

## CHAPTER 11 METRIC CONVERSIONS

Metric	Imperial Equivalent
5 m	16.5 feet
7 m	23 feet
8 m	26 feet
30 m	100 feet

Conversions in this table are rounded to a convenient number.  
See Appendix E for exact conversion factor.

Values from tables and examples are not included in Metric Conversions

## CHAPTER 11 TABLE OF CONTENTS

<b>Introduction</b> .....	11-1
Stewardship and Sustainability .....	11-1
<b>Buffers, Riparian Areas, and the Environment</b> .....	11-2
Buffers .....	11-2
Riparian Areas .....	11-2
Stewardship Areas and Climate Change .....	11-3
<b>Buffers</b> .....	11-4
<b>Buffer Environmental Concerns</b> .....	11-4
<b>Buffer Legislation</b> .....	11-4
<b>Buffer Beneficial Management Practices</b> .....	11-8
Activities Requiring Use of Buffers .....	11-8
General Buffer Design .....	11-8
Runoff Buffers .....	11-10
Windbreaks and Shelterbelts .....	11-11
Buffers for Pesticide Drift .....	11-13
Buffers for Mist and Dust .....	11-13
Buffers for Odour and Noise .....	11-14
Buffers for Biodiversity .....	11-14
<b>Riparian Areas</b> .....	11-15
<b>Riparian Area Concerns</b> .....	11-15
<b>Riparian Area Legislation</b> .....	11-15
<b>Riparian Area Beneficial Management Practices</b> .....	11-19
Riparian Areas .....	11-19
Riparian Area Management .....	11-21

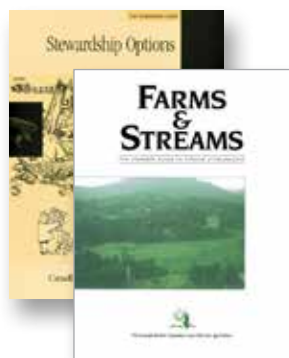
## STEWARDSHIP AREAS

### INTRODUCTION

This chapter discusses stewardship areas for protection of the environment. It contains introductory information on the relationship between these areas and the environment. It also contains information on environmental concerns, legislation and beneficial management practices related to:

- ◆ buffers
- ◆ riparian areas

### STEWARDSHIP AND SUSTAINABILITY

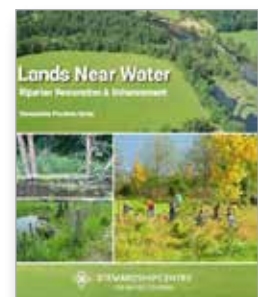


**Stewardship.** This term is often used when dealing with issues surrounding the environment. Stewardship can be loosely defined as “taking care of something”, but in environmental terms, can mean “*the careful planning and beneficial management of our resources, including the people and wildlife that depend on them.*”

Stewardship is not only important to aquatic life and wildlife but to landowners as well. Healthy streams and riparian areas create a positive influence, for example, on the health of adjacent uplands, which are often productive farmland. Similarly, stewardship of native grasslands ensures continued biodiversity and resulting economic returns to the farm by creating long-term livestock forage availability. → see Stewardship Crops, **page 4-13**



- 📄 [Stewardship Options for Private Landowners in B.C.](#)
- 📄 [Fringe Benefits: A Landowner's Guide to the Value and Stewardship of Riparian Habitat](#)
- 📄 [Farm Practices Habitat Management](#)
- 📄 [Best Management Practices: Farm Forestry and Habitat Management](#)
- 📄 [Land Development Guidelines for Protection of Aquatic Habitat](#)
- 📄 [Agricultural Building Setbacks from Watercourses in Farming Areas](#)
- 📄 [Lands Near Water – Riparian Restoration and Enhancement](#)
- 📄 [Agricultural Waterways – Drainage Management and Restoration](#)



**Sustainability.** The root of this term is “sustain”, and could be defined as “management that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Sustainability is actions and considerations practiced by agricultural producers that use farm resources to ensure the success of the farm in a manner that considers the economic, environmental and social outcomes. When applied to natural resources, sustainability considers all parameters to ensure their long-term viability and success.

# BUFFERS, RIPARIAN AREAS, AND THE ENVIRONMENT

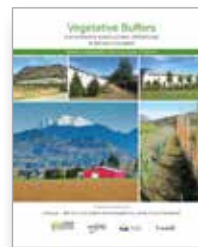
Environmental concepts related to buffers and riparian areas are listed in alphabetical order below.

## Buffers

Are generally defined as specially managed areas used to separate farm activities from sensitive areas that may be impacted by those activities.

Buffers can function as a barrier to reduce the risk of contamination or as an active or passive “treatment system” to remove contaminants before they reach sensitive areas. Most buffers are either a specially managed area of crops, a combination of crops and trees, or designed landscape plantings, and can include physical barriers such as fences, walls or berms. Buffers may be situated adjacent to farm buildings, manure storages, watercourses, or fields which receive manure or pesticides and are meant to protect watercourses, wells, roads, trails, and recreational or urban areas from adverse impacts. Buffers can provide a multitude of other benefits such as:

- ◆ Reducing erosion and runoff;
- ◆ Enhancing aquatic and terrestrial habitat;
- ◆ Increasing soil productivity;
- ◆ Providing aesthetics and visual barriers;
- ◆ Reducing noise, odour and dust;
- ◆ Providing stable microclimates;
- ◆ Providing economic diversification;
- ◆ Providing carbon sequestration in vegetative buffers to offset greenhouse gas emissions and helping farm operations adapt to climate change.



