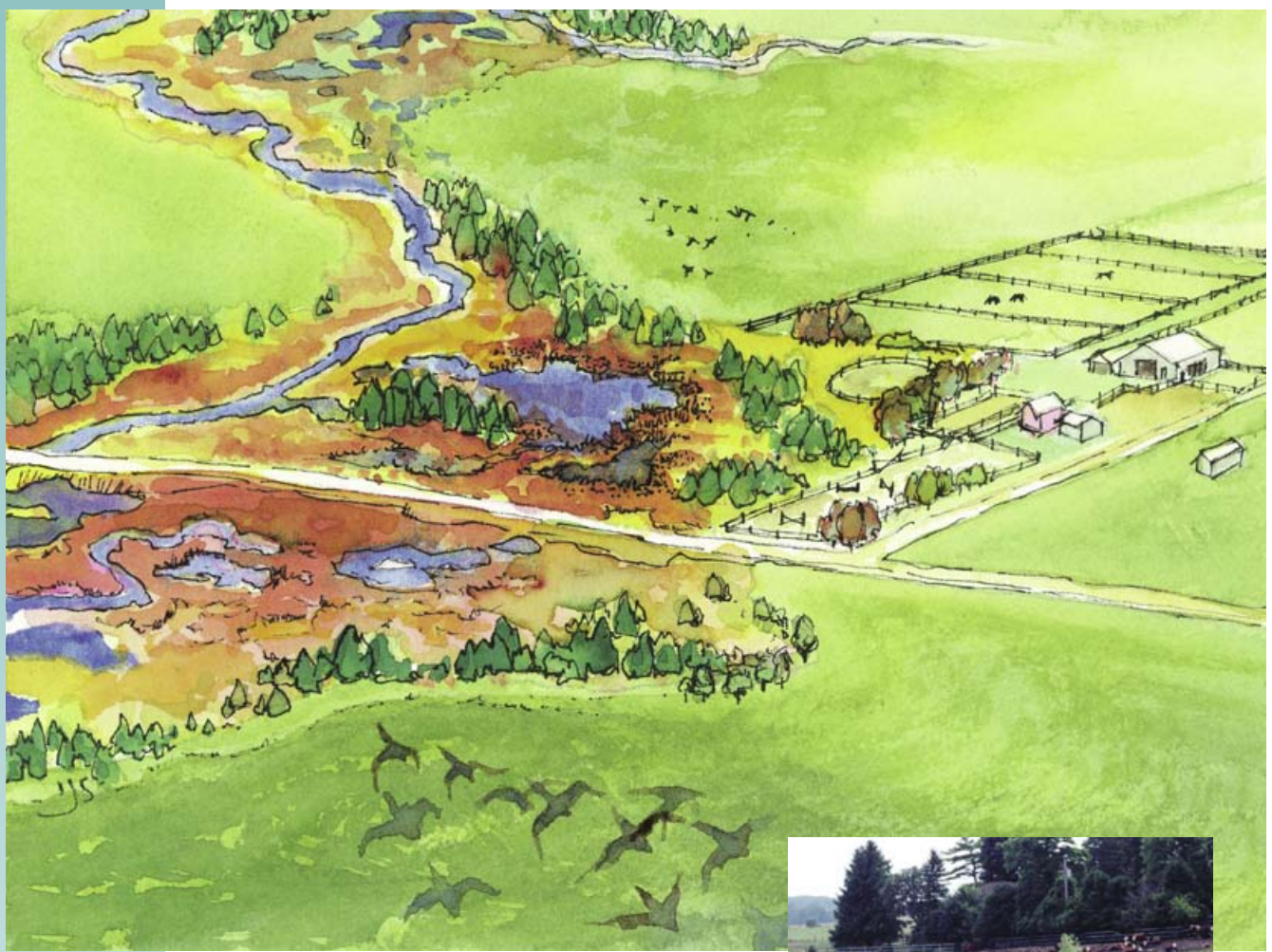
Wetlands are permanently or seasonally flooded areas with high water tables, saturated soils, and water-tolerant plants. In agricultural areas, wetlands can be found in depressional areas away from watercourses and lakes, or can be part of the riparian areas of watercourses and lakes. Wetlands include swamps, marshes, bogs and fens.

These wetlands are often associated with natural ponds.

Ponds are small bodies of non-flowing surface water – like miniature lakes. Ponds can be fed by discharging groundwater, overland flow or by flooding watercourses. Riparian vegetation around ponds closely matches nearby wetland vegetation.

Natural ponds and wetlands are important watershed resources. They provide:

- **water storage**
- **water purification**
- **recreational opportunities, and**
- **fish and wildlife habitat.**

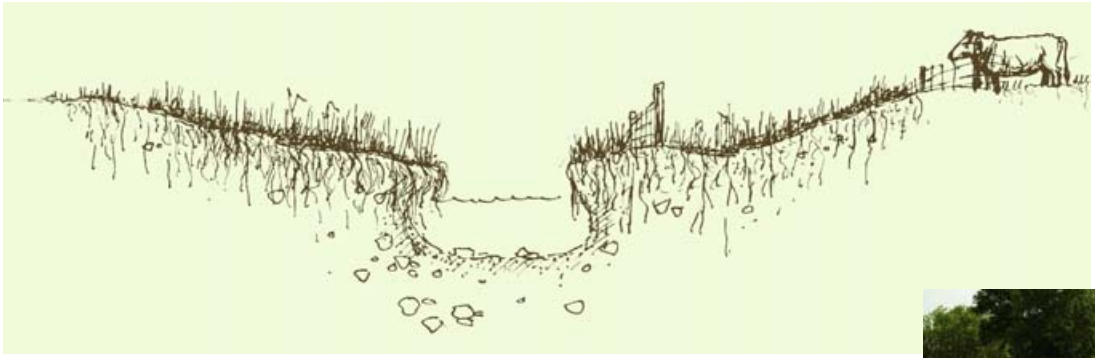


Wetlands are important for water quality, water supply, and habitat functions. Livestock should be excluded from grazing in wetlands.

Ponds are fragile ecosystems and are directly connected to the quality of the drinking water for both your family and your livestock. Livestock should be excluded from grazing around natural ponds.

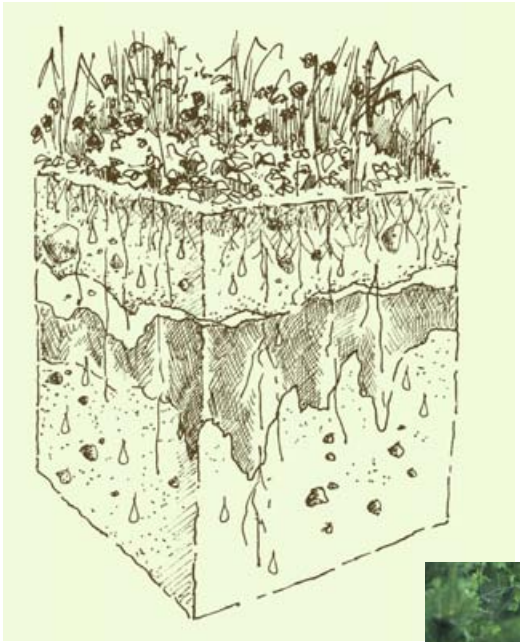
ENVIRONMENTAL IMPLICATIONS OF GRAZED RIPARIAN AREAS

FUNCTIONS



A well-managed grazed riparian area supports vegetation with rooting systems that hold bank soils in place, and help the channel to form a cup shape. Riparian pastures with these qualities have a greater capacity to store floodwaters.

Livestock performance can be significantly improved on a well-managed streamside pastures.



Properly managed grazed riparian buffers improve soil and maintain or protect water quality. Roots stabilize the soil. Plant materials add organic matter to the soil that improves its structure, chemistry and biological diversity. Streamside pastures act as vegetated buffers, helping entrap and filter out sediment and debris from floodwaters and runoff. Within the soil profile, nutrients are adsorbed to soil particles, absorbed by plants, and transformed into less harmful chemicals.

Riparian areas can serve as travel corridors for wildlife.

The red-sided dace is a Special Concern fish under the species-at-risk schedule, relying on properly functioning riparian areas for habitat protection.

Streamside pastures with treed buffers protect fish habitat. Tree roots hold soil in place. Trees provide shade and cool water temperatures. Fallen woody debris is used as cover for many aquatic species. Leaves from trees help to feed aquatic insects and other food sources for fish.

IMPACTS OF LIVESTOCK ACCESS

Livestock access can impair riparian functions. The extent of the impact increases with the sensitivity of the grazed riparian area, the intensity of access (i.e., number of livestock in a given space), and the duration of the access during sensitive times of the year.

Manure can be deposited directly or can reach surface water with storm runoff events. This is most commonly a problem with high-density stocking conditions like those found in yards and drylots (outdoor confinement areas).

Riparian soils and streambanks are prone to compaction when access is not managed.

Unmanaged access and high-density stocking levels lead to overgrazing, bank instability and increased runoff.

Livestock tend to congregate in the same spots. This can be prevented by diverting them away from these areas with shade, salt, feed, and alternative water.

POTENTIAL IMPACTS OF UNMANAGED GRAZING ON STREAMSIDE PASTURES

LIVESTOCK ACTIVITIES	CONDITIONS WHEN POTENTIAL RISK IS GREATEST	POTENTIAL RISKS	POTENTIAL IMPACTS
MANURE DEPOSITION*	• spring and early summer – when manure is deposited near streams • high-density livestock – manure is directly deposited in surface water during low-water conditions	• nutrient runoff • pathogen contamination • sediment loading	• lower oxygen levels for aquatic life • ammonia toxicity • degradation of spawning habitat • shift in aquatic species • decreased ability of fish to spawn and grow • treatment required for drinking water
SOIL COMPACTION	• saturated soil conditions • soils with high silt and clay content • high-density livestock or prolonged congregation	• soil degradation • sediment loading • decreased water infiltration	• increased risk of flooding • increased risk of erosion • degradation of aquatic habitat • increased cost of water filtration • loss of deep-rooted vegetation
OVERGRAZING	• early spring, late summer and early fall – when plant growth is slow or anytime that density exceeds capacity	• less water infiltration • increased runoff • lower diversity of vegetation	• reduced groundwater recharge • lower water table • increased risk of flooding • less shade and higher stream temperatures • less sediment trapping • decreased water infiltration • increased streambank erosion
DAMAGED STREAMBANK	• saturated soil conditions • insufficient vegetation cover • heat – livestock seek shade and cool water • no BMPs in place such as alternative water, shade, salt, feed	• severe streambank erosion	• fewer plant roots for bank stability • increased surface water turbidity • degradation of aquatic habitat • accelerated bank erosion and widening of stream channel • increased risk of flooding

* Manure is considered a deleterious substance under subsection 36(3) of the Fisheries Act.

A SYSTEMS APPROACH TO RIPARIAN GRAZING

Use the systems approach to double-check that the BMPs you've selected are effective, practical, and suit your operation.

Perhaps you've already adopted a "systems approach" to most of your operation. If not, consider putting it to work for you. A systems approach has:

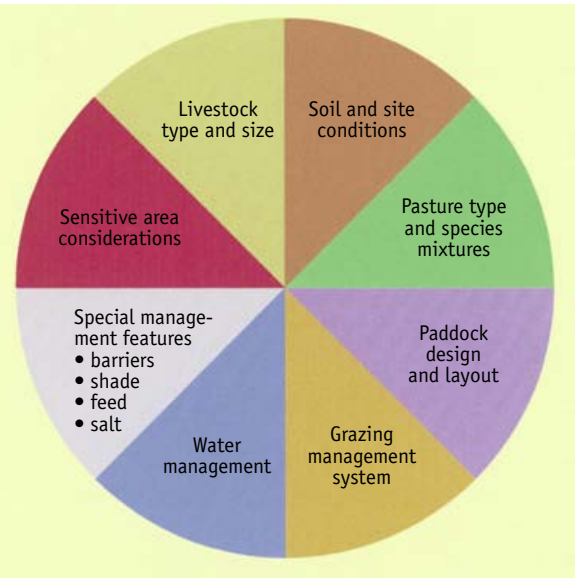
- integrated goals – including production, environmental and economic
- a management-intensive approach – changes are planned, monitored and adjusted
- flexibility – planned changes are adjusted to better suit seasonal weather changes and pasture requirements
- site-specific characteristics – production targets, management system, special features and protection practices relate to local site conditions.

In a systems approach, the key components of the production system are identified and described during the planning process. You act on the understanding that an important management change or change in local conditions will have impacts on other components – and adjust accordingly.

The components of a riparian grazing system include:

- livestock – type and size
- pasture type and species mixtures
- soil and site conditions
- sensitive area considerations
- water management
- grazing management system
- paddock design and layout
- special management features (placement of shade, salt, feed, barriers).

The key to streamside grazing is management. Streamside grazing without livestock exclusion will only work if there is a demonstrated commitment to intensive management.

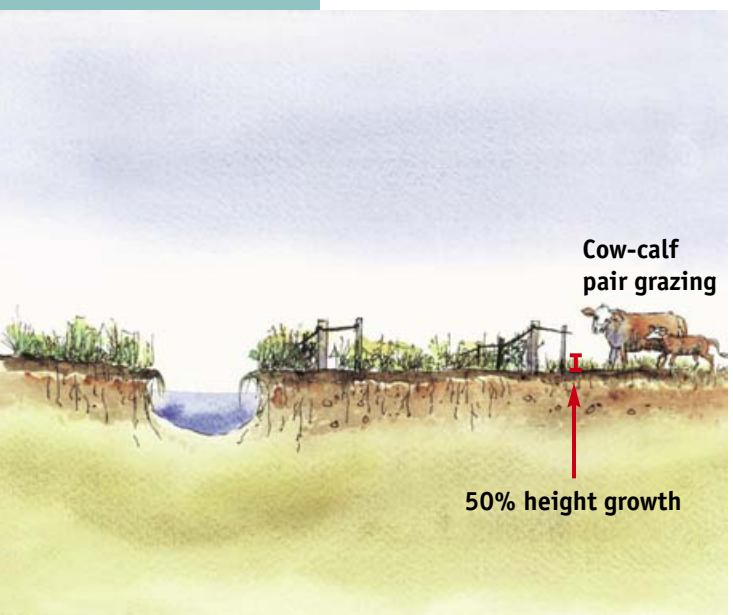


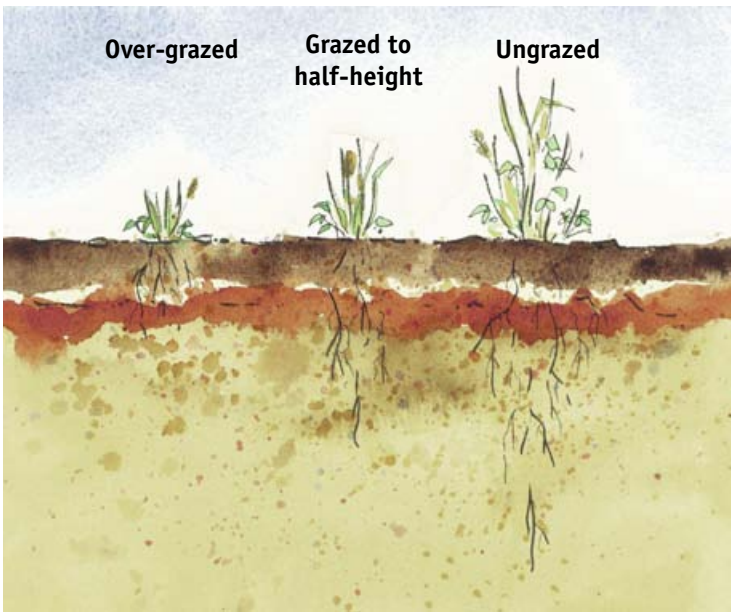
A systems approach to management ensures that the entire system is considered in a comprehensive way.

COMPARISON OF MANAGEMENT PRACTICES IN STREAMSIDE AREAS

MANAGEMENT PRACTICE	UNRESTRICTED ACCESS	MANAGED GRAZING
1. PLANNING AND MANAGEMENT	• not a planned system • no risk assessment • management methods focus on inputs and production outputs	• planned system to prevent problems • routine monitoring of paddocks • flexible management practices • management solutions address environmental and production goals
2. SITE-SPECIFIC PLANNING	• no restriction to streambanks or water • no protection for environmentally sensitive areas	• requires site-specific knowledge about soil and site conditions • livestock access to sensitive areas (e.g., banks and shores) is limited or restricted
3. PASTURE SHAPE AND LAYOUT	• large pastures – livestock move at will • congregation not discouraged	• paddocks designed to reduce wasted forage • watering areas, shade, and minerals are strategically located within paddocks • paddock design features encourage movement, not congregation
4. NUMBER OF PADDOCKS	• grazing area is one large paddock	• several small pastures or paddocks, sized according to planned needs, and delineated using temporary fences
5. ALTERNATIVE WATER AND OTHER INPUTS	• alternative water systems not provided • livestock use surface water for drinking water	• alternative water systems, feed, salt and shelter are located away from streambanks
6. PASTURE FORAGE REGROWTH	• pastures are not usually rested in an organized manner	• pastures rested and provided with sufficient time for forages to regrow before next rotation • forage height used to schedule rotation
7. GRAZING DURATION	• continuous, season-long grazing OR • grazing in same spot, same season, each year	• limited grazing time, then moved to another paddock • animals moved frequently and at least every 5 days
8. FORAGE USE MONITORING	• monitoring forage use is minimal • continuous, season-long grazing OR • grazing in same spot, same season, each year	• forage use monitored so that animals are moved after they've removed $^1/_2$ – $^2/_3$ of the forage growth

Intensive management requires regular monitoring of pasture conditions.





Constant grazing will not allow forages to maintain root growth or build up reserves. As a result, with repeated over-grazing, regrowth is progressively poorer and root systems weaker. On the other hand, if grazing is managed to remove only half of the height growth, regrowth can be maintained.

RIPARIAN PASTURE MANAGEMENT

Upland pasture management is a planned system of pasture production. It includes establishment and improvement as part of grazing management.

Riparian pastures or components of riparian pastures can be managed similarly. But components such as certain floodplains will require special precautions.

Ravine soils are prone to weed pressures normally associated with marginal lands.

Riparian areas are fragile – prone to flooding, compaction and erosion. Use BMPs that minimize disturbance when improving pasture conditions.

PRINCIPLES

Pastures are forage crops managed specifically for grazing. They are subject to the forces of natural succession, i.e., the shift of plant communities from grass/legumes to grasses to non-forage or undesirable pasture plants, shrubs and trees.

To combat this natural process, and to reduce the need for costly renovation, pastures need to be managed intensively. Intensively managed pastures are more efficient (for meat and milk production) and deter natural succession.

Intensive management can be particularly challenging in riparian areas because:

- floodplains are very productive and under naturalization pressures from all kinds of vegetation – natural and introduced, invasive and non-invasive, upland and lowland – and not all is desirable for grazing production or environmental production goals
- many adjacent ravine slopes are just the opposite: soils are often degraded and not productive, and exposed ravine soils are prone to weed pressures normally associated with marginal lands (e.g., carpet weed)
- management is also challenging: floodplains are fragile and inaccessible, and ravine areas are often sloping and in poor condition.

Pasture management goals should include the following:

- adequate soil fertility
- careful pasture crop species and mixture selection
- effective establishment and improvement techniques
- effective weed control
- sustained grazing, and
- protection of riparian areas.

Floodplains are very productive and are under intense weed pressure.

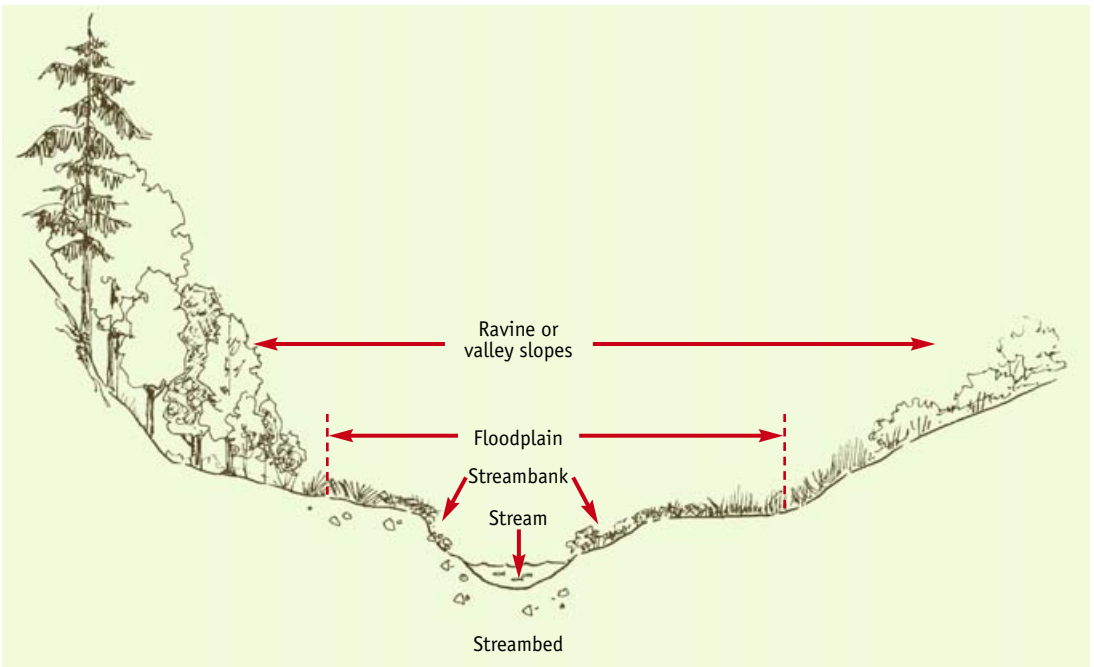
"Management Intensive Grazing or MIG has allowed me to achieve pasture production of over 600 pounds of beef produced per acre."

– Tim Prior, Brussels, Ontario

SITE-SPECIFIC RIPARIAN PASTURE MANAGEMENT

Riparian areas have several landscape components:

- banks or shores
- floodplains or bottomlands
- ravine slopes
- upland areas – usually above the ravine slope and more level (also known as table lands).



For many obvious reasons, banks and shoreline areas should not be considered part of a riparian pasture. Here the management strategy should be to eliminate or discourage access.

Floodplains and bottomlands come in all shapes and sizes, so always be sure to match pasture management to site conditions.

- **some are narrow and are indistinguishable from upland pastures**
  - this is common in landscapes with level topography and adjacent to narrow-channel streams, drains, and some wetlands and ponds
  - these areas can be managed like uplands, provided special considerations are taken for pasture establishment and the application of inputs

- **others are narrow and part of a ravine system**
  - these areas are often naturalizing or have wetland, woodland and natural meadow components
  - intensive pasture management options here pose higher environmental risk and should be left to grazing management decisions
- **some bottomlands – as found in rivers and larger streams – are wide enough to support a forage-pasture system**
  - besides some access challenges, management choices can be similar to upland areas – provided special considerations are taken for pasture establishment and the application of inputs
- **ravine slopes**
  - can be pastured or naturalizing, healthy or degraded
  - management options are limited for degraded or naturalizing ravines on slopes >10%
  - some moderate improvements, including weed and brush control, over-seeding (consider erosion control species mixtures), and nutrient management are recommended

For the most part, slope and erodibility are the most limiting pasture management features. This makes conventional site preparation a high-risk proposition, and maintenance of desirable forage species a critical management objective.

Upland or tableland pastures follow conventional pasture management principles.

Proper soil fertility – Forage grasses and legumes are competitive plants. But they need a continual supply of crop nutrients to out-compete weeds and provide sustained forage production. Fertile pastures are an environmentally friendly land use.

Crop selection – Pasture species and mixtures should be selected to meet your site conditions, animal requirements and management expectations. Mixes that are durable, nitrogen-efficient, and provide sustained yields are the best choices for pastures near riparian areas.

Narrow floodplains in level landscapes can be treated like upland pastures. However, special care must be taken when applying nutrients and herbicides during pasture renovation.

Pasture management on the wide floodplains of streams requires special attention to the risks of managing close to surface waters.

For a more detailed approach to pasture management, please refer to *Pasture Production* (OMAFRA Publication 19).

BEST MANAGEMENT PRACTICES

This section features tips for improving pastures, improving grazing management, and protecting the environment.

To improve a streamside pasture, you can choose between rejuvenating and renovating it. To decide which path to take, you should:

- ▶ assess pasture condition
- ▶ determine production goals, environmental limitations and timeframe
- ▶ determine conditions that limit improvement (soil depth, etc.)
- ▶ assess costs.

Rejuvenation is a quick way to improve undergrazed areas with low fertility. Test soil and improve fertility to increase survivorship and production of desired species. Develop and follow a GMP to sustain production.

Renovation means increasing productivity by introducing pasture species with or without disturbing the soil. Successful renovation depends on:

- ▶ proper pasture mix selection
- ▶ site preparation
- ▶ timing of seeding
- ▶ legume inoculation
- ▶ soil fertility and moisture levels during establishment, and
- ▶ weed control during establishment.

Extensive flooding can cause severe damage to recently established streamside pastures. Chain harrowing and cyclone seeding can be used to overseed flood-damaged areas where needed.

Special precautions are required to prevent erosion and runoff when working near water.

Test soils in riparian areas regularly.

Riparian Pasture Improvement – Stand Establishment

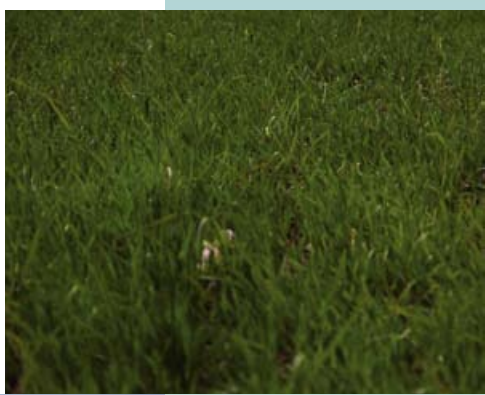
Manage fertility with care. Fertile pasture soils will help pasture crops become established, grow and compete with weeds.

- ✔ Test soils one year before establishment.
- ✔ Keep P and K levels high – forage/pasture species are big feeders.
- ✔ Sample unique areas separately, e.g., bottomlands and ravine slopes.
- ✔ Apply fertilizers carefully in riparian areas to maximize nutrient use efficiency and at times that will reduce loss from flooding and runoff.

Match seed mixture to goals.

- ✔ Select a mixture that meets your goals for site conditions, growth, gain targets, and use. Species that are durable, fast growing, and nitrogen- and water-efficient will help lower greenhouse gas emissions.
- ✔ For floodplains – choose moisture and flood-tolerant pasture mixes for these areas.
- ✔ For ravines and steep slopes – consider species mixtures normally used for erosion control.
- ✔ For uplands – consider pasture-forage mixes that are suitable for both pasture and hay crops.

Choose flood-tolerant forage species and mixtures for floodplains.



Seed with care.

- ✔ Plant seeds 6–12 mm ($^1/_4$ – $^1/_2$ in.) on clay and loam soils and 12–18 mm ($^1/_2$ – $^3/_4$ in.) on sandy soils.
- ✔ Use companion crops such as spring cereals only in areas prone to erosion.
- ✔ Consider using no-till after a cover crop is killed prior to establishment – soil is disturbed less.

Get an early jump on weeds.

- ✔ Get an early jump on weeds. Kill perennial weeds prior to establishment
- ✔ Clip weeds during early establishment and in pastures left for longer rest or rehabilitation periods.

Choose erosion-control mixtures for degraded areas.

Riparian Pasture Quality Assessment

Riparian pasture condition is a key indicator of pasture and grazing management practices. Having a good fix on it is an essential step in building a successful grazing system.

Pasture condition is highly variable within and among riparian pastures, and closely related to management and land use history, productivity and sensitivity. However, over time, you should be able to identify the direction in which the pasture condition is moving.

The following chart is meant to help you:

- ▶ assess condition within and between pastures
- ▶ determine where and what kind of improvement is required, and
- ▶ evaluate results of management decisions.

"We value pasture as our most important crop. We have built good laneways to the fields and fenced the cattle onto the lanes and out of all wetland areas. They have access to water at a low-level crossing and at alternative gravity-flow troughs beside the waterways. These lanes and our alternative watering allow us to use five- to seven-acre fields to manage the grazing throughout the season as well as different breeding groups of cattle.

"We have also fenced small fields along the streams, where we can graze cattle for short periods of time when the ground is dry so that little damage is done to the streambank or area. These practices have not only let us increase beef production but have improved herd health and prevented leg and feet injuries while better managing our stream and wetland areas."

– James & Joan McKinlay, Ravenna, Ontario

PASTURE CONDITION SURVEY

	FIELD	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
	ACRES					
	MONTH & YEAR	M____/Y____	M____/Y____	M____/Y____	M____/Y____	M____/Y____
CATEGORY	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE
SPECIES COMPOSITION	Undesirable 0 1 2 3 Desirable 4					
PLANT DIVERSITY	Narrow 0 1 2 3 Broad 4					
STAND DENSITY	Sparse 0 1 2 3 Dense 4					
PLANT VIGOUR	Weak 0 1 2 3 Strong 4					
LEGUMES IN STAND	<10% 0 1 2 3 >50% 4					
PLANT RESIDUE	Deficient 0 1 2 3 Excess 4					
BROWSE UNIFORMITY	Concentrated 0 1 2 3 Uniform 4					
SEVERITY OF USE	Heavy 0 1 2 3 Light 4					
WOODY PLANTS	>40% 0 1 2 3 <10% 4					
SOIL EROSION	Severe 0 1 Moderate 2 3 Slight 4					

The source for this chart is the *Grazing Systems Planning Guide,* written by K. Blanchet, J. DeJong-Hughes and H. Moechnig, and published by the University of Minnesota Extension Service, item 07606, revised 2003.

Pasture condition is a good indicator of pasture production, quality, and environmental impact.

The best management practice for low-density streamside pastures is to exclude where needed.

RIPARIAN GRAZING SYSTEMS

Quite simply, the best management practice for low-density streamside pastures is to:

✔ exclude where evidence warrants, according to the results of your risk assessment.

Otherwise, the strategy for low-density grazing near riparian areas should be to:

✔ mimic exclusion by using a suite of BMPs

✔ use the risk assessment and GMP to pinpoint where access-related problems exist and which BMPs would be best to address them

✔ complement these measures with a well-planned grazing system, high quality pasture, a suitable fencing system, and non-fencing approaches such as alternative water sources.

LIVESTOCK AS STREAMSIDE GRAZERS

Each species has unique grazing habits, but here are some general habits across species:

▸ livestock graze 7–12 hours/day
▸ quantity grazed is related to bite size and grazing rates
▸ larger bites are taken when forage is in good supply
▸ livestock will be more selective if forage quality is high and access is unrestricted
▸ sheep and goats are the most selective followed by horses and cattle
▸ grazing animals have height and species preferences.

GRAZING HABITS, BY SPECIES

LIVESTOCK	GRAZING METHOD	GRAZING PREFERENCES	GRAZING PATTERNS
CATTLE	• use tongues to pull plants into mouths	• ideal plant height range is 10–25 cm (4–10 in.) • prefer fine grasses • prefer to roam or move	• rotational or strip grazing are suitable methods • will congregate in areas of preference – species or local conditions • move milking cattle every 2 days; heifers and drys every 5 days • move beef every 5 days
HORSES	• selective grazers • bite close to ground	• need space to run • small paddocks are not suitable	• graze one area close to ground and leave less preferred area for manure
SHEEP	• use lips and tongues to graze selectively	• forbs>grasses>sedges>shrubs • prefer short-height material	• uniform grazers • will not access flowing water
GOATS	• use lips and tongues to graze selectively • prefer to browse	• not as particular • milking goats require high quality forages	• very adaptable • will graze small trees and shrubs

Cattle prefer to roam when grazing but will adjust well to small paddocks.

Goats are very adaptable grazers.

Sheep are uniform grazers and will not access flowing waters.

Horses are not suited to small paddocks.

PRINCIPLES OF GRAZING NEAR RIPARIAN AREAS

This section explores a number of grazing management practices applicable to riparian areas. Selecting a grazing management practice or a combination of practices depends on several factors including:

- ▶ available grazing-land resources
- ▶ opportunities for improvement
- ▶ farm/ranch goals and finances.

Grazing management alone can reduce much of the impact of livestock on most environmentally sensitive areas and improve productivity. But it's most effective when used with other BMPs for pastures near riparian areas. Understanding the principles is the key to identifying which grazing management system will work in your operation.

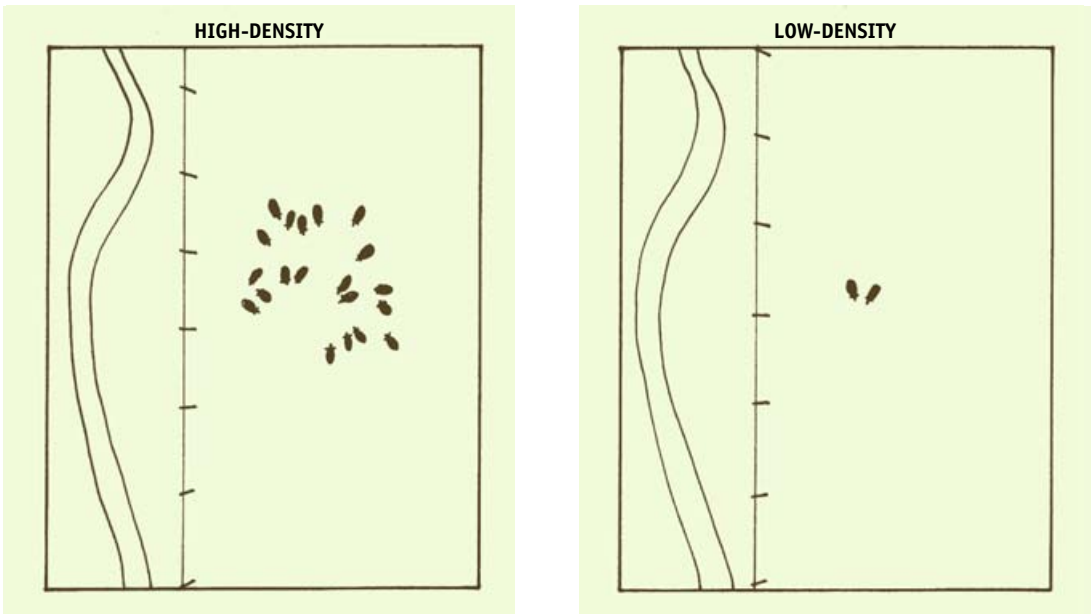
Grazing Capacity and Stocking Rates

Grazing capacity

Grazing capacity is the **average** stocking rate that a pasture can sustain (or carry) over time without the need to provide additional feeds and without causing excessive damage to the riparian area. Grazing capacity depends on local climate, and soil and site conditions. Knowing the grazing capacity of your riparian area is important for medium- and long-term planning. Stocking rates are influenced by such factors as riparian health and the current season's growing conditions.

Stocking rates

Each acre of pasture has the capacity to sustain a certain number of livestock over the grazing season – beyond which the pasture can't recover quickly enough or site damage is severe (e.g., compaction). Stocking rate is influenced by site type (floodplain vs. upland), soil type and quality, and weather conditions. By managing for stocking rates, graziers can maintain production and minimize impact.



Stocking rate is considered the most significant factor in streamside grazing management. Overgrazing in high-density pastures leads to poor pasture condition and environmental damage.

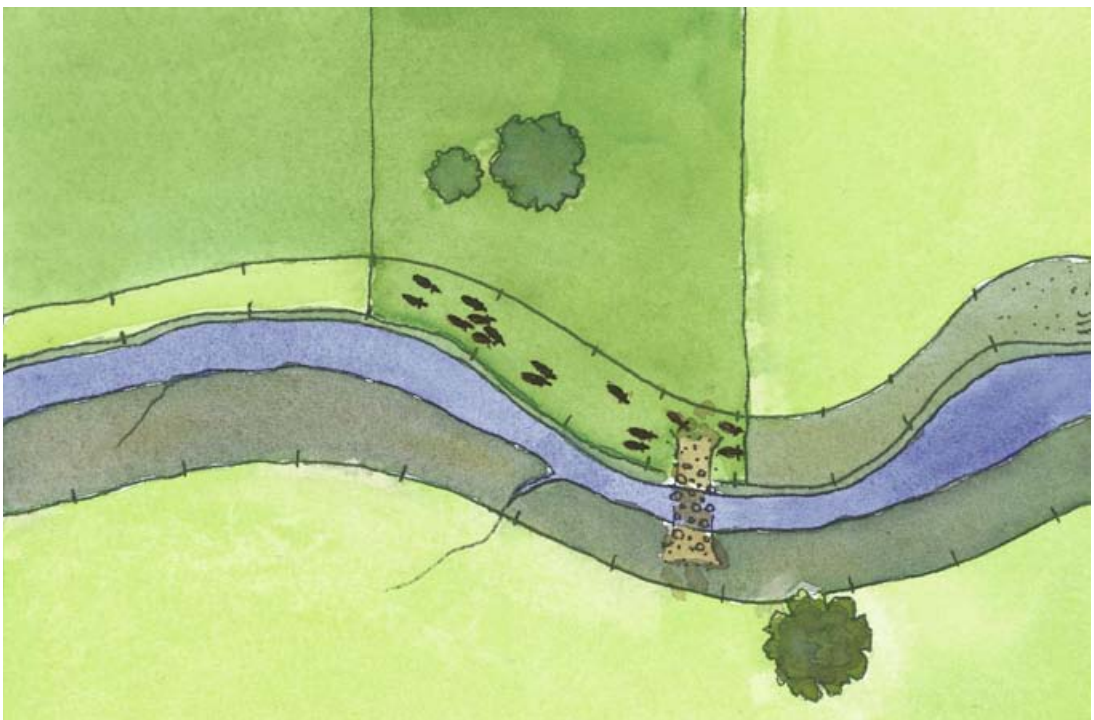
The highest stocking rate for most low-density grazed riparian areas is 2.5 cow-calf pair/ha/yr (1 cow-calf pair/ac/yr) or equivalent. Stocking rates that exceed this level are considered high-density.

Remember that:

- ▶ stocking rates can affect animal production and the health of riparian and upland areas
- ▶ the safest and most profitable stocking rate usually lies between the rate that achieves the highest individual gain and the rate that achieves the maximum per acre animal gain – moderate stocking rates are recommended
- ▶ moderately stocked grazing land often withstands drought better than overstocked land.

Regardless of the grazing system employed, overstocking will negatively affect the health and productivity of riparian areas and uplands.

Site Features and Conditions



Grazing in riparian areas can be site-specific. Here, the narrow floodplain is fenced off, but accessed for a short duration with high-density stocking to control weeds in late summer – when conditions are dry.

Even at lower densities, grazing in a fragile riparian area can be harmful. Small streams, ponds and wetlands that are saturated most of the time may not be able to withstand much grazing pressure without being damaged.

The situation is considerably different in large, broad floodplains of the middle and upper reaches of rivers. These sites can withstand higher livestock densities for very short periods if grazing is delayed until conditions are drier. On the other hand, eroded or fragile ravine slopes have the lowest grazing capacity. In most cases, the upland portion of a riparian pasture area has the highest carrying capacity.

Soil type or texture may have a limiting effect on stocking density. Some soil types (e.g., soils with a high silt and clay content) are prone to compaction. Other soil types – those that are shallow to bedrock, or have high sand and gravel contents – are prone to leaching. Still other riparian areas – those with high clay contents or past compaction – are more prone to runoff. All of these situations will limit stocking rates.

In addition, riparian areas with steeply sloping ravine or valley slopes are more prone to runoff and erosion.

Riparian areas with high natural water tables are at a higher risk for groundwater contamination as stocking density increases.

Residual Vegetation

The quality of riparian vegetation is key to sustained production targets and environmental goals. To meet these goals, a critical amount of "residue" – meaning the growing forage vegetation post-grazing – must remain after each grazing period.

Pasture residue is important for regrowth, plant reserves for over-wintering or periods of drought, maintaining cover, and for effective nutrient cycling. The amount of residue required will vary with the type of riparian vegetation, number and intensity of flooding cycles, grazing system, and season of grazing.

Specific recommendations for residue condition for pasture species in riparian areas are not known. However, the general guidelines are as follows:

- an average stubble height of 15–20 cm (6–8 in.) is recommended for grasses and legumes with intermediate light, e.g., timothy
- 20–25 cm (8–10 in.) would be required for taller species, such as orchardgrass
- adequate stubble height of herbaceous plants will ensure reduced pressures on browse species. In areas with multiple flooding cycles, an average stubble height of 30 cm (12 in.) would be desirable.

The recommended amount of residue will also depend on the growing season. Less residue can be left if the season is ideal for forage production. More should be left during poor conditions such as a drought.

Careful planning and monitoring of livestock habits will help manage paddock residue requirements on a site-specific basis.

Leaving sufficient cover after pasture will result in greater forage growth the following season.

Poor cover is an indicator of poor site conditions or poor management.

MINIMUM HEIGHT FOR PASTURE SPECIES AT BEGINNING AND END OF GRAZING SEASON

SPECIES	BEGIN GRAZING: INITIAL GRAZING HEIGHT IN EARLY SPRING* (INCHES)	BEGIN GRAZING: MINIMUM AND OPTIMUM GRAZING HEIGHTS (INCHES)	END GRAZING: MINIMUM STUBBLE HEIGHT (INCHES)**	END GRAZING: MINIMUM REGROWTH BEFORE KILLING FROST (INCHES)
ALFALFA***	–	Bud stage	–	6 ****
KENTUCKY BLUEGRASS	2	4–6	2	4
ORCHARDGRASS	3–4	6–10	3	6
PERENNIAL RYEGRASS	3–4	5–7	3	4*****
REED CANARYGRASS	4–5	8–8	4	6
BROME	4	8–14	4	6
TALL FESCUE	4	6–10	3	6
TALL WHEATGRASS	4–5	8–14	4	6
TIMOTHY	4	6–10	4	5
		WARM-SEASON GRASSES		
BIG BLUESTEM		10–14	6	6
INDIAN BLUESTEM		10–14	6	6
LITTLE BLUESTEM		5–7	3	4
SWITCHGRASS		12–20	8	10

This chart was adapted from *Grazing Systems Planning Guide*, University of Minnesota Extension Service. (see pg. 31).

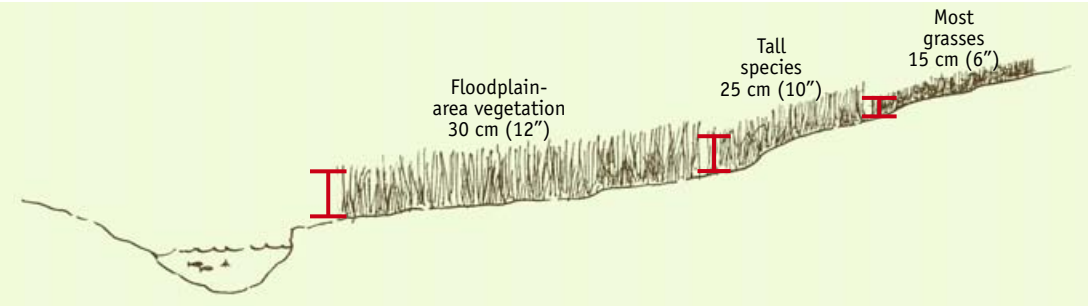
* This applies only to the initial grazing in the spring. The livestock must be moved rapidly through paddocks to prevent overgrazing and compaction.

** Minimum stubble height must be observed to maintain growth throughout the grazing season. This minimum critical height applies to the entire season.

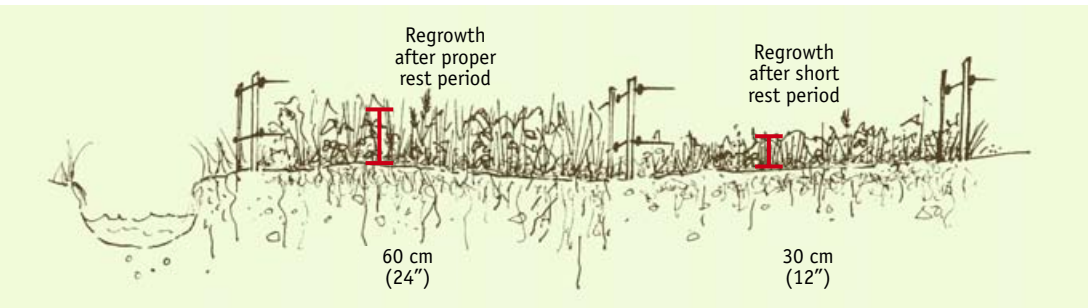
*** There is a greater risk of bloat on stands with more than 50% alfalfa, especially before full flower.

**** Alfalfa should not be grazed or harvested later than 35–45 days before the first date of freeze-up.

***** Regrowth should be grazed to 5 cm (2 in.) after dormancy and prior to snow cover.



Pasture residue or the amount of growing forage that remains after grazing is critical for regrowth and survival through winter and during droughts.



Pastures require proper rest periods for regrowth and forage survival. One indicator of short rest periods is the invasion of weeds.