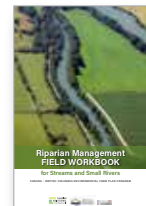
Many other terms are used in place of the word 'buffer' depending on their intended use. These include shelterbelt, windbreak, landscaped buffer, trap crop, catch strip, vegetative filter strip, hedgerow, conservation buffer, field margin, living snow fence, or riparian area.

## Riparian Areas

Areas bordering watercourses or wetlands are known as riparian areas.

Common to all riparian areas are the following:

- ◆ A combined presence and abundance of water, either on or close to the surface.
- ◆ Vegetation that responds, requires and survives well with abundant water.
- ◆ Soils that are modified by abundant water, stream or wetland processes and lush, productive and diverse vegetation.



The riparian areas along watercourses include the banks, a diverse array of plants and animals and the floodplain. A riparian area can be part of a buffer. See **Figure 11.1**.

 [Riparian Management Field Workbook](#)

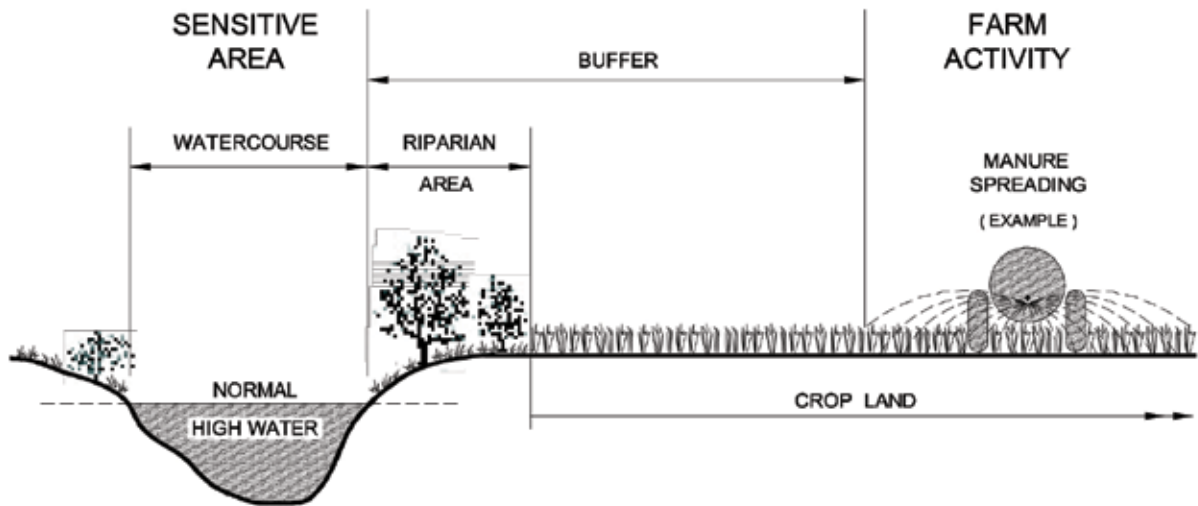


FIGURE 11.1 Relationship between Buffers and Riparian Areas

## Stewardship Areas and Climate Change

Multi-functional buffers and riparian areas can serve an important role in both mitigating and adapting to climate change. Buffer and riparian zone vegetation and soils have high capacity to sequester carbon and offset greenhouse gas emissions. Buffers of all types help to moderate extreme weather events and increase farm resilience to climate change.

A setback is a distance separating two things. It is not meant to be a treatment area like buffers. For instance, a setback may be required between a property line and a building.

➔ see Farm Building Siting, **page 2-8**

# BUFFERS



## BUFFER ENVIRONMENTAL CONCERNS

Primary environmental concerns related to ineffective or non-existent buffers are:

- ◆ Contaminated runoff reaching a watercourse.
- ◆ Pesticide drift causing air, water, or soil pollution.
- ◆ Unreasonable odour, noise, or dust reaching neighbours.
- ◆ Uncontrolled temperature management resulting in inefficient heating or cooling of livestock, equipment and buildings.
- ◆ Soil erosion by wind or water.
- ◆ Weed, insect, or disease pest invasions.
- ◆ Unreasonable disturbances of wildlife at crucial times of the year.
- ◆ Lost opportunities to sequester carbon and offset greenhouse gas emissions from multi-purpose vegetative buffers.
- ◆ Less resilience of agricultural operations to adapt to climate change.

For detailed information on these concerns:

- ➔ see Impacts on Biodiversity and Habitat, **page 7-7**, and refer to Farm Activities and Impacts
- ➔ see Water Quality and Quantity Factors, **page 9-1**, refer to Contaminants
- ➔ see Air Quality Factors, **page 10-1**, refer to Contaminants, to Dust and Particulates

## BUFFER LEGISLATION

The following is a brief outline of the main legislation that applies to buffer use.

- ➔ see **page A-1** for a summary of these and other Acts and Regulations

### Local Bylaws

Local governments may regulate aspects such as setbacks to control odour, noise and nuisance issues.



## Environmental Management Act

The *Code of Practice for Agricultural Environmental Management* requires persons to use environmentally responsible and sustainable agricultural practices when carrying out agricultural operations, for the purpose of minimizing the introduction of waste into the environment and preventing adverse impacts to the environment and human health.

The *Code of Practice for Agricultural Environmental Management* has requirements for agricultural wastes practices and setbacks:

- ◆ PART 4 (SECTIONS 14-19): Setback requirements (from drinking watercourse, water course, and property boundary) for storage of agricultural by-products, agricultural composting processing, wood residue storage and application, nutrient application, confined livestock and poultry areas, on-ground feeding locations or mobile feeding bins, and composting and burial pits.
- ◆ PART 6 (SECTIONS 31-60): Collection, storage, and use requirements for agricultural by-products (including compost and wood residue).
- ◆ PART 7 (SECTIONS 61-76): Slaughter, mortalities, and processing waste (including land applications of wastewater and agricultural compost).

One way of meeting these AEM Code requirements is to have effective buffers.



## Water Sustainability Act

The *Water Sustainability Act* (WSA) is the principal law for managing the diversion and use of water resources, and changes in and about a stream.

The following SECTIONS of the WSA may be useful to agricultural operators in particular:

- ◆ SECTION 6: Prohibits diverting water without a licence except in limited circumstances for fire suppression, domestic use and mineral prospecting.
- ◆ SECTION 11: Requires approvals for making changes in and about streams.
- ◆ SECTIONS 16 & 17: May require mitigation measures on (sensitive) streams where a water diversion or use is authorized.
- ◆ SECTION 45: No new dams on protected rivers
- ◆ SECTION 88: In the case of low or impending low water, for the purposes of protecting the fish population, the minister may make an order regulating the diversion, rate of diversion, time of diversion, storage, time of storage and use of water from the stream by holders of licences or approvals in relation to the stream or aquifer connected hydraulically to the stream
- ◆ SECTION 128: Regulations respecting sensitive streams

The *Water Sustainability Regulation* contains the rules for applications for licensing of surface and groundwater diversions and use, and for "changes in and about a stream".



## Riparian Areas Protection Act

The *Riparian Areas Protection Act* creates the authority for government to enact Provincial directives to protect areas that border streams, lakes, and wetlands. The *Riparian Areas Regulation* (RAR) calls on local governments to protect riparian areas during residential, commercial, and industrial development by ensuring that a Qualified Environmental Professional (QEP) conducts a science-based assessment of proposed residential, commercial, and industrial activities in riparian areas.

With this Act, and through the *Riparian Areas Regulation*, local governments in certain regions of the Province are able to protect riparian areas during residential, commercial, and industrial development by ensuring that a Qualified Environmental Professional (QEP) conducts a science-based assessment of proposed activities. This includes residential buildings on land zoned for agricultural purposes. Section 12 provides Provincial directives on streamside protection.

The RAR only applies to the residential portion of the farm and only in the southern half of BC. The RAR does not apply to farm practices as defined in the *Farm Practices Protection Act*. In some cases, this can lead to the misunderstanding that the RAR does not apply to lands zoned for agriculture, or in the Agricultural Land Reserve (ALR). The RAR does apply to these lands for activities that are not *farm practices*, for example residential construction. It is important to note that local governments have the ability to establish bylaws that apply to agricultural lands, and some have implemented setbacks for agricultural buildings that complement the setbacks designated under RAR. Guidelines for [Agricultural Building Setbacks from Watercourses in Farming Areas](#) have been developed and incorporated into the Guide for Bylaw Development in Farming Areas.



## Integrated Pest Management Act

Administered by BC Ministry of Environment and Climate Change Strategy, this Act regulates the sale, containment, transportation, storage, preparation, mixing, application and the disposal of pesticides and their containers.

SECTION 3(1): Without limiting any other provision of this Act, a person must not (a) use a pesticide that causes or is likely to cause, or use, handle, release, transport, store, dispose of or sell a pesticide in a manner that causes or is likely to cause, an unreasonable adverse effect.

It is important for producers to ensure that their pesticide application practices adhere to Section 3(1), as described above, because it may be applied when a drift incident is being investigated in order to determine if the use of the pesticide resulted in an unreasonable adverse effect, or if the action was likely to cause the unreasonable adverse effect.

This Act and the *Integrated Pest Management Regulation* require pesticides to be used according to label directions, such as a specified buffer distance.

Pesticide storage and safe handling practices may be reviewed by a Ministry inspector or a Conservation Officer (also designated as an inspector under the IPM Act) during a farm inspection



## Fisheries Act

Administered by both Fisheries and Oceans Canada and Environment and Climate Change Canada, this Act is established to manage Canada's fisheries resources, including fish habitat. The Act can also be administered provincially by FLNRORD and ENV. The Act applies to all Canadian waters that contain fish, including ditches, channelized streams, creeks, rivers, marshes, lakes, estuaries, coastal waters and marine offshore areas. It also applies to seasonally wetted areas that provide fish habitat such as shorelines, stream banks, floodplains, intermittent tributaries and privately owned land. The Act includes provisions for stiff fines and imprisonment to ensure compliance.