Frequency and Duration of Grazing and Rest Periods

Pasture and riparian species require rest periods for regrowth. Otherwise, they can be grazed out and replaced by weeds, or even bare soils. With management-intensive grazing practices, graziers monitor regrowth patterns and manage grazing frequency to maintain production. This is of particular importance in riparian areas.

Frequency of grazing and the length of rest period can be manipulated to improve or maintain the health of riparian areas.

In general, only one short grazing pass (3–4 days or less) is recommended per season for floodplain and other sensitive areas, such as near wetlands, ponds and riparian meadows. If more than one grazing pass is employed, adequate rest period between grazing passes is essential, and total grazing time should not exceed 2–3 weeks.

Rest allows plants to recover from grazing and helps maintain plant roots and vigour. Rest also allows soil to recover from compaction. Rest periods are normally 25–60+ days depending on plant growth.

Short grazing periods will minimize the potential for grazing regrowth before plants recover fully.

As grazing pressure increases, the amount of rest required increases. The longer the grazing period, the longer the rest period required. The greater the green plant material remaining after grazing, the less rest required.

Long-term rest (one or more growing seasons) may be employed in problem areas where riparian health is at risk or in areas set aside for long-term recovery. Newly established vegetation such as trees, shrubs, and pasture species mixes benefit from being undisturbed as well.

Also, years of above-average precipitation offer an opportunity to rest one or more paddocks for a full season.

Complete exclusion of animals from riparian areas is not the only option but should be considered or identified in risk assessment – except in environmentally sensitive areas, where exclusion may be your only option.

Consider exclusion as a BMP when protecting environmentally sensitive areas such as wetlands or riparian meadows.

Use long-term rest to restore highly degraded streamside areas.

In severely damaged areas, livestock exclusion may be necessary to start the recovery process. The duration of the rest period depends on the severity of the degradation and local site conditions. Ultimately, the goal of providing rest is to allow the recovery of vegetation and streambanks, and survival of recently established plants.

Areas that are badly degraded or have been abused for many years will take a long time to recover. Similarly, riparian areas in more fragile environments, such as chronic low-water watersheds or areas with long winters, will take a longer time to recover than areas with more moderate climates or more humid conditions.

The rest period should also allow for the establishment of sufficient vegetation to stabilize the streambank, filter sediments, and allow nutrient recycling. Management practices that favour riparian area revegetation are listed below.

Long-term rest may be a suitable BMP when you're establishing trees or trying to rehabilitate highly degraded areas.

- ✔ Control weeds, especially if invasive or noxious weeds are present. In less degraded areas, grazing once or twice in the late summer can control weeds.
- ✔ Improve pasture – including fertility, pH and species composition.
- ✔ Stabilize streambanks with rip-rap, bio-engineering structures or fast-growing plants before revegetating other portions of the riparian area.
- ✔ Allow new plants such as shade trees or barrier trees and shrubs to become well-established before allowing livestock to graze in the revegetated area. This establishment period may last several years, especially in dry sites or severely degraded areas.

Control of Animal Distribution

Control of livestock distribution often determines the success of a grazing management plan for riparian areas. We know that livestock prefer the lush forage, shade and water availability found in riparian areas. This is more noticeable in drought years, when there's more to eat in the riparian zone.

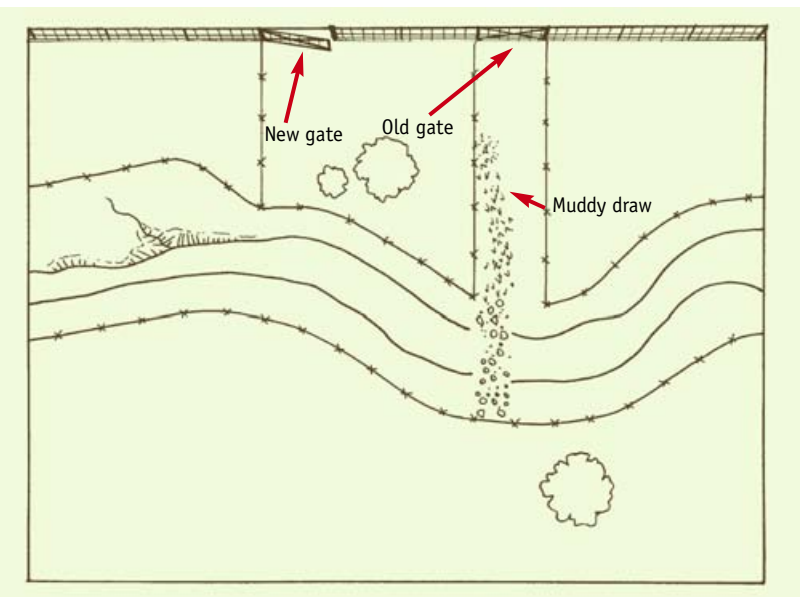
Practise riparian-friendly, management intensive grazing strategies to limit the season and duration of access. To encourage greater use of the uplands and less use of riparian areas, consider the following practices.

- ✔ Develop alternative water sources in uplands away from streams and water bodies, if possible.
- ✔ Establish shade/shelter facilities in uplands.
- ✔ Provide feed and supplements away from riparian areas.
- ✔ Place salt blocks away from riparian areas.
- ✔ Herd livestock into less preferred areas of the paddock.
- ✔ Switch paddocks. Livestock preference for riparian areas may be stronger in some paddocks than in others.
- ✔ Change season or timing or sequence of streamside paddock grazing. Manipulate the grazing season as livestock preference for riparian areas may vary with season.

In some streamside pastures, impact can be reduced by moving feed and other items away from the banks.

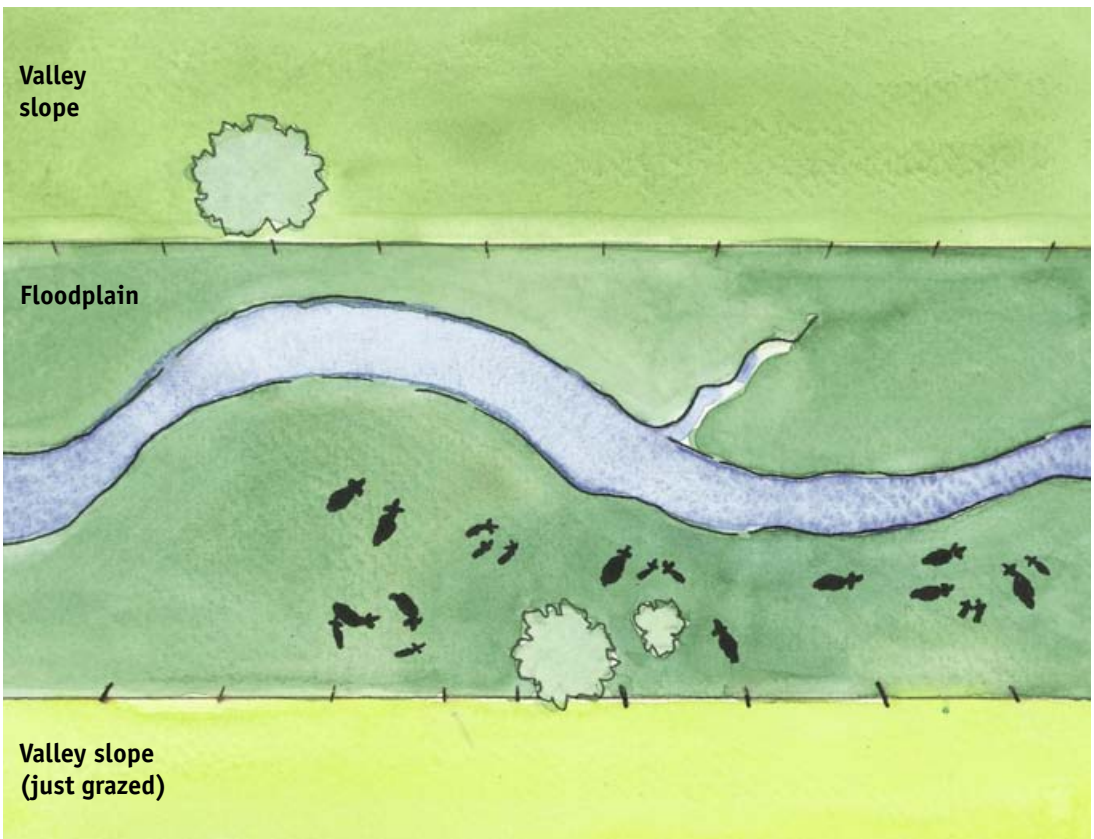
Move salt licks and feeding stations away from the streamside area.

Impacts from the grazing of riparian areas may be delayed or reduced if livestock enter the paddock from a point away from the riparian area.



✔ Change the location of the pasture entrance. Impacts from the grazing of riparian areas may be delayed or reduced if livestock enter the paddock from a point away from the riparian area.

✔ Consider fencing if less costly practices are not effective. Permanent or movable, the most suitable type depends on management goals, area size, topography, and location of shelter, water, salt, and other resources.



Temporary fences are an efficient way to control distribution. With the delayed grazing method, livestock can be fenced away from the stream until conditions are drier.

Seasonality of Rotational Grazing Practices in Healthy Riparian Areas

Managing when livestock are allowed access to riparian areas is also critical to maintaining and restoring riparian health. Riparian soil and water quality problems can be prevented with seasonal grazing.

Factors that determine the appropriate time to graze animals in riparian areas include:

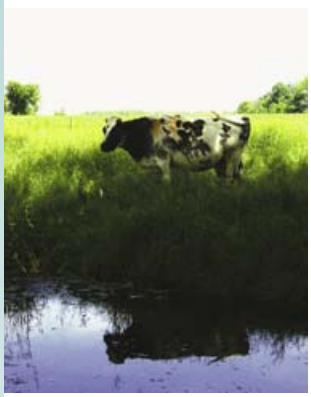
- ▸ soil moisture following snowmelt, rainfall, and heavy streamflows
- ▸ the type of riparian vegetation and its periods of peak growth and dormancy
- ▸ freeze and thaw cycles, as well as snow cover patterns, during the winter.

To prevent compaction:

- ✔ don't graze wet riparian areas
- ✔ exclude animals from riparian areas during late fall, late winter and early spring
- ✔ move livestock out of floodplain areas for most of the fall season in areas with heavy late-season rains.

To prevent erosion:

- ✔ consider fall grazing in some areas, particularly on ravine and valley slopes, if it can be carefully monitored – leaving enough vegetation at the end of the season to protect against spring runoff and erosion
- ✔ consider midsummer grazing or early fall in floodplain areas – leaving sufficient time for forage regrowth before winter.



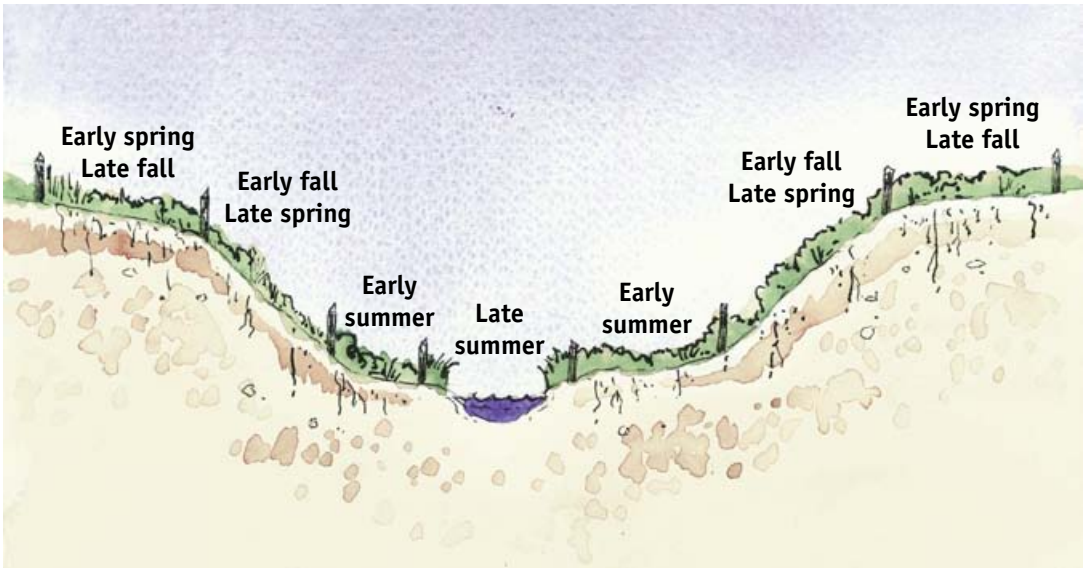
Timed grazing can also be used to protect healthy vegetative growth in riparian areas. Periodic grazing can be used to remove the top portions of grasses and sedges. This promotes vegetative reproduction by stimulating the sprouting of additional stalks or tillers.

Allowing access for grazing livestock during early spring can put them at risk of flooding and injury. In the photo above, the tree bears a high-water mark from an Easter Weekend flood.

GRAZING SEASON SELECTION

GRAZING SEASON	WHERE SUITABLE	ADVANTAGES	DISADVANTAGES
SPRING TO EARLY SUMMER	• upland areas and ravine slopes can be suitable for only a short period (3 weeks or less) • during droughts and if floodplain soils are dry so that the risk of compaction is low	• time for re-growth during the remainder of the growing season	• increased risk of floodplain compaction and bank damage in wet areas • grazing occurs during the active growth stage of plants and the risk of overgrazing may be high
MID TO LATE SUMMER	• most floodplains for short periods with management-intensive grazing practices • where salt, shade and alternative water are used to attract livestock away from the floodplain area • where full-season rest techniques are routinely used	• conditions are more resilient to impact • lush growth of streamside vegetation is more palatable and nutritious when the upland plants are declining	• reduced time for recovering from defoliation before onset of the dormant season – repeated annual grazing in riparian areas in midsummer eventually reduces plant vigour and productivity, thereby promoting invasion of undesirable species • cattle and horses will access water if no temporary fencing system is used
FALL	• most ravine slopes and upland components of riparian areas without young planted trees and shrubs • streamside grazing when salt, minerals, feed, herding and/or drinking water are placed away from the water	• reduced potential for overgrazing • soils are often drier in early fall and less susceptible to damage • reduced impact on fish and wildlife habitat needs	• potential damage to trees and shrubs due to excessive browsing • livestock may choose to linger in the riparian area unless provided with incentives to move into the uplands • higher risk of compaction and bank damage as soil water content increases

Access in early fall causes minimal damage when conditions are dry.



When managing grazing near riparian areas, not all seasons are equal.

- **Spring – In most cases, try to avoid access in spring. High soil moisture contents lead to compaction and bank damage.**
- **Summer – Without other BMPs in place, summer grazing can be the most damaging time for streamside vegetation. The grazed area doesn't have sufficient recovery time before winter.**
- **Late summer and early fall – These are usually the preferred seasons for access. Plants are mature, root reserves are up, and winter hardiness should not be affected. Moreover, low soil moisture content at this time reduces the risk of compaction and bank damage.**

Winter grazing is site-specific. Grazing grassy buffers in open winters will have similar minimal impacts to fall grazing. However, grazing treed or forested riparian areas can be devastating to vegetation. The risk of manure runoff during the winter months and early spring also increases.

GRAZING SYSTEMS

Grazing management systems vary according to the following characteristics:

- ▸ site types, quality and condition – riparian grazing systems should be site-specific
- ▸ livestock type – the needs and behaviours of grazing livestock
- ▸ pasture quality and sensitive areas – production is optimized and damage is minimized
- ▸ stocking rates and density – some systems accommodate density levels that exceed the carrying capacity of fragile riparian areas
- ▸ frequency and duration – length of time livestock can spend in a paddock will vary depending on environmental conditions, grazing system, season of use, and growth rate of vegetation
- ▸ season of access – some grazing systems allow you to alternate the season of use, thus minimizing the potential adverse effects of repeated grazing during a particular season

► paddock layout – the greater the number of paddocks, the shorter the amount of time livestock spend in each paddock, and the lower the potential for re-grazing plants before they fully recover from previous grazing events.

SUITABILITY RATINGS FOR RIPARIAN GRAZING SYSTEMS

GRAZING SYSTEM	POTENTIAL FOR IMPROVING ANIMAL DISTRIBUTION	POTENTIAL FOR MAINTAINING BANK STABILITY	POTENTIAL TO REDUCE DAMAGE TO STREAMSIDE SOIL
SEASON-LONG	Very low	Low	Low
SHORT DURATION – HIGH INTENSITY	Very high	Moderate	Low
 **Short-duration systems are well-suited to floodplains that dry out during the summer.**			
DEFERRED – NO ROTATION	High	Low	Moderate
DEFERRED WITH ROTATION	High	Moderate	High
REST–ROTATION	High	High	High
 **In rest-rotation systems, a selected paddock is left at rest for an entire season.**			
STREAMSIDE PASTURE[1]	Very high	High	High
 **Riparian pasture is established to control timing and intensity of grazing.**			
CORRIDOR FENCING[2]	Not applicable	Very high	High

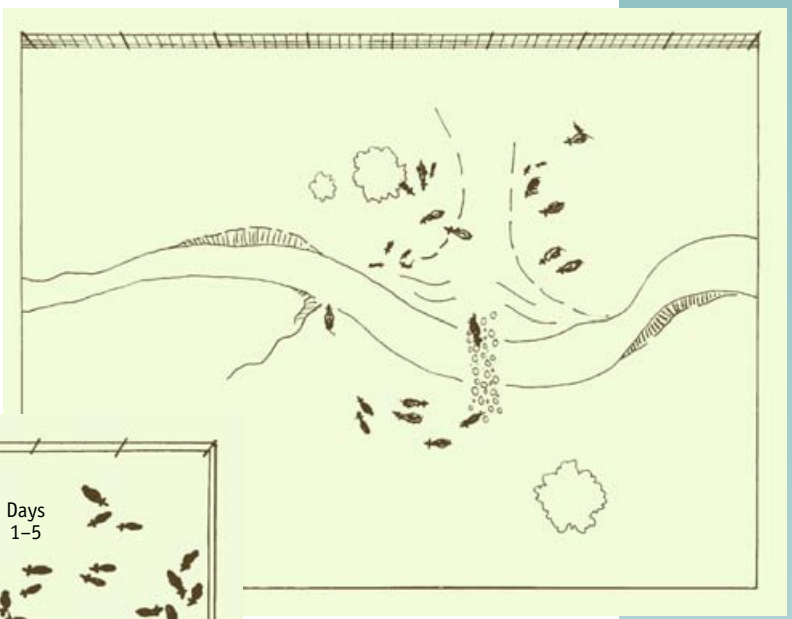
[1] A paddock is established consisting exclusively of the streamside area to control timing of grazing and level of utilization.
[2] Streamside area is fenced-off and no grazing is allowed.

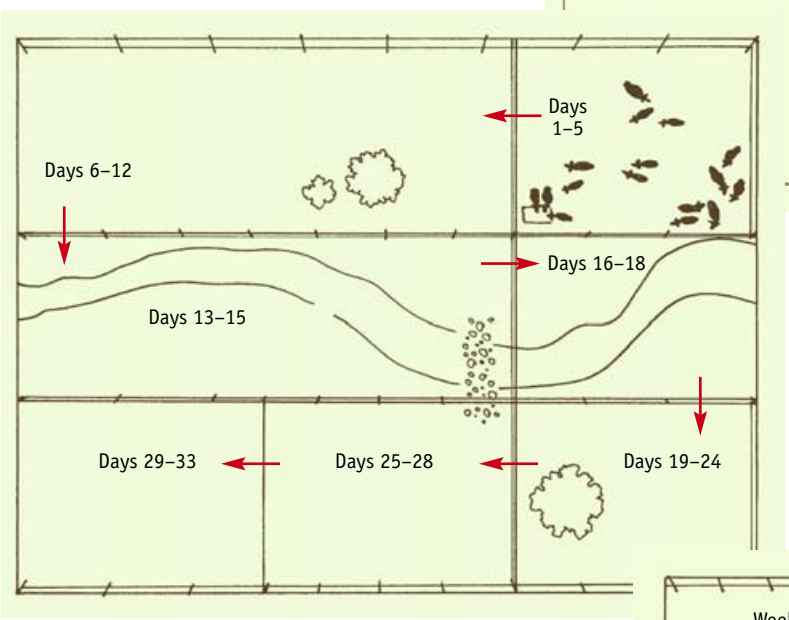
STREAMSIDE GRAZING MANAGEMENT SYSTEMS

GRAZING SYSTEM	DESCRIPTION	WHEN AND WHERE SUITABLE	BEST MANAGEMENT PRACTICES	COMMENTS AND CONCERNS
SEASON-LONG	• season-long stocking • livestock can be very selective regarding forages **Severely degraded areas usually require fencing and exclusion as part of a suitable management system.**	• bedrock-controlled shores and wide-channel streams where stocking rates are very low and minimal impact is observed • livestock behaviour follows forage growth	• requires management features such as salt, feed, shade, water and barriers to encourage livestock away from sensitive areas	• forage species can be over-grazed – seasonal damage isn't prevented • unsuitable for pastures near wetlands and ponds • may work with corridor-fencing where livestock are excluded with this system, particularly if near narrow-channel watercourses and drainage ditches
TIME-CONTROLLED GRAZING (OR SHORT-DURATION)	• livestock are rotated through several paddocks over short intervals on a recurring basis • high stocking rates for short periods of time – with rest periods for recovery	• suitable for grassy streamside pastures with fenced paddocks • useful for dairy and other high-production livestock operations	• move livestock to next paddock when 10–15 cm (4–6 in.) of forages remain • note that rate of rotation varies with the rate of plant growth • use specialized timing and intensity of grazing to control weed growth	• rest periods must be long enough for suitable recovery • grazing times must be short enough to prevent rapid regrazing • there's a higher risk of damage in spring
SEASONAL ROTATION (OR DEFERRED ROTATION)	• grazing is delayed until forage plants have reached desired growth stage and when soil conditions are less prone to damage	• suited for low-density stocking near wide-channel streams, middle-reach rivers and riparian areas to avoid damage in spring and plant stress in mid-summer	• use short grazing periods – not managed as intensively as time-controlled grazing • works best with alternative watering systems and other practices that encourage animals to congregate away from streambanks	• riparian areas should be in healthy condition prior to using this system • helps newly planted buffer areas get established

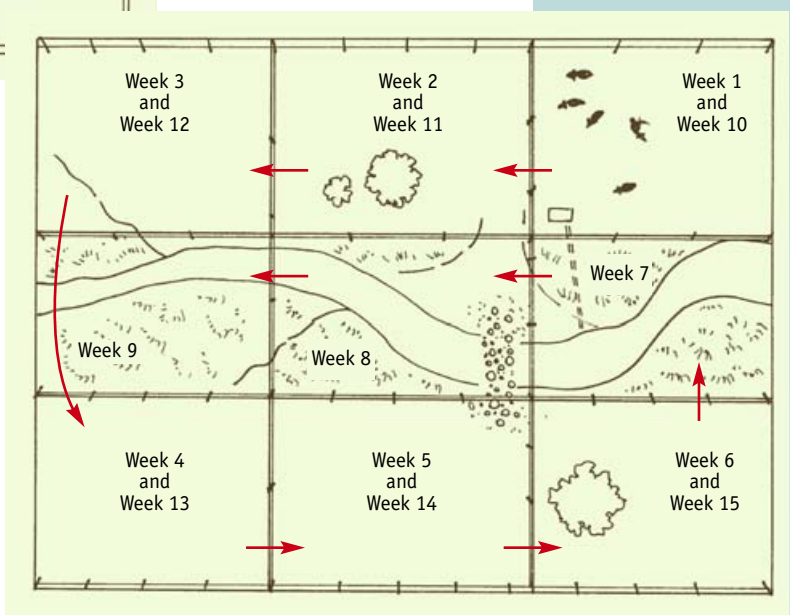
Chart continues on pg. 48

Season-long grazing is most suited when stocking rates are very low and when feed, water or shelter has been moved away from banks.





Short-duration systems can work well on well-established forages and productive soils when rest periods are adjusted to soil moisture conditions.

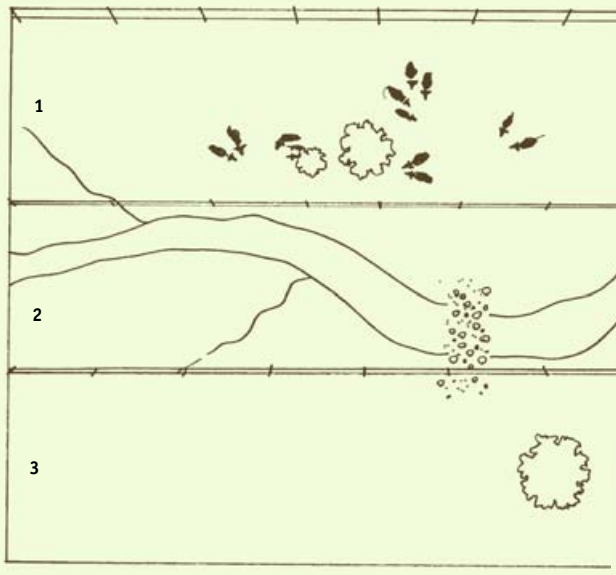


With seasonal rotation, grazing is delayed until pasture species growth (maturity) and conditions are more suitable.

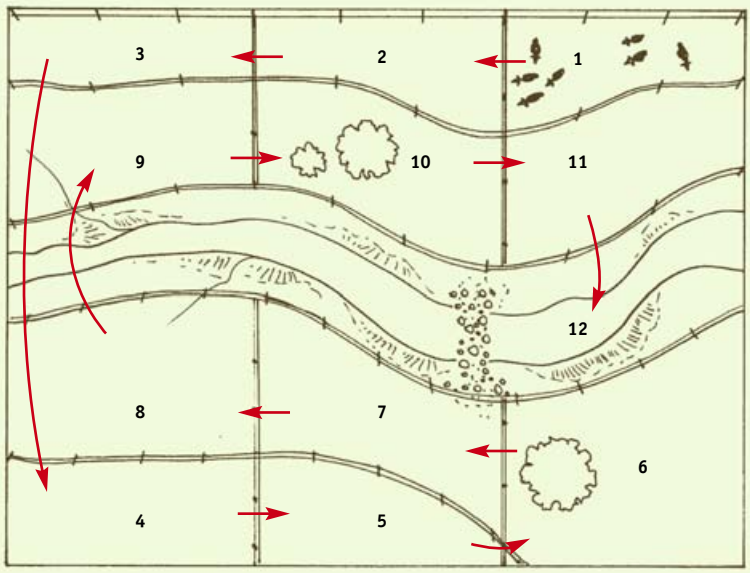
STREAMSIDE GRAZING MANAGEMENT SYSTEMS (cont'd.)

GRAZING SYSTEM	DESCRIPTION	WHEN AND WHERE SUITABLE	BEST MANAGEMENT PRACTICES	COMMENTS AND CONCERNS
THREE-PASTURE REST–ROTATION SYSTEM	• only 2 paddocks of 3 grazed each year • rotation schedule for pastures: ◦ year 1: spring grazing ◦ year 2: late summer and fall grazing ◦ year 3: complete rest	• ideally suited for streamside grazing – floodplains can be favoured to allow for restoration or improved pastures to become established • unsuitable for areas recently planted to woody species	• monitor carefully to protect against streambank degradation in spring and forage depletion in the fall • requires management features such as salt, feed, shade, water and barriers to encourage livestock away from sensitive areas	• if used in woody riparian areas, restrict grazing time during the late-summer rotation to limit livestock feeding on woody plants • adding more pastures will increase the amount of time land is rested and will further protect woody species • allows for grazing restored areas during prolonged droughts
SITE-SPECIFIC MANAGEMENT	• paddocks are designed to maximize grazing and minimize risk – using pasture species, growing season and site position as factors	• in riparian areas where site differences are distinct (e.g., wet floodplain and degraded ravine slopes)	• graze drier sites early and for short durations • defer grazing on wetter sites and graze for short intervals	• acceptable low-density grazing in grassed ravines, floodplains and adjacent to wetland areas, where access can be controlled/restricted to the preferred (drier) season, and for very short periods to control weedy vegetation

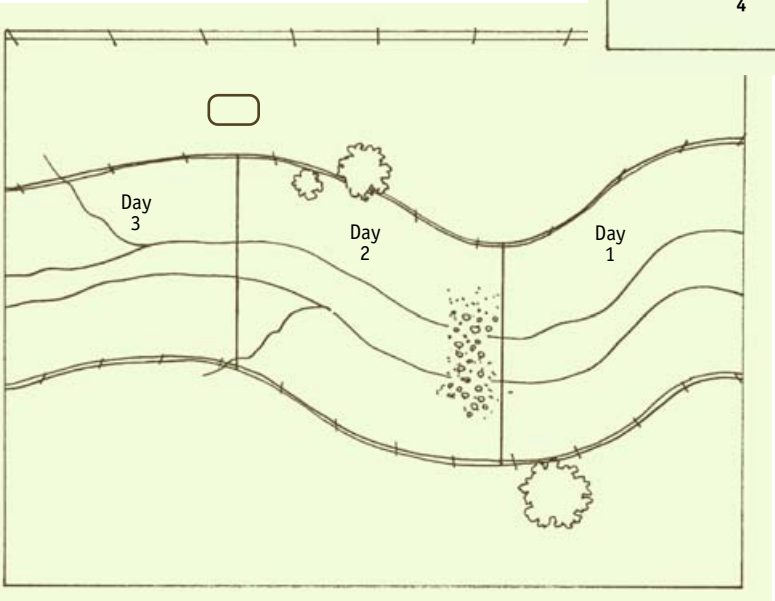
Degraded ravine slopes can be managed separately from the floodplain and upland pastures to help forages re-establish.



With pasture-rest rotation, only two of the pastures are grazed each year. This system is suited to areas where access is needed but banks need time to rehabilitate.



A site-specific system involves the grouping of paddocks by soil and site properties (rather than just area-grazed). Dry areas can be rested thoroughly during droughts.

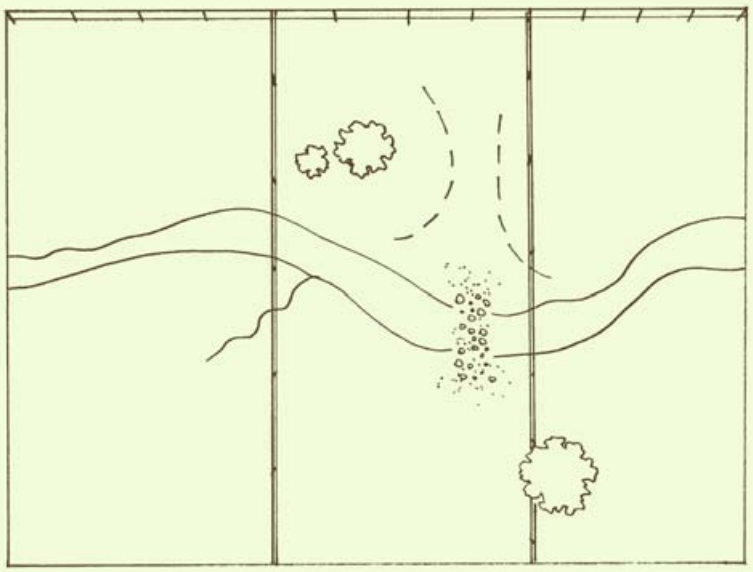


Cross-stream short-duration is a hybrid of short-duration and site-specific systems. It allows short-term access to control weed growth along streams. This system can be modified annually by changing the (temporary) fence design to a short-duration, seasonal or pasture-rest system.

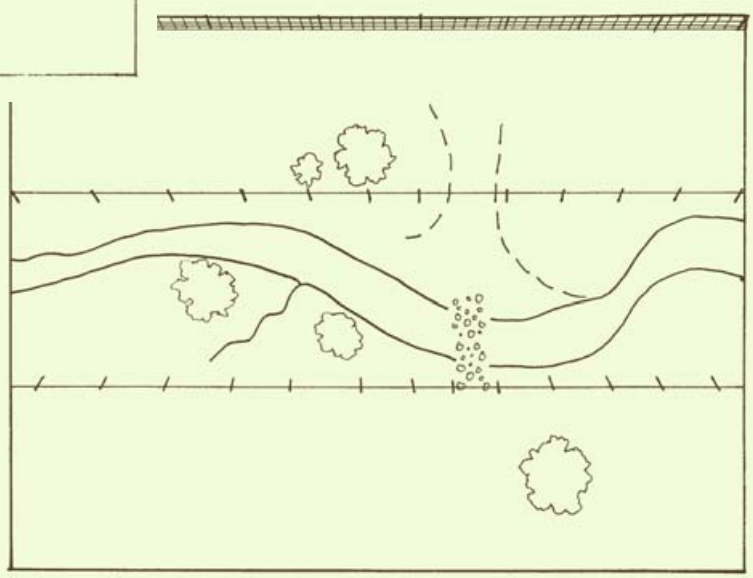
PASTURE LAYOUTS FOR SOME STREAMSIDE GRAZING MANAGEMENT SYSTEMS

PASTURE LAYOUT	DESCRIPTION OF PADDOCK LAYOUT	WHEN TO USE THIS PRACTICE	BEST MANAGEMENT PRACTICES	COMMENTS
RIPARIAN UPLAND PASTURE	• small paddocks containing both upland and floodplain vegetation	• smaller watersheds and riparian areas near short-sloped ravines in good condition • enough good quality forage available in upland areas so livestock don't depend on riparian vegetation for their foraging needs	• move livestock to non-riparian areas before upland vegetation becomes depleted	• use riparian-dominated paddocks for access in mid-summer or as late-season hay crop
RIPARIAN PASTURE	• streamside pastures separate from uplands	• when paddocks are relatively small so that impact can be monitored • when weed control is required • on sites where scheduling grazing doesn't depend on condition of upland vegetation	• monitor and manage to restore favourable riparian conditions • monitor impact on soil and vegetation • move to paddocks away from streamside area	• change season and duration to reduce annual impact
CORRIDOR FENCING	• permanent exclusion by fences	• where recovery of degraded riparian areas is required • permanent fences are costly and may not be suitable in ice-floe and flood-prone areas • electric or other non-permanent fences allow more management flexibility at a lower cost	• use cedar rail for shallow to bedrock • use electric fencing with flexible posts for ice-floes • use cement fenceposts in steel drums for high water table conditions • maintain with seasonal inspections • develop buffers on streamside	• unsuitable where impact is minimal and alternative water is too expensive • corridor fencing alone may not improve riparian grazing practices

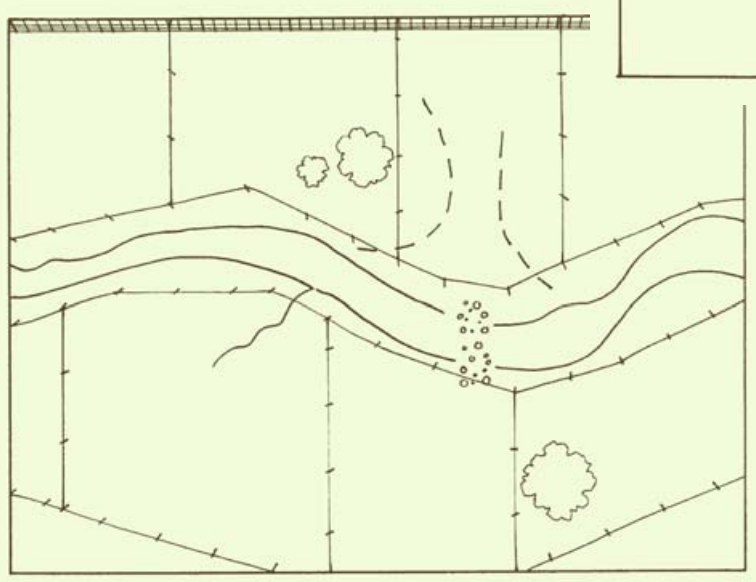
Corridor fencing with permanent fencing materials will provide streambank protection. Outside the corridor, you have season-long or intensive grazing management options.



Small paddocks consisting of both upland and floodplain sites are suitable for smaller-sized streamside pastures when conditions are good.



With corridor fencing, livestock are excluded from the stream area. Intensive grazing management practices are encouraged for the rest of the riparian and upland area.



Floodplain paddocks are managed separately from the upland and ravine slope paddocks.

If you have grazed riparian areas, you have two choices: manage or exclude!

FENCING SYSTEMS

FENCING FOR EXCLUSION

Fencing for exclusion means livestock have no access to a watercourse, pond, lake or wetland. Fencing doesn't have to be permanent and expensive – but it must be effective.

Exclusion fencing is the first step towards rehabilitation of riparian areas. There's less sediment disturbance and no direct manure deposition. Bank, bed, and local riparian erosion is also reduced. Water quality improves. Fish and wildlife habitat starts to come back.

Suitability

Permanent fencing is suitable for:

- holding areas adjacent to riparian areas
- intensively grazed riparian areas where the density exceeds 2.5 Nutrient Units (NU)/ ha/yr (1 NU per acre in a given year)
- extensively grazed riparian areas with severe problems or with moderate problems where fencing is the most suitable solution
- extensively grazed areas where fencing for exclusion is determined to be the only effective long-term solution.

Fencing with buffers is a suitable management option in riparian areas where damage is noticeable and ice-floes are not common.

Permanent fencing is not an option for areas prone to ice-floes.

If your watercourse is a municipal drain, you must confirm the appropriateness of your plans with the engineer's report for the municipal drain.

Permanent fencing is not suitable for:

- riparian areas prone to ice-floes
- riparian areas subject to frequent and extensive flooding.

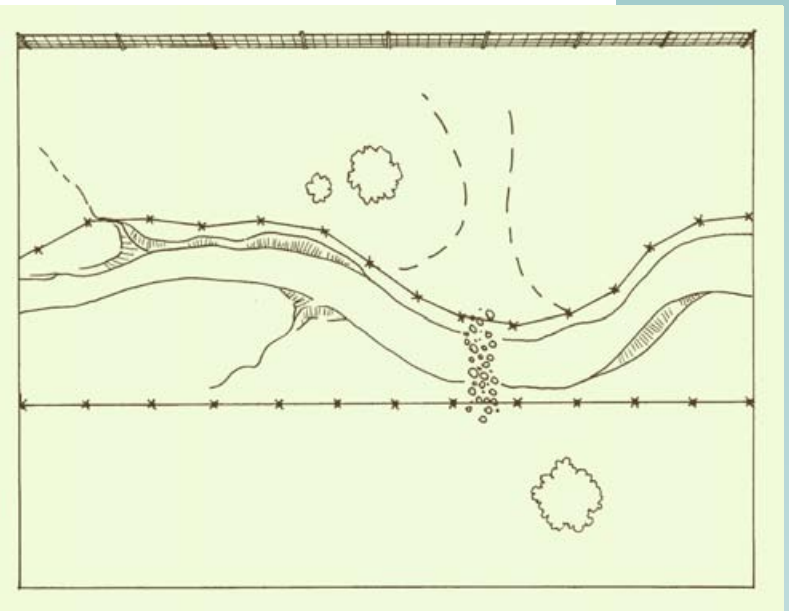
Design Considerations

As you plan, consider the following:

- ▸ size of area and length of fence
- ▸ 5-m (15-ft) minimum buffer (recommended) between fence and top of bank
- ▸ square-off for maintenance ease
- ▸ electric fencing with flexible posts for ice-floes
- ▸ cedar-rail designs for shallow to bedrock or excessively stony areas
- ▸ special fencing for high water table conditions – e.g., fencepost cemented in steel drum.

Maintenance Checklist

- ✔ inspect permanent fences seasonally for repair
- ✔ inspect posts regularly
- ✔ manage vegetation near electric fences



Some graziers prefer to square-off paddocks where there is considerable stream meandering.

Cedar-rail fences can be designed to work in pastures that are too wet or shallow to bedrock.

Permanent fencing can and should be complemented with any of the following:

- ▸ controlled access
- ▸ buffer strip and treed buffer establishment
- ▸ alternative source of drinking water
- ▸ relocating shade, salt and feeding
- ▸ temporary grazing of riparian areas.

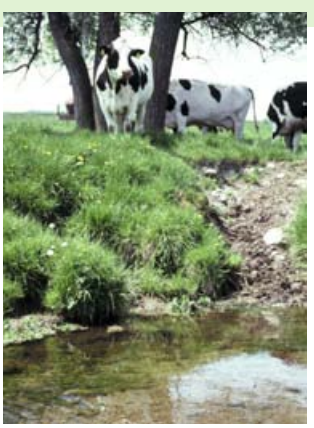
FENCE TYPES

TYPE	DESCRIPTION	ESTABLISHMENT TIPS	ADVANTAGES + / DISADVANTAGES –
RAIL 	permanent • traditional fencing method	• place a strand of electric or barbed wire along fence ○ some styles rest on top of ground, thus a good choice on shallow bedrock or high water table locations • allow space for drain maintenance • leave at least 5 m (15 ft) from top of bank/shore as buffer	+ permanent + minimal inspection and maintenance + moderate cost – construction can be time-consuming – not suitable for ice-floes and floods
PAGE WIRE 	permanent • page wire	• select fence height and wire spacing based on animal type to be excluded • fence must be adequately anchored • allow space for drain maintenance • leave at least 5 m (15 ft) from top of bank or shore as buffer	+ permanent + minimal inspection and maintenance – construction can be time-consuming – not suitable for ice-floes and floods – expensive
SUSPENSION 	permanent • high-tensile smooth wire	• has 3–8 strands of wire on posts set at 27 m (90 ft) centres • can be electrified, i.e., 1 or 2 strands 12.5 GA – smooth wire is most common • allow space for drain maintenance • leave at least 5 m (15 ft) from top of bank/shore as buffer	+ permanent + relatively quick and easy to install in floodplain areas + moderate cost – electrified fence requires some vegetation maintenance
ELECTRIC 	temporary or permanent • wire/polywire/ polytape	• can be installed quickly • space posts at 15 m (50 ft) • use tape, wire or combinations with easy-to-install posts • must be properly grounded • train livestock to use	+ easily installed and moved + suitable for flood-prone areas + low cost – requires power source – some maintenance/management requirement with vegetation – requires regular checking

Note: Never electrify barbed-wire fence.

If previous access provided drinking water for livestock, you must provide an alternative source. See pages 58–59 for suggestions.

If livestock are given a preferred location to access water, pressure may be greatly reduced along other portions of the watercourse – even to the extent of reducing the need for extensive fencing.



FENCING TO REDUCE ACCESS

Controlled access involves fencing with openings that permit livestock access to the water for drinking or crossing. It is not intended for high-density grazing areas.

Please note that allowing livestock access is not in full compliance with the Fisheries Act. However, it may be a necessary step where total exclusion is not possible.

Fencing to reduce access is suitable:

- for low-density riparian grazing areas where access is causing low to moderate problems
- for upper and middle reaches of watersheds, and some ponds
- where pasture length is long and/or the stream meanders, making it difficult to establish continuous fencing
- where there are pastures on both sides
- where creating a reliable water supply would be difficult and expensive
- where streambed materials are coarse enough (e.g., gravels, stones, cobbles) to reduce impact or to reduce appeal for livestock crossing

Management Tips

✔ Use permanent or temporary fence to reduce access.

✔ Leave at least a 5 metre (15-ft) setback from the top of bank.

✔ Determine approach to crossing:

- don't focus all livestock on one crossing in extensive pastures
- locate crossings to points that currently exist – this distributes the smaller impacts to several areas and allows for stream recovery between crossings (see pages 57–58 on crossings).

✔ Monitor livestock movement in the pasture to determine favoured access points:

- place planned crossings nearby, and use limited fencing to "funnel" livestock to the new crossing.

Advantages and Disadvantages

+ makes water available for drinking
+ reduces time that livestock are in water
+ stabilizes banks
– concentrates livestock in specific areas
– can increase impacts at focal points
– may require maintenance at entry points
– top of bank trailing can cause impact unless fence is set back from top of bank.

Controlled access – here as one-sided access – is suitable for certain low-density streamside pastures, particularly if salt, feed, shade or alternative water have been located away from the area.

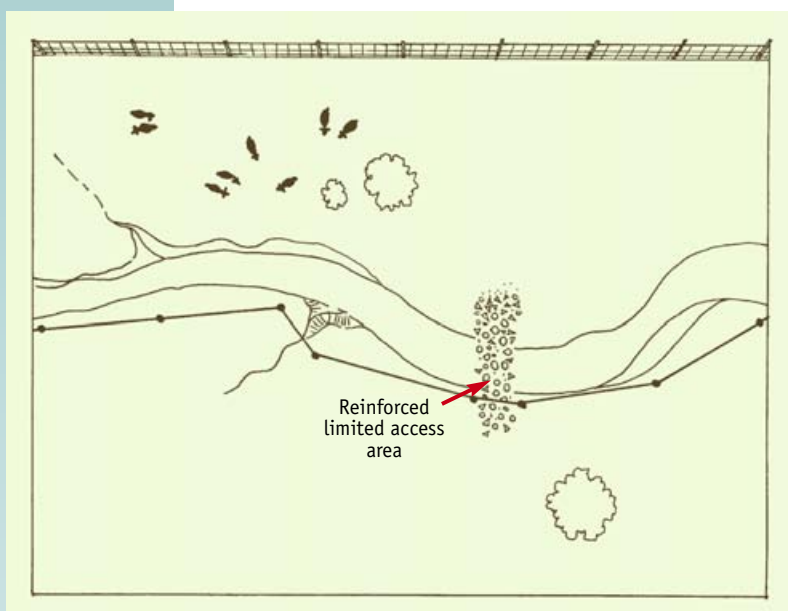
Monitor livestock to determine favoured access points before designing fencing systems to reduce access.