The purpose of this Act is to provide a framework for (a) the proper management and control of fisheries; and (b) the conservation and protection of fish and fish habitat, including by preventing pollution.

This Act was updated in 2019 and now empowers the Minister to make regulations for the purposes of the conservation and protection of biodiversity.



The definition of fish habitat is: “water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”. The quantity, timing and quality of the water flow that are necessary to sustain fish habitat are also deemed to be a fish habitat. Furthermore, serious harm to fish includes the death of fish or any permanent alteration to, or destruction of, fish habitat.

Provisions of the *Fisheries Act* relevant to agricultural operations include:

- ◆ Protection for all fish and fish habitats;
- ◆ Prohibition against the death of fish or the ‘harmful alteration, disruption or destruction of fish habitat’;
- ◆ A permitting framework and codes of practice to improve management of large and small projects impacting fish and fish habitat.
- ◆ Protection of fish and/or fish habitats that are sensitive, highly productive, rare or unique; and
- ◆ Consideration for the cumulative effects of development activities on fish and fish habitat.

Specific sections of the Act include:

SECTION 34.2(1) The Minister may establish standards and codes of practice for:

- (a) The avoidance of death to fish and harmful alteration, disruption or destruction of fish habitat;
- (b) The conservation and protection of fish or fish habitat; and
- (c) The prevention of pollution.

SECTION 34.4 (1) No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish.

SECTION 35 (1) No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat.

Every person who contravenes subsection 34.4(1) or 35(1) is guilty of an offence and liable.

Notifying authorities about serious harm to fish or deposit of a deleterious substance:

SECTION 38 (4.1) Every person shall without delay notify an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations of a harmful alteration, disruption or destruction of fish habitat that is not authorized under this Act, or of a serious and imminent danger of such an occurrence, if the person at any material time

- (a) Owns or has the charge, management or control of the work, undertaking or activity that resulted in the occurrence or the danger of the occurrence; or
- (b) Causes or contributes to the occurrence or the danger of the occurrence.

SECTION 38 (5) If there occurs a deposit of a deleterious substance in water frequented by fish that is not authorized under this Act, or if there is a serious and imminent danger of such an occurrence, and detriment to fish habitat or fish or to the use by humans of fish results or may reasonably be expected to result from the occurrence, then every person shall without delay notify an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations.

SECTION 38 (7) As soon as feasible after the occurrence or after learning of the danger of the occurrence, the person shall provide an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations with a written report on the occurrence or danger of the occurrence.

## **Pest Control Products Act**

Regulations under this Act require that users of pesticides follow the directions or limitations as shown on the pesticide label which may include the need for buffers.

## BUFFER BENEFICIAL MANAGEMENT PRACTICES

Comply with the applicable buffer related legislation, including the above, and where appropriate, use the following beneficial management practices to protect the environment.

### Activities Requiring Use of Buffers

Four specific farm activities may require the establishment of a buffer. **Table 11.1**, lists both the farm areas or activities and the type of buffers that can be used to protect sensitive areas.

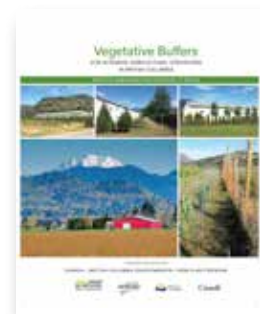
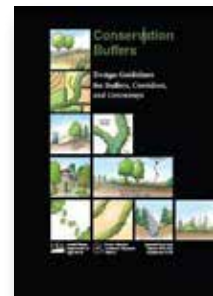
Farm Activity	Buffer Type	To Protect
Intensive Livestock	Runoff Buffer Mist and Dust Buffer Odour and Noise Buffer	Watercourses, Wells Neighbours, Agricultural Crops Neighbours, Wildlife
Manure Application	Runoff Buffer Mist and Dust Buffer Odour and Noise Buffer	Watercourses, Wells Neighbours Neighbours, Wildlife
Pesticide Application	Runoff Buffer Pesticide Drift Buffer Odour and Noise Buffer	Watercourses, Wells Neighbours, Watercourses, Vegetation, Wildlife Neighbours, Wildlife
Bare or Cultivated Soil	Runoff Buffer Windbreaks and Shelterbelts Mist and Dust Buffer	Watercourses Soil Neighbours

### General Buffer Design

Buffers are generally established for a multitude of outcomes and can provide extra insurance against unforeseen environmental problems. However, they should not be intended as the primary means of intercepting sediments and dissolved chemicals generated as a result of poor farming practices or the lack of a nutrient management plan.

Depending on their characteristics (e.g., width, composition, height) and other factors (e.g., weather, emissions, soil type, slope), well-designed and maintained buffers have the capacity to:

- ◆ Remove nutrients and pesticides;
- ◆ Remove certain pathogens;
- ◆ Remove sediment;
- ◆ Reduce odour transmission;
- ◆ Sequester carbon (equal to 50 percent of the mass of woody vegetation present in a buffer);
- ◆ Control erosion and increase water infiltration into soil;
- ◆ Protect water quality;
- ◆ Reduce dust emissions;
- ◆ Stabilize banks and slopes;
- ◆ Block wind and snow;
- ◆ Provide visual screens;
- ◆ Contribute to good neighbour relations.