LIMITED ACCESS POINTS

Limited access allows livestock to reach water for drinking but does not permit crossing. Again, strictly speaking, access is not allowed under the Fisheries Act. However, it's better to do whatever possible to protect water quality than do nothing at all.

Limited access points are suitable for:

- riparian pastures under planned management intensive grazing system
- pasture systems where livestock pasture on only one side of a watercourse
- pastures where there's already a bridge or culvert crossing that can be used by livestock to get to other pastures
- areas where alternative watering isn't feasible
- upper-reach areas where ice damage or flooding hasn't been a concern.



One-sided pasture fencing can work well if it's part of an intensive grazing management system.

Management Tips

- ✔ Construct a permanent or temporary fence that extends from the shore into the water to depths of <46 cm (18 in.) and can be moved during high water periods.
- ✔ Make it large enough for several livestock to water at once.
- ✔ Protect with erosion-resistant materials.

Advantages and Disadvantages

+ low cost
+ livestock don't get complete access to water
+ concentrates livestock in only a few areas

– only access one side
– impact on sloped entry to water
– limited use for pastures on both sides
– susceptible to ice and floods
– requires fencing along entire access
– should also include stabilization work in area where livestock have access to drink (ramp, shore, upstream and downstream)

CROSSINGS

When pastures are located on either side of a watercourse, you may need to manage access while minimizing damage.

Closely monitor livestock movement in the pasture to determine the location of favoured watercourse access points. Establish crossings nearby, and consider using limited fencing to funnel livestock to preferred access sites.

Remember that structural features should be designed to reduce access, but should not cause damage to fish habitat or prevent others from using navigable waters. Poorly designed crossings can obstruct fish movement in flowing waters and limit navigation by small watercraft.

If there are no environmental concerns with a natural crossing between extensively grazed areas, then you may want to consider leaving well enough alone. Sometimes the siltation that could result from improvements can make things worse.

You must check with regulatory authorities to obtain approvals before creating any type of crossing structure. Start with your local Conservation Authority or Ministry of Natural Resources (MNR) office. Remember too that for work in and around water, you may require assistance from an engineer or other professional.

Bridge Crossings

▶ wood or steel bridge adequately designed as crossing
▶ suitable for upper-reach watercourses with excessive flooding or ice-floes
▶ should span from the top of the banks of both sides
▶ can be used by machinery
▶ expensive, requires permit and approvals – not suitable for drains

Mid-Level Crossings with Full-Flow Culverts

Culverts and concrete are used to construct these bridge-like crossings at mid-bank level.

▶ culverts are usually placed at bed-level (embedded to 10% of culvert diameter)
▶ may be suitable for narrow-channel streams and drains
▶ approvals are required from the various agencies for work in and around water
▶ relatively high cost
▶ can cause flooding upstream

Bed-Level Crossings

- crossing is established at watercourse bed-level
- materials used are concrete slats, coarse, angular stone and other prefabricated materials
- suitable for wide-channel streams and some drains
- approvals are required from various agencies for work in and around water
- no negative impact on water flow if built properly
- livestock still have impact while crossing

Leave Natural Crossings As They Are

- livestock use one or multiple natural (non-constructed) crossing areas
- bed is firm and contains >50% coarse materials (>2 mm [0.08 in.] in diameter)
- suitable for very low-density grazing systems with coarse-textured beds
- use other BMPs to alter grazing and traffic behaviour
- use rock or boulder deflectors or thorny shrubs to direct livestock to preferred crossing areas

ALTERNATIVE WATER SOURCES

Alternative water alone can dramatically reduce the amount of time livestock spend in and around water. Depending on the circumstances, livestock even show a preference for water troughs over streams. Alternative water may be drawn from streams, wells or groundwater springs.

Recent grazing management research indicates that, given the choice, livestock prefer alternative water sources. And when such sources are put in place, they will reduce access by 80% or more.

WATER FROM BARNS

If a barn is nearby, this is the simplest approach to accessing groundwater supplied through an existing well. Consider shading the trough to limit algal growth if this is a permanent site.

SOLAR-POWERED PUMPS

Recent designs of more efficient pumps and solar power panels result in a feasible, reliable source. Solar panels that are used to recharge deep-cycle marine batteries provide a continuous power source for the pump.

DUGOUT PONDS
Dugout ponds are excavated to collect surface runoff, groundwater and tile drainage as an alternative water source. Buffer areas around the pond and fencing should be considered to protect the quality of the water source. Have a soils investigation done prior to excavation to be sure water will stay in the pond. Otherwise you'll need artificial liners of bentonite clay or synthetic materials.

NOSE PUMPS
This diaphragm pump is mechanically activated by livestock. The pumping action draws water through an intake line and foot valve. Nose pumps aren't suitable for calves or sheep.

SEEPAGE TROUGHS
Seepage troughs intercept groundwater from seepage areas on hill slopes. If used year-round, place inlet and outlet pipes close together. This will increase surface turbulence and help keep them ice-free.

WINDMILLS
A windmill can be expensive, but is reliable and low maintenance. Old mills can be rebuilt to keep costs down. These work best if you provide a storage reservoir as backup to supply water during low wind periods.

RAM PUMPS
Ram pumps take advantage of falling or flowing water to drive the pumping mechanism. Get a supplier to help you determine the appropriate pump for your situation.

SHADE, SHELTER AND FEEDING

Dense plantings of trees and shrubs – especially with thorns – can deter access to surface waters.

In extensively grazed areas with moderate-to-minimal risks and observed problems, sometimes just a combination of a few BMPs can make all the difference.

For example, moving feed, salt and water away from the riparian area can be as effective as and less costly than permanent fencing. In areas of low risk, placing deflectors in areas of habitual access and adding alternative watering may be sufficient to reduce the risk of environmental impact.

Vegetative Barriers

✔ Use thorny shrubs or very dense evergreen trees to deter livestock from riparian areas.

✔ Use temporary fencing and some weed control practices to protect the trees until they're established, especially on floodplains.

✔ Use this BMP in combination with other non-fencing options to increase effectiveness.

In addition to those trees and shrubs that are already thriving, consider species such as: wild rose, black locust, wild apple, red pine, white spruce, white cedar and tamarack.

This approach is suitable for low-risk areas where livestock have access at several points.

Stone Deflectors and Barriers

✔ Place stones and other materials in the path leading to riparian areas. Livestock will gain access at a different place or go to an alternative watering facility.

✔ Use materials such as:

- ▸ large natural stone (cobbles or larger) on top of the bank – space them far enough apart to permit plants to grow
- ▸ permanent fence in segments – this keeps livestock completely out of sections to permit permanent plant cover, tree growth and root stabilization.

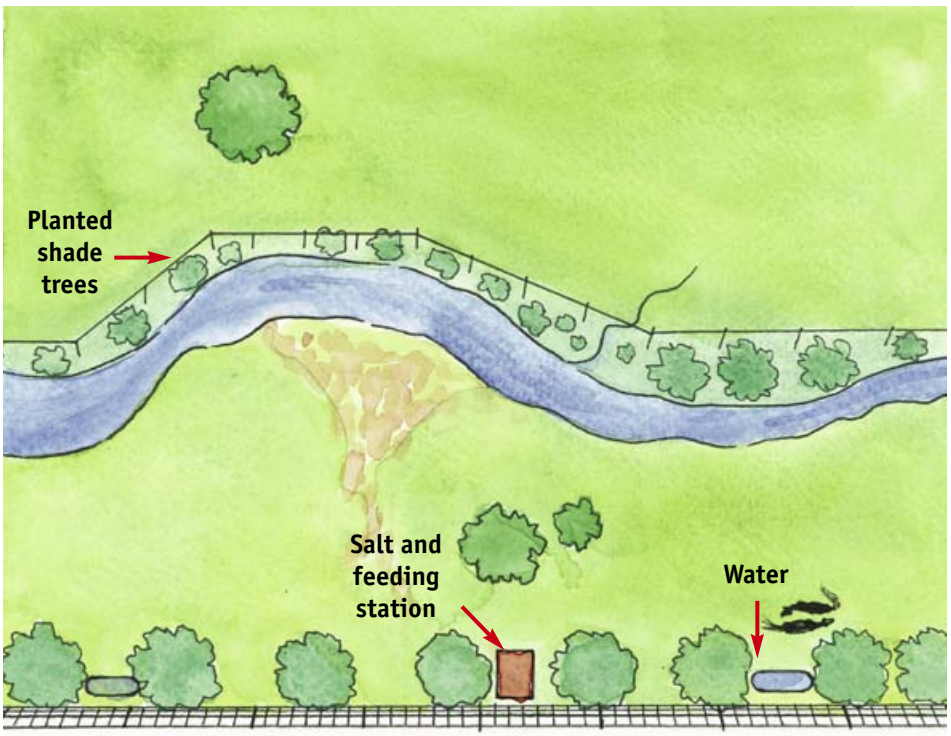
Placing stones and other physical barriers may deter livestock access when used in combination with other streamside grazing BMPs.

Relocating Shade, Salt and Feeding Areas

Livestock are attracted to shade, salt and feeding areas. Moving them away from riparian areas will reduce the risk of impact in moderate-to-low risk areas. Again, these BMPs work best if done in combination.

✔ Locate salt, feed and shelter(s) more than 50 metres (164 ft) from surface water (ponds, lakes, watercourses or wetlands) where there is no fencing.

BMPs FOR WATER QUALITY AND HABITAT



Shaded streams are better for fish habitat. Shade trees and shrubs should be planted on the south and west sides to improve the cooling effect as seen on the left side of the stream. Shade can also be used to attract away from riparian areas. It is more effective when alternative water, salt and feed stations are also located away from the streamside.

Trees planted in riparian areas where extensive fencing is not planned may eventually encourage access by livestock seeking shade.

Even well-managed riparian grazing areas cannot control erosion and runoff from cropland. Much of the risk of surface runoff and concentrated flow from cropland can and should be managed in the field by soil and water conservation structures and practices. Grazed riparian pastures are one part of this soil and water conservation system – to repeat, **they are the last line of defence**.

The BMPs illustrated below are practices and designed structures that will reduce cropland erosion and runoff.

CONTOUR STRIP CROPPING

Alternate strips of row crops, cereals and forages on the contour level slow surface flow and increases infiltration rates.

EROSION CONTROL STRUCTURES
Structures such as this grassed waterway are designed to control erosion and safely convey surface water to an adequate outlet. You should seek technical advice for design and construction. Common examples include grassed waterways, drop pipe structures, terraces, and water and sediment control basins.

ROCK RIP-RAP
Rock rip-rap is a hard erosion-control structure for banks. Angular rocks are strategically placed at 2-ft horizonal for every 1-ft vertical rise, or flatter to protect bank materials. Rock rip-rap is most suited to local spots of extreme erosion. It may not be suitable for sandy areas or areas with significant subsurface flow. In these areas, soil materials can be washed from beneath the rock, causing failure and severe erosion. These structures are best used in combination with plant bioengineering techniques.

LIVE STAKING
Live, rootable cuttings are planted along eroded banks of small streams to create a living root mass that will stabilize and bind the soil.

DROP PIPE INLETS
Placed at the edge of fields near ditches and other watercourses, drop pipe inlets drop concentrated flow and ponded waters safely to watercourses. Pipe designs can be steel or plastic.

WaSCoBS (WATER AND SEDIMENT CONTROL BASINS)
WaSCoBs are earthen berms constructed across a low draw in the field with the function of ponding runoff water. They prevent gully erosion by intercepting concentrated flow and creating temporary ponding conditions behind an earth dam or berm. Ponded water is slowly released through a drop inlet to a proper tile inlet. Water is ponded behind the berm for up to 24 hours.

GMP – HOW TO DEVELOP YOUR PLAN

Planning is a process of working from ideas and vision to decisions and action. It's also a work in progress. Expect to continually assess actions and adjust your plan to keep you on track.

Over time, a comprehensive plan provides a mechanism – through record-keeping and monitoring – to improve BMPs and your ratings in the riparian risk assessment. It can also signal diligence in minimizing environmental impacts.

We'll explore steps 1–5 in greater detail on pages 66-95.

Riparian areas are both productive and fragile. Developing an effective grazing management plan for riparian areas requires a detailed inventory and assessment of local conditions.

8-STEP OVERVIEW

Step 1. Set goals. (pg. 66)

- Develop riparian management goals that are compatible with your overall long-term farm business goals.
- Integrate production targets with financial goals and planned environmental improvements.
- Prioritize goals.
- Assess and redefine the goals if necessary.

Set business goals that reflect both grazing requirements and site limitations.

Step 2. Conduct an inventory of your streamside-grazing area. (pg. 68)

- Use air photos and soil maps.
- Map the facilities. Include fences, gates, stock-watering stations, corrals, power sources, salt and mineral stations, trails and roads.
- Map pasture sites. A pasture site is an area of land with the potential to produce a specific kind and amount of vegetation. Common Ontario pasture sites include: loamy, stony, floodplain, wetland, and sandy.
- Map pasture types such as native grassland, shrub type, woodland type, marsh type, and seeded pasture.
- Conduct a pasture condition survey. Pasture condition assessment is based on comparing species composition on a specific pasture site to an undisturbed site with the same potential. This assessment works well for the upland pasture sites and forms the basis for stocking rate recommendations and other grazing management decisions.

Use maps and aerial photos to map the land and water features of your streamside grazing.

To assess pasture condition, compare vegetation composition on a pasture site to an undisturbed site with the same potential.

Conduct a risk assessment for your riparian area.

Step 3. Conduct a riparian risk assessment. (pg. 73)

- Consider potential and actual risks of environmental damage with respect to site features, sensitive areas, management practices, and downstream use.

Use this book and other references together with your own observations to determine herd forage requirements from streamside grazing areas.

Step 4. Determine forage requirements. (pg. 87)

- Determine livestock grazing forage requirements in order to plan the proper location, paddock size, and grazing frequency and duration.

Now that you've set goals and inventoried grazing resources, you're ready to analyze the information and develop options.

Step 5. Analyze, interpret, and select a management system. (pg. 88)

- Look for risks and opportunities. Examine the information you've collected to uncover potential improvement opportunities.
- Select management practices that will capitalize on those opportunities.
- Take into account:
  - the needs of both the upland and riparian areas
  - balancing forage demand with forage supply, allowing flexibility to meet year-to-year fluctuations in forage productivity.

Step 6. Develop an action plan.

- If needed, redesign a paddock and facilities layout that suits the local conditions and goals.
- Schedule BMPs for pasture improvement and protection of sensitive high-risk areas.

Schedule BMPs to improve production and protect sensitive areas.

Step 7. Implement the plan.

- Get how-to knowledge:
  - get advice
  - get permission
  - get going!

Seek professional assistance where necessary to put the plan into action.

Step 8. Monitor and update the plan.

- Monitor riparian health and pasture condition.
- Check on pasture performance in response to improvement BMPs.
- Update plan accordingly.
- Redo risk assessment to evaluate impact of GMP actions.

Appropriate streamside grazing involves managing livestock distribution.

Grazing management planning is an ongoing process. Assess and update the plan to increase its effectiveness each year.

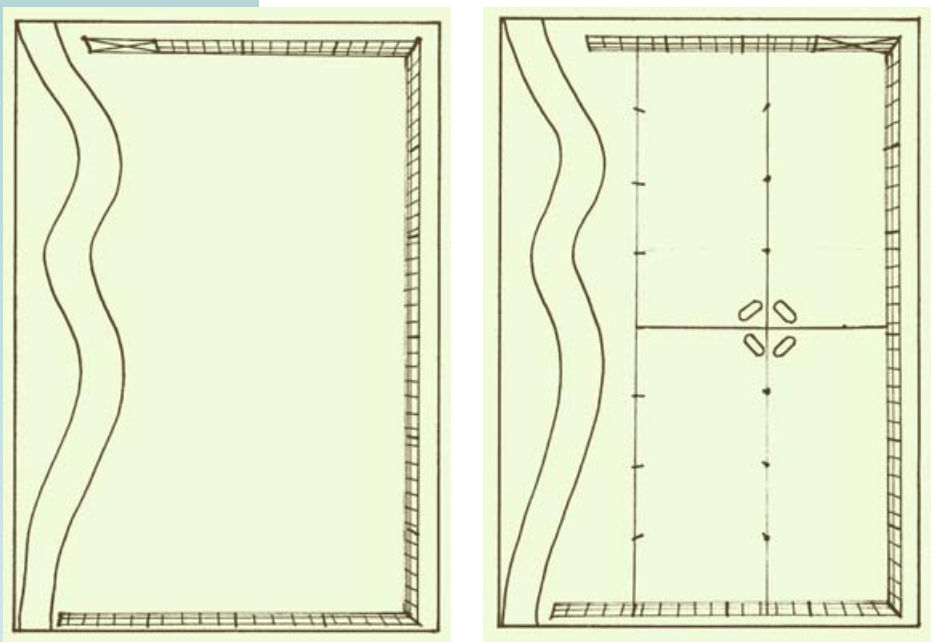
STEP 1. SET GOALS

The term "managed grazing" encompasses a range of strategies and philosophies. But as you set goals for pasture production and environmental protection, remember that the most critical component is management. The specific riparian grazing system you choose is important, of course. But it's good management – with controlled use – that will get you desired results.

Other critical components of riparian grazing practices include:

- combining managed upland grazing practices with good riparian grazing management
- installing alternative watering systems and controlling grazing to minimize deposition of manure in or near streams
- adapting grazing management practices to local conditions and to the species being grazed
- employing long-term rest from grazing when riparian areas are highly degraded
- employing short-term or seasonal rest to protect wet streambanks and riparian vegetation that is emerging, regenerating, or setting seed
- maintaining streambank structure and function by maintaining a healthy cover of riparian vegetation
- using a flexible approach that involves documenting mistakes so that they are not repeated.

Keep livestock from streams and streambanks.



To encourage livestock to move around paddocks, construct small paddocks that are as square-shaped as possible, and place water in each paddock.

As with upland grazing practices, livestock should be managed to ensure that they optimize forage use, graze evenly across paddocks, and do not congregate in any one area.

Constructing small paddocks that are more square than rectangular, and placing water and any supplements at different corners of the paddocks will encourage livestock to move around paddocks.

Alternative water systems and controlled crossing areas are critical management tools for riparian areas.

PUTTING STREAMSIDE GRAZING BMPs INTO PRACTICE

GOAL	BEST MANAGEMENT PRACTICES
REDUCE STREAMBANK DEGRADATION	• create designated stream-crossing areas • move alternative water, salt and other features to reduce congregation
RECOVER DEGRADED RIPARIAN AREAS	• monitor streamside area to identify areas of concern • replant where necessary – use establishment techniques suitable for streamside areas • rest pastures to allow new plants to become well-established • exclude livestock from heavily damaged riparian areas
IMPROVE PERFORMANCE OF STREAMSIDE VEGETATION	• delay grazing to help plants recover before regrazing • control weed growth in adjacent areas • restrict access where forage plants are flowering or going to seed • restrict access where regrowth or survival of forage plants is in jeopardy
REDUCE RISK OF MANURE LOADING	• move alternative water, salt and other features to reduce congregation • use shrubs and stones as barriers to reduce access time in surface waters • use crossing systems that reduce contact with water
REDUCE SOIL COMPACTION	• only graze when soils are dry • keep livestock away from sloughing banks • move alternative water, salt and other features to reduce congregation • deter the formation of pathways

Monitor pasture condition. Rest paddocks where forage species are seeding.

Use BMPs to encourage livestock to move away from actively sloughing banks.

Move alternative water sources out of the floodplain.

STEP 2. CONDUCT AN INVENTORY OF STREAMSIDE-GRAZING AREA

PHYSICAL FEATURES

Physical features are a key part of your inventory. They strongly influence:

- the suitability of grazing management systems
- site productivity
- the suitability of paddock layout and locations for management features
- the proximity and inclusion of sensitive areas, and
- the limitations and risk of environmental impact.

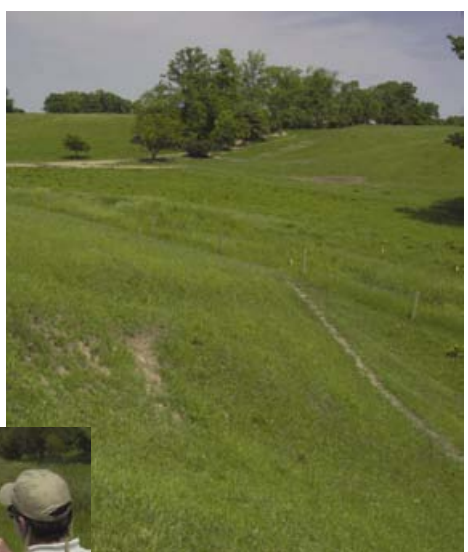
Physical features such as land, soil and water need to be described and mapped so as to help guide interpretation for management decisions.

LAND AND SOILS

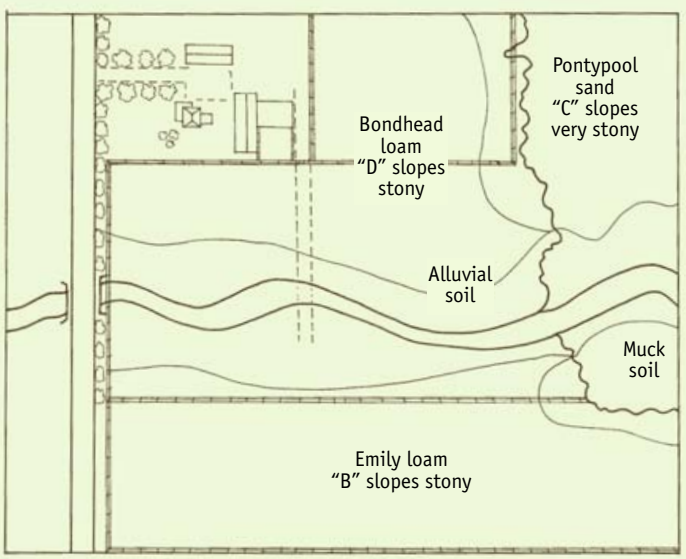
1. Locate or draw a map showing the boundaries of the land available for grazing.

A county soil survey is a good first step for determining soil types in your pastures. The publication contains general characteristics of each soil type, including soil texture, drainage, water-holding capacity, and organic matter content.

Soil and slope influence management choices.



SOILS MAP



Draw a map of your area.

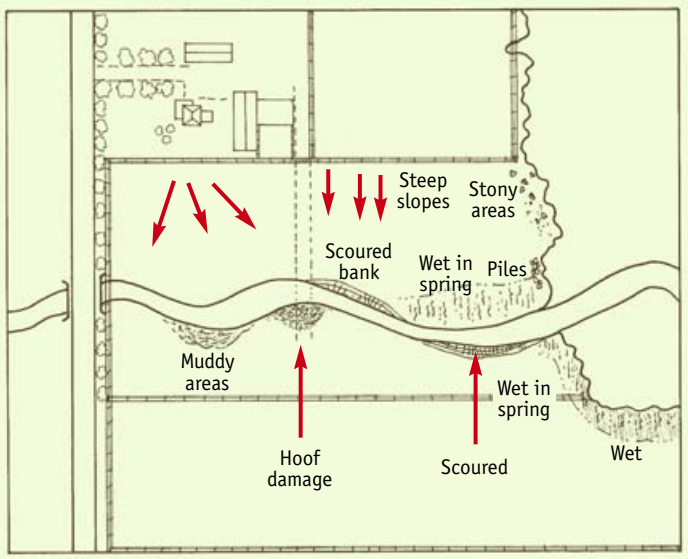
2. Identify sensitive land areas or soil limitations for grazing in the pasture.

Sensitive land areas have a high potential to generate or transport unwanted materials towards ground or surface water. The types of materials that could contaminate water are bacteria, nutrients from livestock manure, and sediment resulting from soil erosion.

Examples of sensitive land areas to be identified and referenced on a map include:

- location of surface waters (wetlands, ponds, lakes or streams)
- quarries, mines or sinkholes
- active or abandoned water wells
- coarse-textured (sandy and gravelly) soils
- steep slopes
- shallow soil to a water table or bedrock
- wooded areas
- intermittent waterways.

SENSITIVE AREAS AND SOIL LIMITATIONS MAP



Identify wet and other sensitive spots.

Limiting features also need to be identified and referenced on a map. You can learn a lot by walking the pasture with someone who's knowledgeable in soils and soil management.

The soil survey for your county will provide information on pasture features found below the soil surface. Examples of soil-limiting features include:

- **sandy soils, which have a high potential for drought**
- **shallow soils over bedrock, which limit the depth of root growth**
- **flood-prone soils, which either restrict growth of certain forages or limit grazing time**
- **organic soils, which limit accessibility and ability to withstand traffic**
- **extreme slopes or landscapes that make pasture areas difficult to reach.**

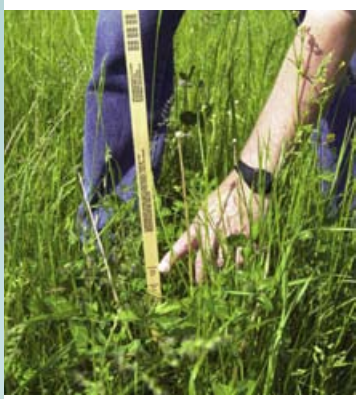
MANAGEMENT FEATURES

FORAGES

1. **List the existing forage species in the pasture.**

2. **Make a pasture vegetation map. Identify dominant plant species and areas in which they grow.**

3. **Determine pasture condition.**



4. **Estimate yields and seasonal distribution of the existing forages found in your pasture.**

Forage grass and legume species each have their own unique growth, persistence, and quality characteristics.

The plants that are currently growing in your pastures may differ from one area to another. Each species responds differently to soil conditions, weather patterns, fertility, and grazing management.

Take a walk through the pastures to gather information:

- identify desirable pasture species and weeds
- use references for grass identification – grass species are often difficult to identify during early stages of growth.

Good pasture condition is critical to a successful grazing system. Assessing pasture condition will help determine if pastures are in need of improvement and what areas need the most help. It's also a useful tool in evaluating impacts of management decisions.

Pasture quality may vary greatly from one pasture area to another, but the trend over time should show the direction in which the pasture condition is moving.

Use the pasture condition survey chart on pg. 101 to help you consolidate your findings.

Forage supply can be estimated for your grazing system – based on the plant species, pasture condition, and soil types found in the pastures and forage yields.

Pasture yields are directly related to forage-hay yields from similar local sites. Contact a professional grazing specialist for help in this regard.

Document the forage yields in lbs/acre. Please note that this is only an estimate to provide a starting point for future planning. Changes in climatic conditions from one year to the next can drastically change forage production and the outcome of seasonal forage supply.

Once the forage species and yield estimates have been estimated, you can determine a monthly forage supply by using the estimated forage production and seasonal distribution patterns.

The estimated monthly values follow seasonal growth patterns of common forage species. This exercise provides a good estimate of the total amount of forage available to livestock for any month of the grazing season.

Subtract the monthly requirement from the monthly forage production to:

- indicate forage balance for the growing season
- predict excess forage production by month
- predict where forage shortages may occur by month.

Total Yield

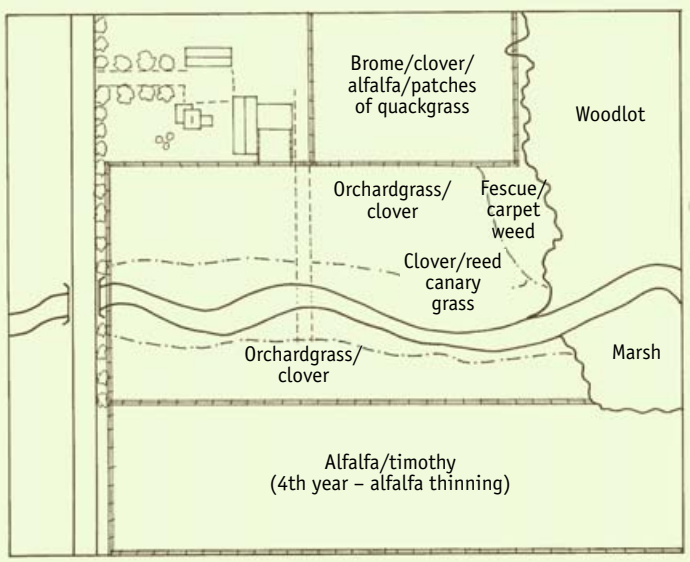
(forage yield) × (acres) = forage production

Example:
(2,500 lbs/acre) × (30 acres) = 75,000 lbs of forage (dry matter basis)

Forage Availability per Month

(total yield) × (% forage available by month) = monthly available forage

FORAGE MAP



Will your options for paddocks and grazing system require an investment in new fencing?

FENCING

Know the kind and condition of existing fences. Map the location of these fences, including both perimeter and interior fences.

Consider whether:

- the condition and location of the existing fence meet the needs of the grazing system
- there are other livestock handling facilities available such as corrals, dry lots, barns, or sheds that are part of the pasture or grazing system.

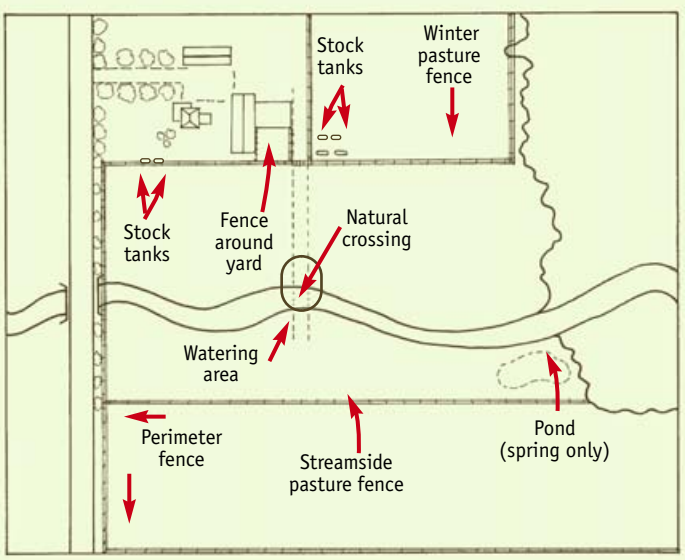
WATER SOURCES

Note and map the existing water sources and drinking facilities.

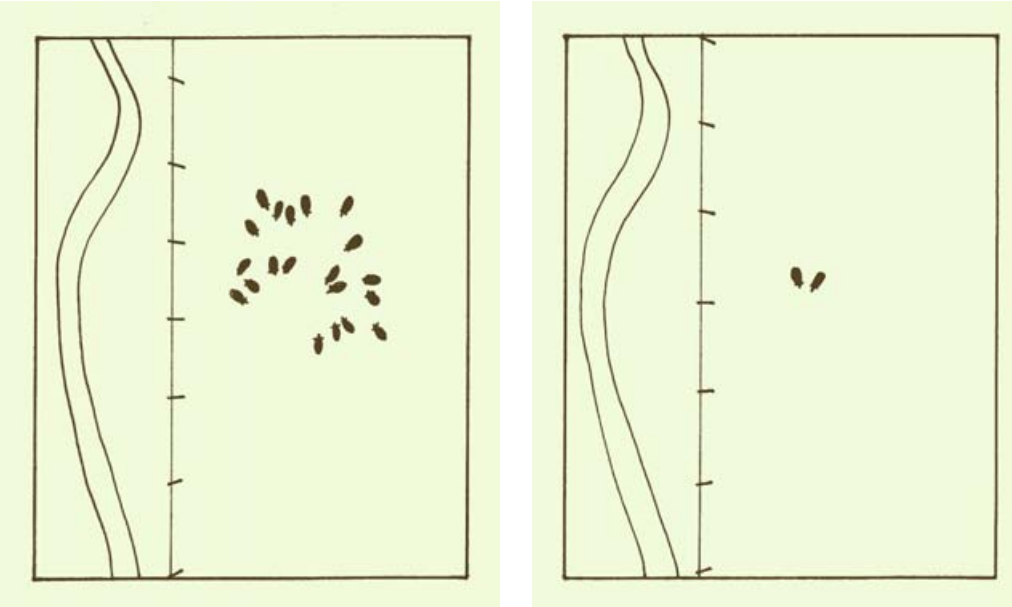
Consider whether:

- the water supply changes seasonally
- water is being transported to the paddock, and if so, how much storage is available
- a source of electricity is available nearby
- existing water sources are able to accommodate a pumping system that doesn't require electricity
- there are other potential water sources that could be made available to the pasture
- you need to drill a new well, and if so, what would be the best site
- a water source is nearby, where water can be obtained by constructing a pipeline system.

WATER SOURCES AND FENCES MAP



STEP 3. CONDUCT A RISK ASSESSMENT (FOR EXTENSIVELY PASTURED RIPARIAN AREAS)



Stocking rate is considered the most significant factor in streamside grazing management. Overgrazing in high-density pastures leads to poor pasture condition and environmental damage.

The risk assessment examines the environmental risks related to the sensitivity of the area, the condition of its features, and the management practices in place.

Generally, the risk is greater with livestock density. **If the density is greater than or equal to 1 NU/ac/yr, it is considered high-density** and is more commonly associated with livestock holding areas, dry lots and exercise yards (i.e., for dairy). At this density, most pastures could not be sustained and feed has to be imported. Furthermore, deposited manure and runoff from these intensive areas would have to be managed to reduce the risk of impact on adjacent surface and ground waters.

In high-density pastured areas, livestock access to watercourses/riparian areas must be restricted. In most cases, a permanent fence is best!

The risk assessment discussed here is for streamside grazing, **where the density is less than 1 NU/ac/yr**, and therefore considered low-density (extensive) grazing.

The rationale for choosing actions in this category is as follows:

- if the problem is severe, it's considered the same as intensive and should be managed the same
- if the problem is moderate, then use BMPs to get a benefit similar to exclusion
- if the problem is minor, then choose BMPs to address critical areas or key functions of interest.

Severe

If your overall score exceeds 60, then your grazing situation is high risk and must exclude livestock from the watercourse.

Moderate

If you score 40–60, you must plan and act. Start by identifying where you got the poorest marks – site features, management, etc. If it was management, plan and follow through on a few changes. This may be enough to improve your situation and your risk category.

Minor/Low Risk

For a low score, a few changes (e.g., to timing and feeding, or graze and rest techniques) may be sufficient.

A risk/site assessment is the best way to determine the nature and extent of problems. The next step is to demonstrate how the problem would be addressed. The Grazing Management Plan (GMP), to follow, will help you respond to an on-site assessment with clearly defined steps that integrate production targets with environmental goals and practicality.

A risk assessment helps you understand how risky a situation is and why it's risky. It's a great tool to help you plan suitable BMPs. This risk assessment has several dimensions:

- management risks – characteristics you can control, e.g., water source, grazing practices
- off-site problems – to address concerns about downstream or nearby users of the same resource, e.g., downstream fisheries, waterfowl habitat area
- impact – evidence of problems, e.g., bank damage.

In the risk assessment for low-density grazing (see next page), these dimensions are grouped and ranked from low risk to very high risk. Each cell in the box has a description of features that help determine risk level. Each risk level has an associated score or risk. The higher the score, the greater the risk.

Where the impact of streamside grazing is minimal, an alternative water source may be sufficient.

Site conditions such as bank stability are key diagnostic tools.

Some surface waters are important habitat areas. Graziers should monitor these areas more regularly for impact.

"The risk assessment was not difficult to complete and provided a good indication of the areas that needed to be improved.

"In little more time than it took to walk along the streambank, the assessment sheet provided an excellent guide to identify the areas that were a potential environmental risk."

– Ian McKillop, beef producer, southwestern Ontario, and President, Ontario Cattlemen's Association

RISK ASSESSMENT CATEGORY	LOW RISK	MEDIUM RISK	HIGH RISK	VERY HIGH RISK
MANAGEMENT PRACTICE				
A. GRAZING DENSITY AND DURATION (pg. 78)	**2** • Low density (<= 0.25 NU/ac/yr) OR • Moderate density with integrated GMP	**4** • Moderate density (0.25–0.5 NU/ac/yr) OR • High density with integrated GMP	**7** • High density (0.5–1.0 NU/ac/yr) OR • Very high density with integrated GMP	**10** • Very high density (>1.0 NU/ac/yr)
B. SEASON (OR CONDITIONS) OF ACCESS TO RIPARIAN AREA (pg. 79)	**2** • No access OR • Controlled access in summer	**4** • Unrestricted access in summer only	**7** • Unrestricted access in spring or fall	**10** • Unrestricted year long access
C. LIVESTOCK ACCESS AND CROSSINGS (pg. 80)	**0** • Exclusion with fencing • No crossings	**4** • Part of pasture fenced OR • Controlled access plus bank protection • Bridge or mid-level crossings plus fencing	**7** • Non-fencing options to control access OR • Controlled access – no bank protection OR • Bed-level crossing	**10** • Unrestricted access • Numerous random crossings
D. LOCATION OF SUPPLEMENTS, SALT, SHELTER (pg. 81)	**2** • All items located >50 m from top of bank	**4** • All items located 20–50 m from top of bank	**7** • Any of these items located 5–20 m from top of bank	**10** • Any one of these items located within 5 m from top of bank
E. LOCATION AND SOURCE OF WATER (pg. 82)	**2** • Alternative water located >50 m from surface water	**4** • Alternative water located 10–50 m away OR • Controlled access plus bed and bank protection	**7** • Water provided using controlled access without bank or bed protection • Alternative water located <10 m away	**10** • No alternative water source in grazed riparian area

RISK ASSESSMENT CATEGORY	LOW RISK	MEDIUM RISK	HIGH RISK	VERY HIGH RISK
SENSITIVITY OF RIPARIAN AREA				
F. TYPE OF SURFACE WATER (pg. 83)	**2** • Rivers >30 m wide • Lakes with bedrock or coarse-textured shores	**3** • Rivers <30 m wide • Drainage ditches • Channelized creeks • Other warm-water channels	**4** • Cool- and cold-water streams • Flowing water with shallow to bedrock riparian areas	**5** • Wetlands, natural ponds, reservoirs, sink holes, recharge areas
G. HABITAT DESIGNATION (pg. 83)	**2** • Low-level importance	**3** • Habitat with moderate level of importance – such as habitat for provincially common and/or widespread species • Migration corridors	**4** • Very important habitat – such as areas adjacent to species-at-risk critical habitat, habitat for species of special concern, or habitat for provincially rare species, or habitat used by specially protected widlife listed under Fish and Wildlife Conservation Act	**5** • Life Science ANSI • Designated fishery • Critical habitat for threatened and endangered species • Wetlands
H. SOURCE FOR DRINKING WATER (pg. 84)	**2** • Downstream urban intake >10 km	**3** • Downstream urban intake 2–10 km	**4** • Downstream urban intake 1–2 km	**5** • Downstream urban intake <1 km
I. RECREATIONAL USE (pg. 85)	**2** • Downstream recreational use >10 km	**3** • Downstream recreational use 2–10 km	**4** • Downstream recreational use 1–2 km	**5** • Downstream recreational use <1 km
J. IMPACT ON BANK CONDITION (pg. 86)	**2** • Banks are stable • Banks are vegetated • Tree roots hold soil material in place • No sloughing from hoof damage	**4** • Banks are mostly vegetated and stable • Some woody plants hold soils in place • Some evidence of damage and sloughing from hooves	**7** • Banks showing signs of instability • Bank vegetation heavily grazed • Little evidence of soils held by plant roots • Noticeable (>25% of area) evidence of sloughing from hooves	**10** • Banks highly unstable • Bank vegetation nearly grazed out and trampled • No evidence of soils held by roots • Most of the banks slumping due to hoof action
Total Score:				

Low Risk: <20 points
Moderate Risk: 20–39 points
High Risk: 40–60 points
Very High Risk: >60 points

MANAGEMENT PRACTICES

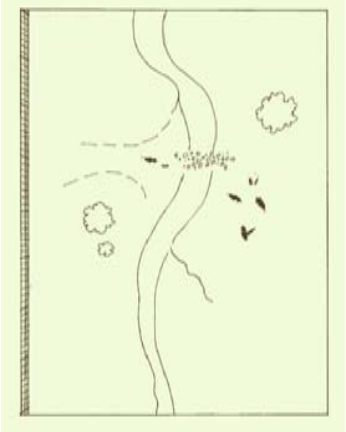
A. Grazing duration and intensity for riparian area

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• Low density (<= 0.25 NU/ac/yr) OR • Moderate density with integrated GMP	• Moderate density (0.25–0.5 NU/ac/yr) OR • High density with integrated GMP	• High density (0.5–1.0 NU/ac/yr) OR • Very high density with integrated GMP	• Very high density (>1.0 NU/ac/yr)

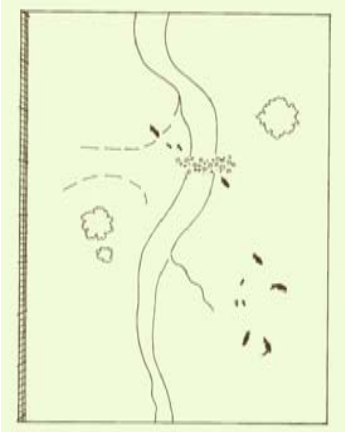
TYPE OF LIVESTOCK	<0.25 NU/AC/YR	0.26–0.50 NU/AC/YR	0.51–1.00 NU/AC/YR	> 1.00 NU/AC/YR
BEEF COW (1 PAIR /NU)	• 1 cow/calf pair/ac for less than 3 months	• 1 cow/calf pair/ac for <6 months OR • 2 pair/ac for <3 months	• 1.0 cow/calf pair for 12 months OR • 1–2 cow/calf pairs for 6 months	• >1.0 cow/calf pair for 12 months OR • >2 cow/calf pairs for 6 months
BEEF STOCKER (2.0 HEAD/ NU)	• <2 head for 3 months	• 1 head/ac for 12 months OR • 1–2 head for 6 months	• 1–2 head/ac for 12 months OR • 3–4 head for 6 months	• >2 head for 12 months OR • >4 head for 6 months
SHEEP (8.0 EWES/NU – INCLUDING LAMBS, REPLACEMENTS, RAMS)	• <2 ewes (+ lambs) for 12 months OR • <4 ewes for 6 months/ac	• 2–3 ewes (+ lambs) for 12 months OR • >4–7 ewes for 6 months/ac	• 4–8 ewes (+ lambs) for 12 months OR • >8–16 ewes for 6 months/ac	• >8 ewes (+ lambs) for 12 months OR • >16 ewes for 6 months/ac
HORSE (MEDIUM-SIZED + UNWEANED FOAL) (2.0 HEAD/ NU)	• <2 head for 6 months	• 1 head/ac for 12 months OR 2–3 head for 6 months	• 1–2 head/ac for 12 months OR • 3–4 head for 6 months	• >2 head for 12 months OR • >4 head for 6 months
DAIRY COW	• 1 cow/ac for <3 months	• 1 cow/ac for <6 months OR • 2 cows/ac for <3 months	• 1 cow for 12 months OR • 1–2 cows for 6 months	• 1–2 cows for 12 months OR • 2–3 cows for 6 months

B. Season of access (or conditions) to riparian area

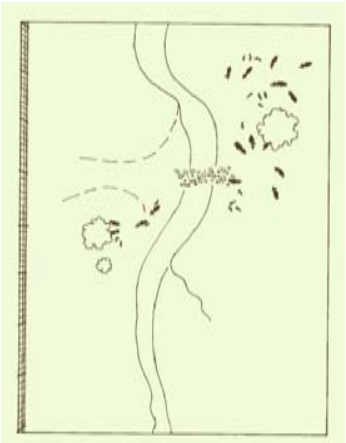
LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• No access or OR • Controlled access in summer	• Unrestricted access in summer only	• Unrestricted access in spring, summer and fall	• Unrestricted year-long access



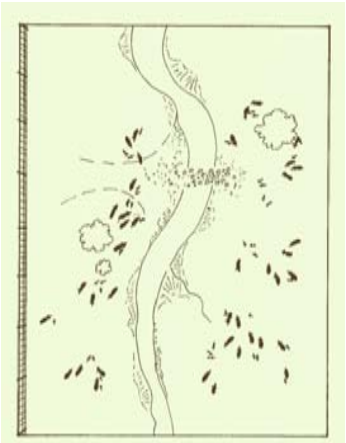
Density rating: Low



Density rating: Moderate



Density rating: High



Density rating: Very high

Unrestricted access in summer only is considered a moderate risk.

Unrestricted access all season long poses a very high risk. Excluding livestock from riparian areas during late winter and early spring lowers the risk of soil compaction and runoff.

Implications

Livestock tend to congregate in preferred locations to access shade, palatable forage and surface water. When livestock have access throughout the year, the pasture forage species and site conditions have little time to recover. Poor pasture cover and compaction of soils and banks are common when access is unrestricted.

Sheep and goats are an exception. They won't go in water.

When livestock are allowed access in spring or fall, there is a higher risk of compaction, as soils are often saturated in riparian areas. In early spring, new forage vegetation will have difficulty recovering from intensive grazing. In fall, intensive grazing will reduce over-wintering for some pasture species.

Carefully managed, summer access to streamside pasture will have minimal impact on forage cover and site conditions.