-  [Vegetative Buffers for Intensive Agricultural Operations in BC – BMP Guide \(2018\)](#)
-  [Conservation Buffers: Design Guidelines for Buffers, Corridors and Greenways \(USDA\)](#)
-  [Odor: Can Trees Make a Difference? \(USDA\)](#)
-  [BC Vegetative Buffers website](#)
-  [Buffer Zones website \(Alberta Government\)](#)
-  [USDA Conservation Buffers website](#)

**Buffer Width.** Effective buffer width can vary significantly depending on its purpose. While there are many resources that provide guidance for specific uses; it may also be useful to experiment with varying widths while monitoring effectiveness. Buffers may be a continuation of a forage field, a separately managed grass area, a planted belt of trees and shrubs, maintenance of a riparian area along a watercourse, or a combination of the above.

Effective buffer widths and composition are a function of:

- ◆ Height of buffer vegetation relative to distance to nuisance or pollution source.
- ◆ The effectiveness of the vegetation to reduce pollution or nuisance.
- ◆ The time of year an activity is occurring.
- ◆ The sensitivity of an area to be protected.
- ◆ The soil, topographic and climatic conditions associated with a site.
- ◆ Habitat values necessary to support biodiversity.

Buffer width can be varied to respond to variability in topography, soil, and other site factors.

 [Riparian Buffer Zones: Functions and Recommended Widths](#)

**Figure 11.2** shows examples of suggested buffer widths based on a manure spreading activity and its risk of impacting a sensitive area. While this example is for manure spreading equipment, the concept applies to other risk assessment situations as well. Application equipment which places manure accurately and directly on the soil surface will require a narrower buffer than, for example, equipment that distributes manure into the air. In addition, solid manure is less likely to move across a field than liquid manure during application or during subsequent rain events.




An early spring manure application will require a wider buffer than would a summer application. This is due to expected higher rainfalls, greater runoff flow events, and reduced grass nutrient uptake early in the growing season. At the time of application, an assessment of field conditions and forecasted precipitation should be used to evaluate appropriate buffer widths for a specific location,.

 [Risk Assessment](#)

When the risk of contaminated runoff flow is high due to conditions such as high rainfall, reduced plant growth, or frozen soil, buffer width and filtering capacity will need to be increased. Vegetative filter strips function best on slopes of less than five percent and are ineffective on slopes greater than fifteen percent. Filter strips are less effective when plants are not actively growing and taking up nutrients.

**Buffer Vegetation.** Structurally diverse buffers (i.e., buffers with grasses, shrubs, and trees) provide more complexity than buffers with only grass or trees. Select plant species for buffers to:

- ◆ Enhance beneficial insects.
- ◆ Be non-weedy or non-invasive → see Weeds, **page 5-13**.
- ◆ Not be hosts for pests or diseases which could affect adjacent crops.
- ◆ Be able to be managed (e.g., by pruning, weed control).
- ◆ Have a potential for economic return (e.g., harvest of forage or cuttings).

-  [Vegetative Buffers for Intensive Operations in BC – BMP Guide \(2018\)](#)
-  [A Guide to Agroforestry in BC](#)
-  [Riparian Management Field Workbook](#)



**Monitoring Buffer Effectiveness.** Ongoing monitoring is required to ensure that a buffer is accomplishing its intended objectives. Assess the effectiveness and integrity of buffers regularly to ensure that a contaminant or nuisance factor is not reaching sensitive areas. If a buffer is not providing adequate protection of a sensitive area, alter the buffer and/or the farm activity causing the impact.

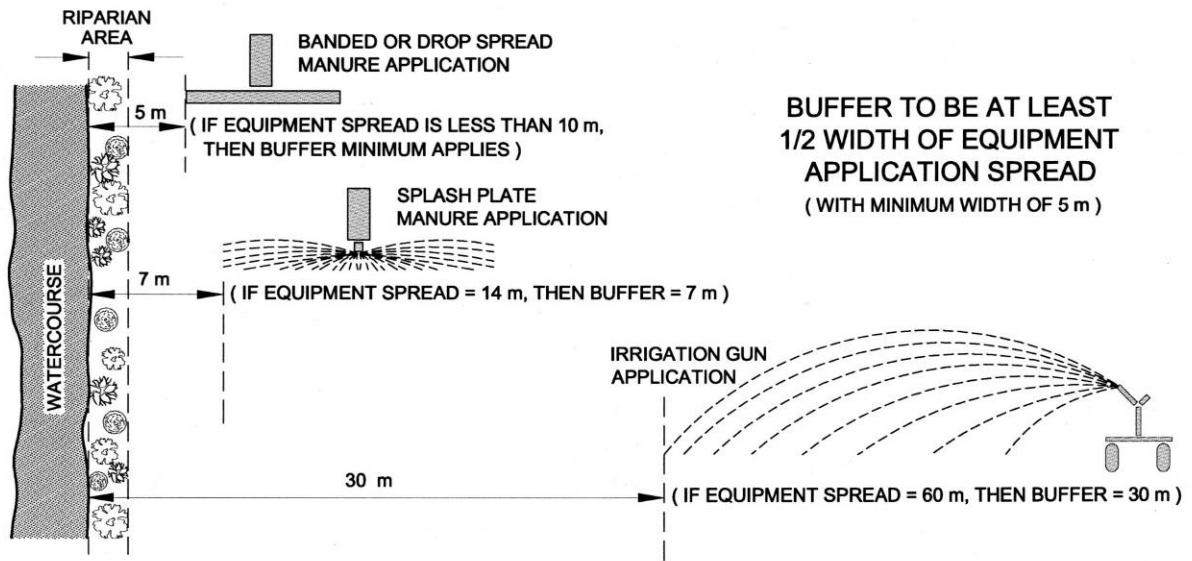


FIGURE 11.2 Suggested Manure Application Buffer Widths Depending Upon Risk of Activity

## Runoff Buffers

To establish an effective runoff buffer, it is important to determine and implement the following buffer considerations. Note that buffer areas may need to be recontoured to prevent concentrated overland flow.

- ◆ Choose buffer designs (vegetation types, layout and widths) that match the site characteristics and sensitivity of a watercourse in order to:
  - Catch and filter suspended solids such as manure or eroded soil;
  - Allow water carrying dissolved or soluble contaminants, such as nutrients and pesticides, to infiltrate the soil;
  - Minimize bank erosion.
- ◆ Choose buffer designs that have a variety of vegetation layers (e.g., grass, shrub, tree) as these are often most effective at reducing sediment and nutrient runoff.
- ◆ Considering adding a herbaceous cover (filter strip), with species like creeping fescue, to increase effectiveness.

In combination with good agricultural practices, buffers are used to minimize the impacts of agricultural activities such as:

- ◆ Movement of nutrients, sediment and pathogens to watercourses or wells:
  - From intensive livestock operations.
  - During and after soil amendment applications (e.g., manure).
- ◆ Movement of pesticide residue to watercourses and wells after application.

## Windbreaks and Shelterbelts

Windbreaks and shelterbelts usually consist of multiple linear rows of various tree and shrub species. They are designed for environmental benefits such as protecting farmsteads and livestock areas, saving energy, enhancing wildlife habitat and for the production of marketable crops. Other agroforestry practices, such as timber belts, silvopastures and alley cropping also provide these environmental benefits.

Windbreaks are specialized design structures such as snow fences or rows of vegetation consisting of trees planted in tight spacings to reduce wind speed, as shown in **Figure 11.4**. They generally are planted at right angles to the prevailing winds to protect crops, soil, livestock and buildings.

Shelterbelts are usually designed with multiple linear rows of trees and shrub species and function much like a windbreak. They have multiple purposes such as providing wildlife habitat, improving the aesthetics of an area, or for harvesting of marketable products.

A windbreak, shelterbelt or other agroforestry practice can provide several benefits such as:

- ◆ Protecting buildings from excessive heat loss or gain;
- ◆ Protecting roads from wind and snow drift;
- ◆ Reducing soil erosion, soil moisture loss and crop stress;
- ◆ Altering the microenvironment for enhancing plant growth;
- ◆ Providing noise and visual screens;
- ◆ Improving air quality by reducing and intercepting dust, chemicals and odours;
- ◆ Improving irrigation efficiency;
- ◆ Improving habitat connectivity;
- ◆ Sequestering carbon.

➔ see Other Concepts Related to Climate Change, **page 12-2**

Tree or fence windbreaks may be used to protect buildings, roads, or fields. They have the ability to protect a distance of up to 30 times their height. Tall grass provides soil erosion protection; however, because grasses are more flexible, the protected area will only be 5 to 7 times their height. **Figure 11.5** illustrates the effect of windbreaks on reducing velocity. The optimum density of the windbreak for reduction in wind speed and interception of airborne particulates is 40% to 60%. Density of a planting is defined as the ratio of the solid portion of the planting to the total area planted.

The advantages of windbreaks are especially important in dry years when low crop yields result in insufficient residue cover to protect the crop and soil from the drying effect of wind and temperature. Windbreaks also trap snow, increasing soil moisture for higher crop yields. This yield increase typically offsets yield losses associated with the need to take some land out of crop production for the windbreak planting. Consideration as to species selected for the windbreak must be given, in order to minimize competition for water and unwanted seedling emergence in farm fields.