C. Livestock access and crossings

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• Exclusion with fencing • No crossings	• Part of pasture fenced OR • Controlled access + bank protection OR • Bridge or mid–level crossings plus fencing	• Non–fencing options to control access OR • Controlled access – no bank protection OR • Bed-level crossing	• Unrestricted access • Numerous random crossings

Controlled access is considered a moderate risk.

Unrestricted access is considered a very high risk.

Bed-level crossings require permanent fencing to be effective.

Implications

In unmanaged streamside pastures, the greater the access, the higher the risk of bank damage and direct contamination.

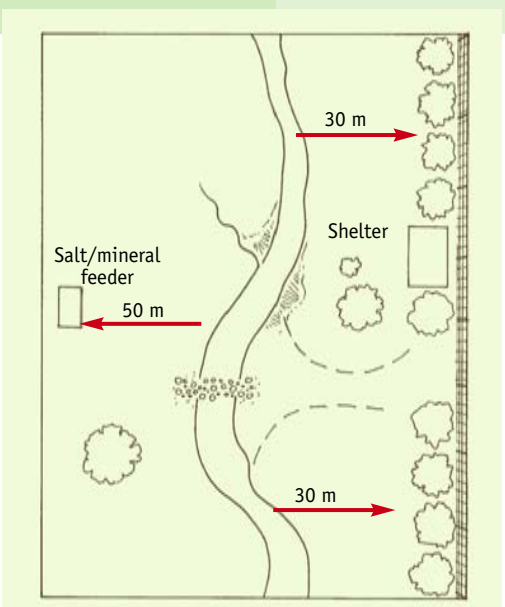
Where pasture exists on both sides of a stream or drain, the impact on the riparian area is related to the type of crossing and the duration of access.

A fenced crossing limits the area and duration of access. Mid-level and bridge crossings virtually eliminate access for livestock crossings.

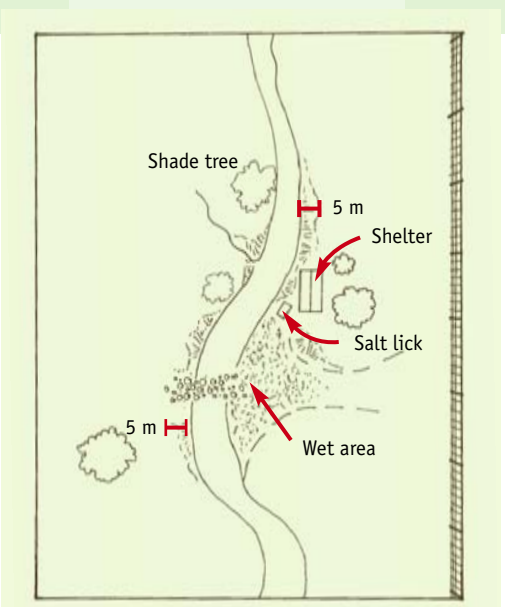
Crossings without fencing – using deflecting boulders, shrubs or natural features such as old ravines or cuts in the bank – can be reasonable approaches to managing access to localize impact.

D. Location of feed, salt and shelters – constructed shelters

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• All items located >50 m from top of bank	• All items located 20–50 m from top of bank	• Any of these items located 5–20 m from top of bank	• Any of these items located within 5 m from top of bank



Livestock tend to congregate around salt, feed and shelter stations. Locating these shelters 20–50 metres (65–164 ft) from the top of a bank/shore is considered a moderate risk.



Locating feed, salt or shade shelters within 5 metres (16 ft) of the top of a bank is considered a very high risk.

Implications

Livestock grazing in riparian areas are attracted to the lush forage, shade, shelter and drinking water found in most streamside pasture areas. Access problems are most often related to animal behaviour. For example, bank instability may be most intense near the preferred access points for drinking water.

Livestock behaviour can be managed by relocating livestock needs away from sensitive areas. By providing alternative water, livestock can be lured to places that are more accessible and provide similar or greater satisfaction.

Grazier research and observation suggest that the impact can be cumulative. So, if alternative water and a salt source are located near shade, away from surface water, access is minimized.

E. Location and source of water

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• Alternative water located >50 m from surface water	• Alternative water located 10–50 m away OR • Controlled access plus bed and bank protection	• Water provided using controlled access without bank or bed protection • Alternative water located <10 m away	• No alternative water source in grazed riparian area

Alternative water located 10–50 metres (33–164 ft) from surface water is considered a moderate risk.

If no alternative water source is provided, livestock will regularly access surface water.

For descriptions of alternative water systems, please see pages 58–59.

SENSITIVITY OF RIPARIAN AREA

F. Type of surface water

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	3	4	5
• Rivers >30 m wide • Lakes with bedrock or coarse–textured shores	• Rivers <30 m wide • Drainage ditches • Channelized creeks • Other warm-water channels	• Cool- and cold-water streams • Flowing water with shallow to bedrock riparian areas	• Wetlands, natural ponds, reservoirs, sinkholes, recharge areas

Implications

Lower-order streams or smaller bodies of surface water are at greater risk of damage from grazing livestock. It's more likely that livestock numbers will be concentrated in a small area, and opportunities for dilution will be fewer.

Contact your local office of the Ministry of Natural Resources or Conservation Authority to determine whether there is any special designation on your property.

Wetlands and ponds are very sensitive to continual access.

Livestock access poses a greater risk to cold-water streams.

G. Habitat designation

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	3	4	5
• Low level of importance	• Habitat with moderate level of importance – such as habitat for provincially common and/or widespread species • Migration corridors	• Very important habitat – such as areas adjacent to species-at-risk critical habitat, habitat for species of special concern, or habitat for provincially rare species, or habitat used by specially protected widlife listed under Fish and Wildlife Conservation Act	• Life Science ANSI • Designated fishery • Critical habitat for threatened and endangered species • Wetlands

For further information, contact your local Conservation Authority or office of the Ministry of Natural Resources.

Rivers designated as fisheries are important habitat and are very sensitive to land uses near them.

Although they're not natural habitat, municipal drains can be moderately important fish habitat.

H. Source for drinking water

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	3	4	5
• Downstream urban intake >10 km	• Downstream urban intake 2–10 km	• Downstream urban intake 1–2 km	• Downstream urban intake <1 km

Implications

Municipalities taking surface water to treat as urban drinking water are obviously very concerned with its quality. Water taken from polluted sources will contain natural and human-activity-generated chemical, physical and biological contaminants.

Physical contaminants can be screened out. Chemical contaminants can be treated. Most biological contaminants – bacteria and larger pathogens – require chlorination and filtering, respectively, for removal. But recent events are a reminder that no treatment system is risk-free. One of the key concerns is the transmission of waterborne pathogens from livestock to people.

Pastures near water intakes for municipal drinking water pose a high potential risk if less than 1 km upstream.

Not all pathogens are persistent. Many are susceptible to the impact of dilution, exposure and distance traveled. Pathogen populations diminish substantially with distance from source to point of water-taking.

I. Recreational use (e.g., beaches, town docks, swimming holes)			
LOW RISK	**MODERATE RISK**	**HIGH RISK**	**VERY HIGH RISK**
2	3	4	5
• Downstream recreational use >10 km	• Downstream recreational use 2–10 km	• Downstream recreational use 1–2 km	• Downstream recreational use <1 km

Surface waters are a shared resource. Recreation is a legitimate use of rural Ontario waterways.

Implications

Livestock access can lead to the addition of manure nutrients, pathogens and sediment to surface waters.

As discussed on pg. 84, not all pollutants are persistent. They are subject to the forces of dilution, exposure, natural treatment and absorption. The impact of these forces increases with distance traveled from source to point of recreational water use.

Manure-based nutrients can encourage excessive plant and algal growth – reducing the quality of recreational use. Waterborne pathogens can also reduce the quality of swimming/recreation use areas.

J. Bank condition

LOW RISK	MODERATE RISK	HIGH RISK	VERY HIGH RISK
2	4	7	10
• Banks are stable • Banks are vegetated • Tree roots hold soil material in place • No sloughing from hoof damage	• Banks are mostly vegetated and stable • Some woody plants hold soils in place • Some evidence of damage and sloughing from hooves	• Banks showing signs of instability • Bank vegetation present but heavily grazed • Little evidence of soils held by plant roots • Noticeable (>25% of area) evidence of sloughing from hooves	• Banks highly unstable • Bank vegetation nearly grazed out and trampled • No evidence of soils held by roots • Most of the banks slumping due to hoof action

Best bank condition: cross-section of channel is cup-shaped; no slumping or sloughing.

Good bank condition: cross-section of channel almost cup-shaped; minimal slumping or sloughing.

Fair bank condition: heavily grazed to overgrazed; noticeable areas of slumping and hoof damage.

Poor bank condition: overgrazed; obvious slumping and sloughing.

"The risk assessment worksheet is an eye opener for a producer to help look for possible problems he or she would never realize existed. When walking the stream-banks, one can then assess the current conditions and start thinking about immediate improvements and further corrective actions."

– Klaus Wand, beef producer, Parry Sound District

Implications

Natural channels form stable banks. When natural watercourses are forming, sinuous channels are shaped from the surrounding geological material. The banks are relatively stable because they are held in place by the dense rooting of streamside vegetation networks.

Banks become unstable when this natural vegetative cover is removed by land clearing and grazing. They lose the natural "gabion-basket" effect provided by tree and shrub roots.

Grazed streamside areas support mostly grassed vegetation. Grasses provide fibrous rooting which, if healthy, will provide adequate bank support.

Grazing frequency and compaction will weaken the vegetation, the rooting system and the stability of the soil. Bank instability increases with grazing density and damage, which makes it one of the most reliable indicators for the overall health of streamside pastures.

STEP 4. DETERMINE FORAGE REQUIREMENTS

Remember that the primary goal of most livestock grazing systems is to produce weight gain on livestock. An increase in animal size will mean an increase in estimated forage needs through the grazing season, as long as animal numbers do not change. Adjust livestock weights for each month to provide a more realistic estimate of forage needs.

What are the plans for potential expansion of the livestock operation?

If an increase in herd size is a goal of the operation, estimate what adjustments to forage will be needed and consider how to best meet those needs with forage supply.

Are there enough acres in the existing pasture to meet the needs of the larger livestock herd? What is the potential forage supply if improvements are made to the pasture or grazing system?

How many herds will be grazed?

You may want to separate the grazing herd into groups based on production, animal species, animal size, or class differences. When the number of herds increases, you'll have to increase the number of paddocks.

When dividing the pasture, consider:

- how many groups could potentially be grazing at the same time
- whether the different groups can graze next to each other – obviously you won't want to place male animals in paddocks adjacent to females in heat.

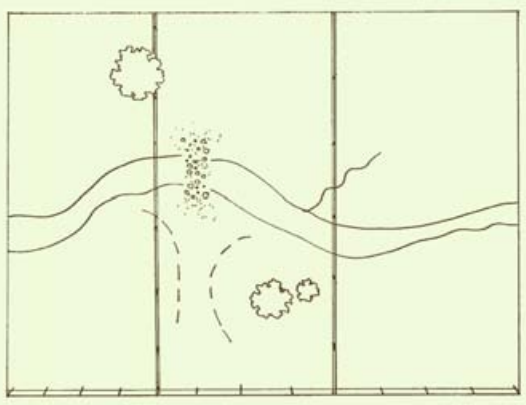
Determining seasonal forage requirement will help plan for paddock design and layout.

Calculate daily utilization rate based on numbers, average weight and average intake.

STEP 5. ANALYZE, INTERPRET, AND SELECT A MANAGEMENT SYSTEM

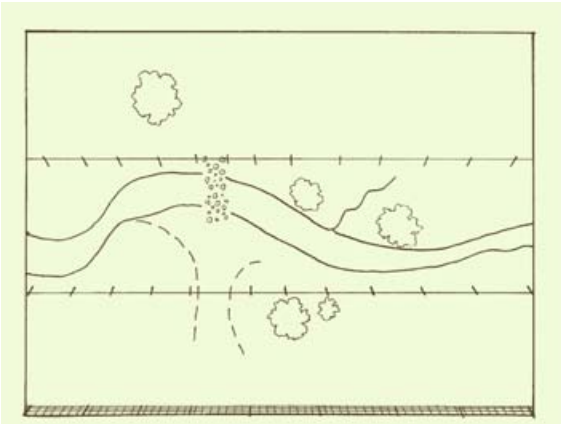
Here are some questions to consider when selecting a grazing management system for your riparian areas.

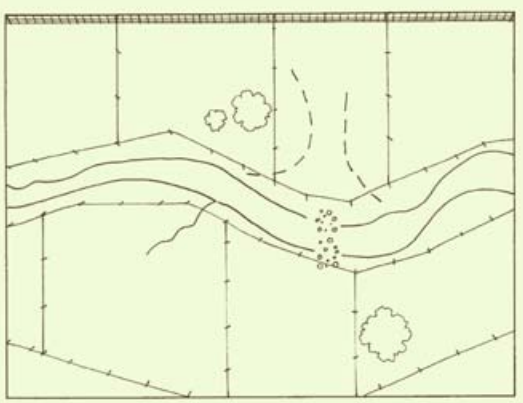
- Will environmental damage be minimized? Will season of access be addressed? Will site condition be addressed?
- Will production be optimized? Will it address the needs and behaviours of grazing livestock?
- Is it affordable?
- Will the layout (number of paddocks and selection of management features) be compatible with site features? Will it be site-specific?
- Will the planned stocking rates and density, and the frequency and duration of grazing and rest periods be sustainable? Will it lower the potential for re-grazing plants before they fully recover from previous grazing events?



Riparian – upland

Corridor fencing



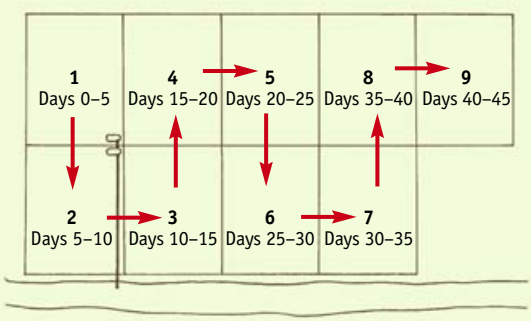


Riparian pasture

PADDOCK SIZE AND LAYOUT

The layout and fencing component of a grazing plan involves determining:

- how many paddocks are required and their size and shape – with respect to local conditions
- the type of fence and locations
- how water will be provided.



Proper layout takes into consideration the size and location of paddocks as they relate to the location of sensitive areas and positioning of alternative water.

NUMBER OF PADDOCKS FOR A ROTATIONAL GRAZING MANAGEMENT SYSTEM

Rest Period

- a rest period allows time for the forage plants to regrow, producing forage for the next grazing cycle
- the length of a rest period varies throughout the growing season
- the minimum number of paddocks in a system depends on the length of the rest period required by the forages
- when preparing your plan, use an average or longer length of time (25–30 days)
  - using less than the average length of time will result in a plan with too few paddocks or paddocks that are too large

Grazing Period

- the length of a grazing period in each paddock is based on the desired level of management, availability of labour, performance objective for the livestock, and growth characteristics of forages
- grazing periods longer than six days will damage new regrowth
- grazing of new growth diminishes the ability of the forage plants to regrow quickly, resulting in an overall yield reduction for the pasture
- a shorter grazing period is associated with livestock operations where livestock performance is essential, such as with milking cows
- longer grazing periods are more typical of beef cow/calf operations, ewe/lamb operations, and maintaining dry cows

The ***minimum*** number of paddocks ***for each herd*** in the pasture system is equal to:

$$\text{Paddock Number} = \frac{\text{Rest period (days)}}{\text{Number of grazing days/paddock (days)}} + 1$$

e.g., **30 days rest and 3 days per paddock**
Number of paddocks = 30/3 + 1 = 11

For more details, please see pg. 78.

PADDOCK SIZE REQUIRED FOR AVERAGE GROWTH CONDITIONS

Paddock Size

- size is based on providing an adequate supply of available forage to meet the herd's requirements
- forages do not grow at the same rate throughout the season
  - cool-season grass growth is very rapid in the spring, slows considerably during the hot summer months of July and August, and increases somewhat again in the fall
  - for a given herd, the area required to produce the necessary forage for the planned grazing period will not be the same throughout the grazing season
- to deal with this variability in growth:
  - plan using average growing conditions
  - vary the length of the grazing period throughout the grazing season when paddock size is fixed
  - vary the size of the paddock when the size is not fixed, as in a strip grazing system

Formula:

Paddock Size = Forage Demand × Residency ÷ Forage Supply

Calculation:

_____ ac = _____ lbs/day × _____ days/rotation ÷ _____ lbs/ac/rotation

- paddock size times the minimum number of paddocks provides the minimum required size of the total pasture unit
- if the existing pasture is larger than this minimum area, more paddocks can be planned for
- this will likely provide more than enough forage in the spring, some of which could then be harvested for hay
- having more paddocks than the required minimum will reduce the risk of running out of forage during the midsummer slump that cool-season pastures normally experience
- if the acreage of the required minimum number of pastures is more than the existing pasture acreage, additional acreage should be devoted to pasture to avoid running out of usable forage during the midsummer slump

Cool-season grasses grow best in the spring and fall. They can be harvested as hay in larger paddocks during seasons where growth exceeds grazing capacity.

Warm-season grasses grow best during the summer months – providing an ongoing supply of high quality forage when cool-season grasses cannot.

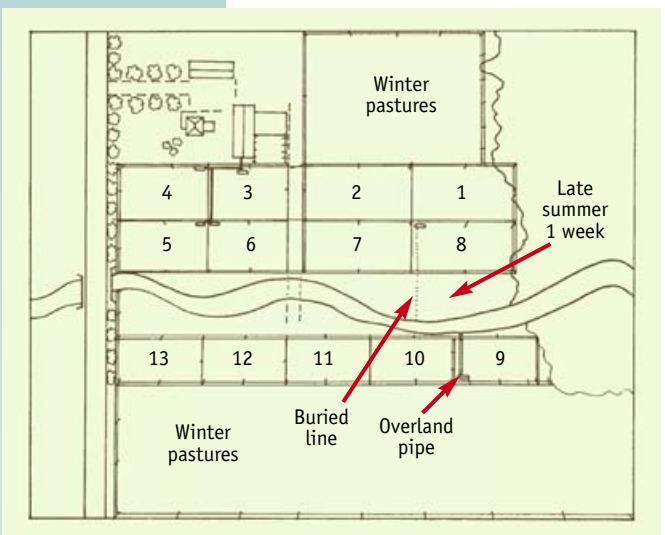
PADDOCK LAYOUT

- information gathered during the inventory process is useful when determining the paddock layout
- some adjustments need to be made to the size of each paddock so they have equal productivity
- each paddock should have:
  - similar soils and slope (e.g., floodplain, ravine slope, upland)
  - similar forages
- paddock layout will also be influenced by the location of lanes for the movement of livestock
  - these lanes should connect all paddocks so that livestock can be moved to any paddock from the one they currently occupy, allowing for maximum flexibility in forage management

Paddocks should be sized and positioned based on forage demand and quality, site condition and uniformity.

Paddock Shape

- paddocks should be as square as possible to promote more uniform grazing
- long, narrow paddocks are usually overgrazed at one end and underutilized at the other end



- paddocks should be planned so that livestock do not have to travel more than 244 metres (800 ft) to get water
  - this will encourage more water consumption by livestock and more uniform grazing within the paddock
  - livestock tend to utilize the forages close to water much more than forages farther from the water
- additional adjustments may be required based on access to water sources, which may have an impact on the shape of the paddocks in a grazing system, particularly in situations where natural water sources, such as ponds and streams, are utilized

FENCE DESIGN AND LAYOUT

The kind of fence that should be installed depends on:

- its purpose
- kind and class of livestock to be contained
- operator preference
- predator control
- cost.

Permanent or temporary fences may define paddocks within the grazing unit. During initial stages of paddock layout, many producers prefer to use temporary fences to create paddocks and lanes. This allows for easy adjustment of the layout as producers learn what size paddock they need, how to move livestock easily, and how forages react to managed grazing. After gaining experience, producers usually install some type of permanent fence to define paddocks and lanes.

In management-intensive grazing systems, permanent fencing can be used to enclose the entire pasture area and for lanes.

WATER SYSTEM DESIGN AND LAYOUT

Livestock must have adequate water to process forages effectively. A well-planned and installed water system will provide sufficient water with minimal disturbance to soil and to the water source itself.

Common sources of water for livestock are streams, ponds, lakes, and wells. Research shows that there can be a significant increase in animal performance and improved herd health if the drinking water is clean and free from sediments, nutrients, pesticides, algae, bacteria, and other contaminants. Because it's cleaner, well water is a preferred source.

Most livestock watering systems consist of a pump, a delivery system (usually a pipeline), and a trough or tank for the livestock to drink from.

Well-planned water delivery systems are more efficient and practical to operate.

Location of Drinking Facilities

- make drinking facilities available in every paddock
- locate drinking facilities so that livestock do not have to travel excessive distances to drink (if possible)
- in systems where livestock must travel long distances to water, forages tend to be over-utilized near the water, and under-utilized in areas of the paddock that are farthest from the water
- other problems associated with this situation include uneven manure distribution in the paddock and diminished animal performance

DELIVERY SYSTEM

Once the paddock layout is established and the water sources identified, the delivery system must be accommodated.

- if water is to be hauled, access by the tanker needs to extend to each storage tank
- if water is to be delivered through a pipeline, the route must be determined so that each paddock in the system has access to the water
  - pipeline layout should follow the shortest route to minimize cost and maintenance problems – this will ultimately determine the general area in which the watering tanks will be placed
- water tanks should be placed on soils that can support heavy traffic and provide easy access by livestock without crowding
- permanently installed tanks should have some type of heavy use treatment around them to prevent the formation of a mudhole
- portable tanks offer the most flexibility
  - their location can be changed frequently by adding a length of pipeline between the coupler and the tank and placing the tank(s) in a different location
  - tanks can be moved as often as necessary to manage grazing and avoid creation of barren areas and mudholes
- fine-textured materials around the water trough are preferred over coarse-textured materials because the latter can injure livestock feet
- if animals must traverse lanes that are in unstable areas, such as wet draws, please see the next section on protecting sensitive areas

MANAGEMENT OF SENSITIVE AREAS

Preventing Muddy Areas

Permanent watering stations will be subject to heavy use since they're often used to provide water for more than one paddock. Water spillage and leakage, which are inevitable, add to the mud problem. As a consequence, you'll need protective materials around watering sites.

Here's the recommended method of building pads for water stations.

1. Prepare a good subgrade by removing debris and vegetation along with at least 20 centimetres (8 in.) of topsoil.
2. Compact the subgrade.
3. Lay down a geotextile fabric.