FIGURE 11.4 Tree Windbreak

- 📄 BC Windbreaks, Shelterbelts, Timber Belts, Buffers
- 📄 Field Shelterbelts for Soil Conservation (Alberta Government)
- 📄 Trees and Shrubs for Prairie Shelterbelts
- 📄 Wind and Snow Fences
- 📄 BC Fencing Handbook
- 📄 Agriculture Canada: Farmyard Shelterbelts

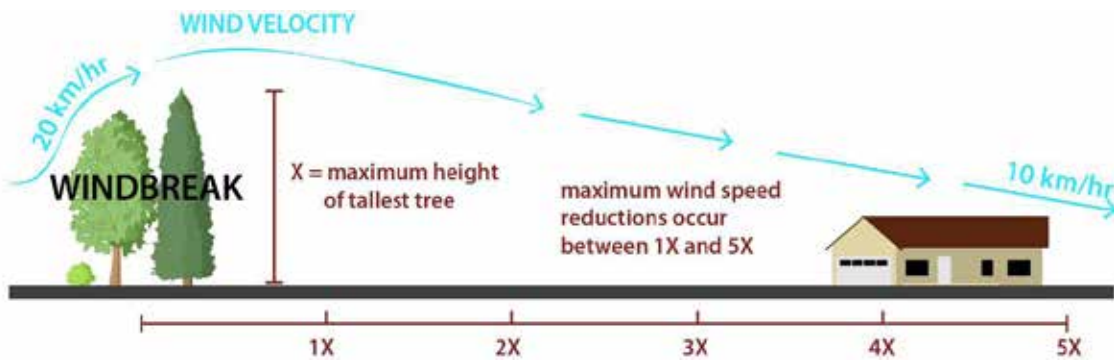
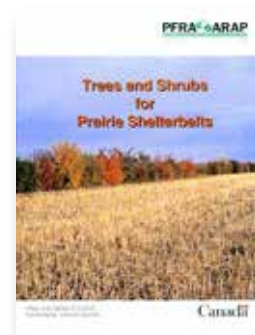


FIGURE 11.5 Approximate Reduction of Wind Velocity by a Single-Row Windbreak



## Buffers for Pesticide Drift

Drift refers to the movement of droplets or vapours, by wind or air current, away from target areas. Drift distance is related to the droplet size, with smaller droplets being carried further by air currents. Drift may result from pesticide applications and a buffer area may be helpful in protecting sensitive areas in close proximity or downwind of an application. Buffers, as indicated on pesticide labels, are actually setbacks and are not active or passive treatment systems as described in this chapter. Pesticide buffers (setbacks) are generally intended for watercourses or for non-target terrestrial areas such as shelterbelts, hedges, woodlands, or wildlife habitat. To help reduce the impacts of spray drift it may be necessary to implement the following practices:

- ◆ Maintain an untreated buffer between the treated area and downwind sensitive areas;
- ◆ Monitor wind direction during spraying to determine when sensitive areas are downwind of the sprayer;
- ◆ Follow pesticide labels, in particular check for buffers (setbacks) from watercourses, wells, sensitive vegetation and wildlife habitat;
- ◆ Use pesticide beneficial management practices.
  - ➔ see Pesticides, **page 5-15**
  - ➔ see General Buffer Design, **page 11-8**.

Vegetation buffers can be planted to physically intercept drift directly, or to reduce wind speed and therefore drift distance. Note that if vegetation is planted to intercept pesticide drift, then pesticide buffers (setbacks) indicated on the label for sensitive terrestrial areas may have to be followed for the newly planted vegetation.

## Buffers for Mist and Dust

Specifications for mist or dust buffers are generally a recommendation of setback distances and species of planting similar to those in windbreaks and shelterbelts. The buffer must be designed to reduce wind velocity in order to allow the particulate matter from agricultural activities to settle out or be trapped on foliar structures like conifer needles. Examples of such activities include fertigation, manure application, dust from field or yard activities, or livestock building ventilation.

**Mist Control.** Mist refers to the small droplets or vapours generated by farm activities such as manure or pesticide application, (see Buffers for Pesticide Drift above). Mist drift can be reduced by using buffers to trap droplets. To minimize the amount of airborne mist, implement the following practices:

- ◆ Use plant density of 40% to 60% to trap mist (the best species for this purpose are conifer tree species such as long needle pines).
- ◆ Select plants with dense branching and twig structure.
- ◆ Use long lived species requiring low maintenance.
- ◆ Use multiple deciduous species with small leaves, and hairy or coarse surfaces.
  - ➔ see General Buffer Design, **page 11-8**

**Dust Control.** Dust refers to particulate matter or soil carried by wind or air current. Dust can be a substantial irritant or safety concern to workers, neighbours and livestock. To minimize the amount of airborne dust, implement the following practices:

- ◆ Ground-level foliage such as grass or shrubs should be planted and maintained to trap dust that exits the barn through exhaust fans.
- ◆ Remove dust accumulations from the buffer to ensure that foliage growth remains vigorous and effective.
- ◆ Establish vegetative buffers such as shrubs and trees along field margins or roads that generate dust during vehicle movement or field activity.
- ◆ Use plant density of 40% to 60% to trap dust (the best species for this purpose are conifer tree species such as long needle pines).
- ◆ Select plants with dense branching and twig structure.
- ◆ Use long lived species requiring low maintenance.
- ◆ Use multiple deciduous species with small leaves, and hairy or coarse surfaces.
  - ➔ see General Buffer Design, **page 11-8**

## Buffers for Odour and Noise

**Odour Reduction.** An odour buffer is characterized by a tightly spaced tree and shrub planting usually planted in close proximity to a livestock facility and perpendicular to the prevailing winds. Most odours generated by livestock facilities travel as particulates suggesting that buffers or shelterbelts can reduce livestock odours by impeding the movements of these particulates. The function of buffers is that the vegetation creates air turbulence causing the odour to either be diluted or trapped within the foliage. For an effective buffer, implement the following practices:

- ◆ Establish effective, vegetative buffers between agricultural operations and neighbours.
- ◆ Choose tree and shrub species that effectively screen out particulates matter and provide an effective visual screen.
- ◆ Consider prevailing winds, screens and terrain when designing odour buffers.
- ◆ Monitor odour levels in sensitive areas.