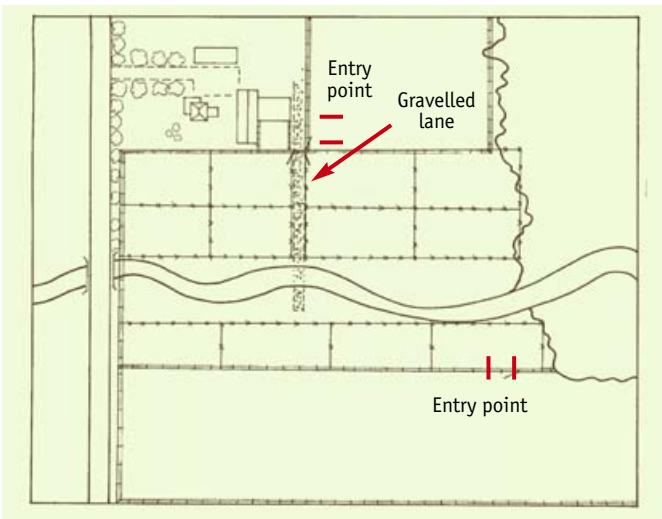
4. Place a 15-centimetre (6-in.) layer of coarse aggregate on the geotextile fabric and top with a 7.5-cm (3-in.) layer of fine aggregate.
5. Allow for a lane width of 3.5–4.5 metres (12–15 ft).
6. Extend pads around tanks by 6–7.5 metres (20–25 ft).

Some pasture areas such as this salt block location will have heavy use.

Heavy Use Area Planning

Some areas of the pasture system will be used so much that the best option is to place some type of protective material to prevent the formation of mudholes. Two such areas are those that surround watering facilities and the alleyways used for livestock movement.

Use maps to identify and plan the management of heavy use areas, such as lanes.



Planning livestock lanes

Livestock lanes will help you control livestock movement. Properly planned lanes allow livestock to move from one paddock to another. They'll also keep livestock out of paddocks that you want to bar them from, for whatever reason, e.g., paddocks that have been recently grazed. Here are some tips:

- the areas within the lanes can normally be grazed along with an adjacent paddock, unless the lane is covered with some type of protective material
- the locations of livestock lanes should avoid potential erosion, concentrated water flow, and flooding
- avoid placing lanes up and down hills, in wetlands, or on organic soils.

THE WORKBOOK

This workbook is designed to put the general knowledge you've gained from the preceding chapters to work in *your* operation. It will walk you through a risk assessment and the development of your own GMP.

(You'll also see page numbers that refer to earlier explanations of some steps, in case you need a refresher.)

To repeat, planning is an ongoing process, one where you continually assess your actions and adjust for future improvements. While it requires time and effort to get rolling, the payoff is there – financially and environmentally.

The GMP involves the following planning steps:

Step 1. Develop goals
Step 2. Conduct an inventory of your streamside-grazing area
Step 3. Conduct a riparian risk assessment
Step 4. Determine forage requirements
Step 5. Analyze, interpret, and select a management system
Step 6. Develop an action plan
Step 7. Implement the plan
Step 8. Monitor and update the plan

Consider working with a grazier specialist when developing your GMP for streamside grazing.

STEP 1. SET GOALS (pg. 66)

- Develop riparian management goals that are compatible with your overall long-term farm business goals.
- Integrate production targets with financial goals and planned environmental improvements.
- Prioritize goals.
- Assess and redefine the goals if necessary.

GOAL	RANK	IMPLICATIONS

STEP 2. CONDUCT AN INVENTORY OF STREAMSIDE-GRAZING AREA (pg. 68)

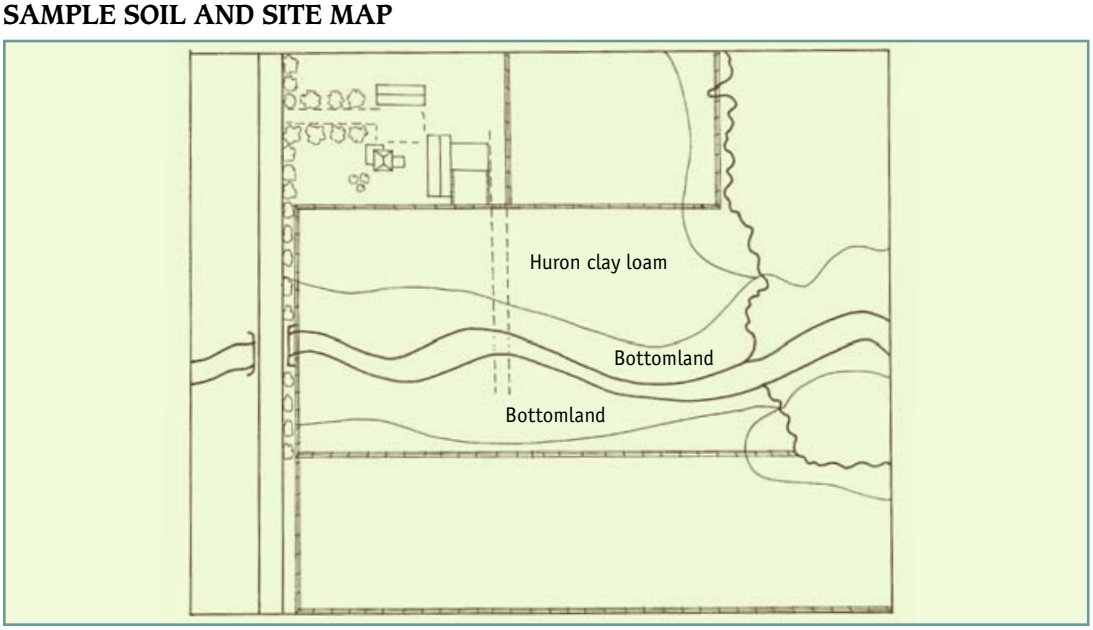
- Make a map of soils and sensitive areas. Use air photos and soil maps.
- Map the facilities. Include fences, gates, stock-watering stations, corrals, power sources, salt and mineral stations, trails and roads.
- Map pastures and paddocks. Include location, size, vegetation, management features.
- Conduct a pasture condition survey.

PHYSICAL FEATURES (pg. 68)

SAMPLE CHART

PHYSICAL FEATURE	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
	Ravine	*Floodplain*			
AREA	*7 ac.*	*5 ac.*			
SOIL	*Huron Clay Loam*	*Bottomland*			
SLOPE	*10%*	*0%*			
LIMITATIONS	*Past erosion, compaction*	*Flood-prone Ice floes*			
SENSITIVE AREAS	*Eroded knolls*	*Marsh Degraded banks*			
DISTANCE TO SURFACE WATER	*60 m. (creek)*	*0–15 m. (creek)*			

SAMPLE SOIL AND SITE MAP

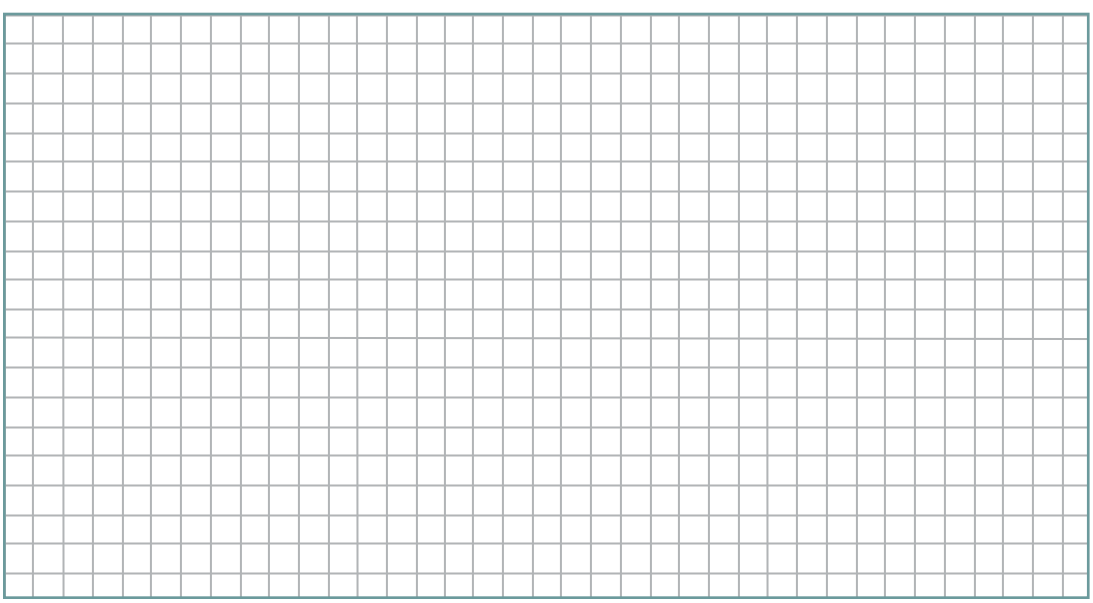


PHYSICAL FEATURES (cont'd.)

YOUR CHART

PHYSICAL FEATURE	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
AREA					
SOIL					
SLOPE					
LIMITATIONS					
SENSITIVE AREAS					
DISTANCE TO SURFACE WATER					

SOIL AND SITE MAP



MANAGEMENT FEATURES (pg. 70)

MANAGEMENT FEATURE	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
ACREAGE					
FORAGE SPECIES					
PASTURE CONDITION					
FENCING TYPE AND CONDITION					
WATER SOURCE(S)					
MANAGEMENT FEATURES					

FORAGE, FENCING AND SENSITIVE FEATURES MAP

PASTURE CONDITION SURVEY

	FIELD	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
	ACRES					
	MONTH & YEAR	M____/Y____	M____/Y____	M____/Y____	M____/Y____	M____/Y____
CATEGORY	SCORE	SCORE	SCORE	SCORE	SCORE	SCORE
SPECIES COMPOSITION	Undesirable Desirable 0 1 2 3 4					
PLANT DIVERSITY	Narrow Broad 0 1 2 3 4					
STAND DENSITY	Sparse Dense 0 1 2 3 4					
PLANT VIGOUR	Weak Strong 0 1 2 3 4					
LEGUMES IN STAND	< 10% > 50% 0 1 2 3 4					
PLANT RESIDUE	Deficient Excess 0 1 2 3 4					
BROWSE UNIFORMITY	Concentrated Uniform 0 1 2 3 4					
SEVERITY OF USE	Heavy Light 0 1 2 3 4					
WOODY PLANTS	>40% <10% 0 1 2 3 4					
SOIL EROSION	Severe Moderate Slight 0 1 2 3 4					

From the *Grazing Systems Planning Guide* – see pg. 31.

STEP 3. CONDUCT A RIPARIAN RISK ASSESSMENT (pg. 73)

Circle the most suitable score for each category. Tally the subtotals and determine your overall risk assessment score at the bottom of page 103.

CATEGORY	LOW RISK	MEDIUM RISK	HIGH RISK	VERY HIGH RISK
MANAGEMENT PRACTICE				
A. GRAZING DENSITY AND DURATION (pg. 78)	**2** • Low density (<= 0.25 NU/ac/yr) OR • Moderate density with integrated GMP	**4** • Moderate density (0.25–0.5 NU/ac/yr) OR • High density with integrated GMP	**7** • High density (0.5–1.0 NU/ac/yr) OR • Very high density with integrated GMP	**10** • Very high density (>1.0 NU/ac/yr)
B. SEASON (OR CONDITIONS) OF ACCESS TO RIPARIAN AREA (pg. 79)	**2** • No access OR • Controlled access in summer	**4** • Unrestricted access in summer only	**7** • Unrestricted access in spring or fall	**10** • Unrestricted year-long access
C. LIVESTOCK ACCESS AND CROSSINGS (pg. 79)	**0** • Exclusion with fencing • No crossings	**4** • Part of pasture fenced OR • Controlled access plus bank protection • Bridge or mid-level crossings plus fencing	**7** • Non-fencing options to control access OR • Controlled access – no bank protection OR • Bed-level crossing	**10** • Unrestricted access • Numerous random crossings
D. LOCATION OF SUPPLEMENTS, SALT SHELTER (pg. 81)	**2** • All items located >50 m from top of bank	**4** • All items located 20–50 m from top of bank	**7** • Any of these items located 5–20 m from top of bank	**10** • Any one of these items located within 5 m from top of bank
E. LOCATION AND SOURCE OF WATER (pg. 82)	**2** • Alternative water located >50 m from surface water	**4** • Alternative water located 10–50 m away OR • Controlled access plus bed and bank protection	**7** • Water provided using controlled access without bank or bed protection • Alternative water located <10 m away	**10** • No alternative water source in grazed riparian area
Subtotal :				

(continued on next page)

CATEGORY	LOW RISK	MEDIUM RISK	HIGH RISK	VERY HIGH RISK
SENSITIVITY OF RIPARIAN AREA				
F. TYPE OF SURFACE WATER (pg. 83)	**2** • Rivers >30 m wide • Lakes with bedrock or coarse-textured shores	**3** • Rivers <30 m wide • Drainage ditches • Channelized creeks • Other warm-water channels	**4** • Cool- and cold-water streams • Flowing water with shallow to bedrock riparian areas	**5** • Wetlands, natural ponds, reservoirs, sink holes, recharge areas
G. HABITAT DESIGNATION (pg. 83)	**2** • Low-level importance	**3** • Habitat with moderate level of importance – such as habitat for provincially common and/or widespread species • Migration corridors	**4** • Very important habitat – such as areas adjacent to species-at-risk critical habitat, habitat for species of special concern, or habitat for provincially rare species, or habitat used by specially protected widlife listed under Fish and Wildlife Conservation Act	**5** • Life Science ANSI • Designated fishery • Critical habitat for threatened and endangered species • Wetlands
H. SOURCE FOR DRINKING WATER (pg. 84)	**2** • Downstream urban intake >10 km	**3** • Downstream urban intake 2–10 km	**4** • Downstream urban intake 1–2 km	**5** • Downstream urban intake <1 km
I. RECREATIONAL USE (pg. 85)	**2** • Downstream recreational use >10 km	**3** • Downstream recreational use 2–10 km	**4** • Downstream recreational use 1–2 km	**5** • Downstream recreational use <1 km
J. IMPACT ON BANK CONDITION (pg. 86)	**2** • Banks are stable • Banks are vegetated • Tree roots hold soil material in place • No sloughing from hoof damage	**4** • Banks are mostly vegetated and stable • Some woody plants hold soils in place • Some evidence of damage and sloughing from hooves	**7** • Banks showing signs of instability • Bank vegetation heavily grazed • Little evidence of soils held by plant roots • Noticeable (>25% of area) evidence of sloughing from hooves	**10** • Banks highly unstable • Bank vegetation nearly grazed out and trampled • No evidence of soils held by roots • Most of the banks slumping due to hoof action
Total Points:				

Low Risk: <20 points
Moderate Risk: 20–39 points
High Risk: 40–60 points
Very High Risk: >60 points

STEP 4. DETERMINE FORAGE REQUIREMENTS (INCLUDES PADDOCK LAYOUT) (pg. 87)

FORAGE REQUIREMENTS AND PADDOCK LAYOUT

Estimate the Forage Demand

The forage demand is the amount of forage dry matter (DM) required to feed the herd/flock for one day. It is calculated based on the rule of thumb that grazing animals require an amount of forage dry matter equal to about 2.5% of their body weight per day.

Formula:

Forage Demand (lbs DM/day) = avg. wt/head (lbs) × 0.025* × # head

Calculation:

Lbs DM/day = _____ lbs × 0.025 × _____ head

(*Use 0.03 for lactating dairy cows)

Estimate the Forage Supply

This is the amount of forage DM that is predicted to be available for grazing after a 15-day growth period in the spring and a 30-day growth period in the summer and fall.

Please note: Actual pasture growth rates are extremely variable. As a result, the numbers presented are for planning purposes only. Optimum growth periods may be longer or shorter than those indicated.

Unless actual measured yields are available, use estimated yields data for grass–legume hay. Use the following table to convert to forage availability on a rotational basis.

FORAGE AVAILABLILITY ESTIMATES (DM)

HAY YIELD TONS/ACRE/YEAR	5.5	5.0	4.5	4.0	3.5	3.0	2.5
FORAGE AVAILABLITY LBS/ACRE/ROTATION	2200	2000	1800	1600	1400	1200	1000
FORAGE SUPPLY _____LBS/ACRE/ROTATION							

Select Residency Period

In other words, decide how long you want your livestock to remain in a particular paddock. One to two days is recommended for lactating dairy cows; three to seven days for all other livestock. Please note: to maximize harvest efficiency, use the shortest residency period indicated for the type of livestock operation.

RESIDENCY PERIOD _____ DAYS

Determine Paddock Size

The paddock size is based on meeting the total forage demand for the number of days of grazing indicated by the residency period.

Formula:

Paddock size = forage demand × residency ÷ forage supply

Calculation:

____ ac = _____ lbs/day × ___ days/rotation ÷ _____ lbs/acre/rotation

Calculate Number of Paddocks

The number of paddocks required is based on meeting the longest regrowth interval recommended, i.e., 30 days.

Formula:

Required regrowth ÷ residency period = # of paddocks + 1 = total # of paddocks required

Calculation:

30 days/paddock ÷ _____ days = _____ paddocks + 1 = total # of paddocks

The extra paddock is included because you need to give all paddocks the prescribed rest. If you determine the rest period is 30 days and the animals are in the paddock for one day and you have 30 paddocks, then there are only 29 days of rest/regrowth. By adding one, you give each paddock 30 days' rest and one day for harvest.

Estimate Total Number of Acres

Formula:

Total acreage required for rotational grazing = size of paddock × number of paddocks

Calculation:

_____ acres = _____ ac/paddock × _____ paddocks

STEP 5. ANALYZE, INTERPRET, AND SELECT MANAGEMENT SYSTEM (pg. 88)

- Look for risks and opportunities. Examine the information you've collected to uncover potential improvement opportunities.
- Select grazing management system and BMPs that will capitalize on those opportunities.

STEP 6. DEVELOP AN ACTION PLAN

- Redesign a paddock and facilities layout that suits the local conditions and goals.
- Schedule BMPs for pasture improvement and protection of sensitive, high-risk areas.

INDICATE BMPs AND SCHEDULED ACTIVITIES ON THE FOLLOWING CHART.

MANAGEMENT FEATURE	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
ACREAGE					
FORAGE SPECIES					
PASTURE CONDITION					
PASTURE IMPROVEMENT BMPs					
PADDOCK SHAPE AND FENCING					
ACCESS OR CROSSING POINTS					
SCHEDULED GRAZING SEASON AND DATES					

INDICATE BMPs AND SCHEDULED ACTIVITIES ON THE FOLLOWING CHART.

MANAGEMENT FEATURE	PADDOCK/ PASTURE AREA A	PADDOCK/ PASTURE AREA B	PADDOCK/ PASTURE AREA C	PADDOCK/ PASTURE AREA D	PADDOCK/ PASTURE AREA E
STOCKING RATES					
DURATION					
REST PERIODS					
WATER SOURCE(S)					
WELL IMPROVEMENTS					
ALTERNATIVE WATER SOURCES					
MANAGEMENT FEATURES					
BMPs FOR SENSITIVE AREAS					

STEP 7. IMPLEMENT THE PLAN

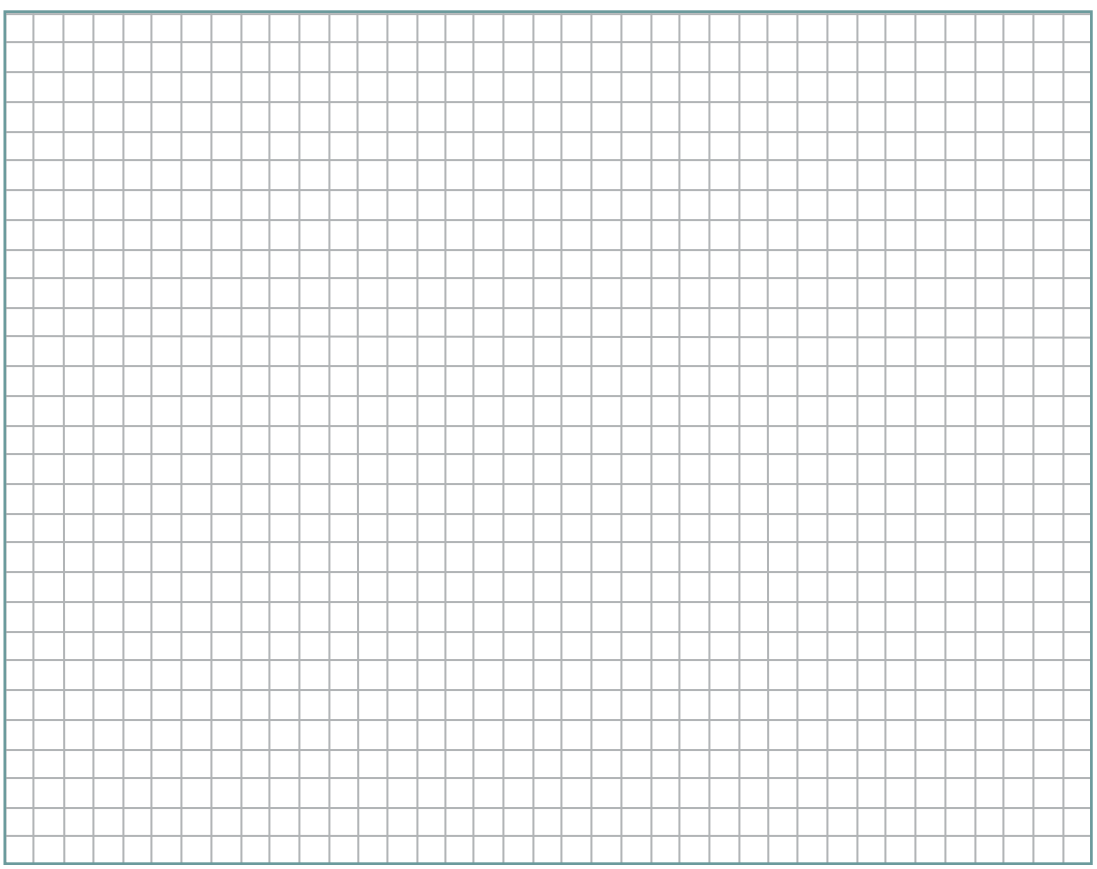
- Get how-to knowledge:
  - get advice
  - get permission
  - get going!

STEP 8. MONITOR AND UPDATE THE PLAN

- Monitor riparian health and pasture condition.
- Check on pasture performance in response to improvement BMPs.
- Update plan accordingly.
- Redo risk assessment to evaluate impact of GMP actions.

It's very helpful to have an up-to-date map of your streamside-grazing area as you implement and monitor your plan.

LAYOUT OF YOUR STREAMSIDE-GRAZING AREA



For More Information

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For a complete copy of the Fisheries Act, please go to:
http://laws.justice.gc.ca/en/F-14/index.html

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