➔ see General Buffer Design, **page 11-8**

 [Vegetative Buffers for Intensive Agricultural Operations in BC – BMP Guide \(2018\)](#)

 [Agricultural Land Commission Landscaped Buffer Specifications](#)



**Noise Control.** A noise buffer can be a structural barrier such as a noise absorbent or deflective wall, a berm, or a dense vegetative planting consisting of trees and shrubs. Livestock and the operation of equipment can generate significant amounts of noise. Note that vegetation will not stop some sounds such as bird scaring cannons which may need to be deflected by a wall or berm. To reduce noise impacts on humans and sensitive areas, implement the following practices:

- ◆ Evaluate the nuisance level of noise created by a specific farm activity.
- ◆ Establish a sufficiently large setback from neighbours for structures containing stationary power equipment or livestock.
- ◆ Construct a noise barrier or establish an effective vegetative buffer zone by planting a shelterbelt of broadleaf and coniferous trees and shrubs.
- ◆ Monitor noise levels in sensitive areas.
- ◆ Use the standards established by the Farm Industry Review Board for audible bird scare devices.

 [Farm Practice – Wildlife Damage Control – South Coastal BC](#)

 [Farm Practice – Wildlife Damage Control – Interior BC](#)

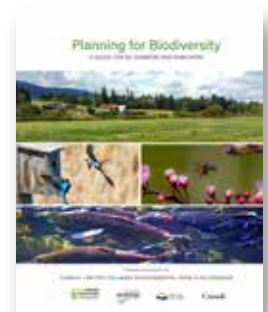
➔ see General Buffer Design, **page 11-8**

## Buffers for Biodiversity

Shelterbelts, agroforestry practices and buffers can provide benefits to wildlife in several ways, including protection from wind and adverse weather, escape or refuge cover, food and foraging sites, reproductive habitat and travel corridors. Shelterbelts designed for the purpose of wildlife enhancement should be of sufficient size to provide winter food and weather protection appropriate for local climatic conditions. The following buffer practices will help support wildlife:

- ◆ Increase the density and diversity of native plant species.
- ◆ Establish buffers to minimize auditory and visual intrusion.
  - Length and width will depend on wildlife species and critical life cycle period.
- ◆ Maintain buffers to provide connectivity across a landscape.
  - Connectivity is necessary during some critical life cycle periods.

➔ see Planning for Biodiversity, **Chapter 2**





# RIPARIAN AREAS



## RIPARIAN AREA CONCERNS

Primary environmental concerns related to riparian area protection are:

- ◆ Farm buildings located within riparian setback distances resulting in impacts to vegetation and water quality.
- ◆ Equipment operation in riparian areas resulting in impacts to vegetation, carbon storage, bank stability and water quality.
- ◆ Livestock access to riparian areas resulting in impacts to vegetation, carbon storage, bank stability and water quality.
- ◆ Intensive crop production in riparian areas resulting in impacts to vegetation, carbon storage, bank stability and water quality.
- ◆ Land clearing and development that results in impacts to vegetation, carbon storage, bank stability and water quality.

For information on these concerns:

- ➔ see Pest Management, **page 5-3**
- ➔ see Impacts on Biodiversity and Habitat, **page 7-7**, and refer to Farm Activities and Impacts

## RIPARIAN AREA LEGISLATION

The following is an outline of the main legislation that applies to riparian area protection.

- ➔ see **page A-1** for a summary of these and other Acts and Regulations



### Water Sustainability Act

The *Water Sustainability Act* (WSA) is the principal law for managing the diversion and use of water resources, and changes in and about a stream.

The following sections of the WSA may be useful to agricultural operators in particular:

- ◆ SECTION 6: Prohibits diverting water without a licence except in limited circumstances for fire suppression, domestic use and mineral prospecting.
- ◆ SECTION 11: Requires approvals for making changes in and about streams.
- ◆ SECTIONS 16 & 17: May require mitigation measures on (sensitive) streams where a water diversion or use is authorized.
- ◆ SECTION 45: No new dams on protected rivers.
- ◆ SECTION 88: In the case of low or impending low water, for the purposes of protecting the fish population, the minister may make an order regulating the diversion, rate of diversion, time of diversion, storage, time of storage and use of water from the stream by holders of licences or approvals in relation to the stream or aquifer connected hydraulically to the stream.
- ◆ SECTION 128: Regulations respecting sensitive streams.

The *Water Sustainability Regulation* contains the rules for applications for licensing of surface and groundwater diversions and use, and for "changes in and about a stream."



## Riparian Areas Protection Act

The *Riparian Areas Protection Act* creates the authority for government to enact Provincial directives to protect areas that border streams, lakes, and wetlands. The *Riparian Areas Regulation* (RAR) calls on local governments to protect riparian areas during residential, commercial, and industrial development by ensuring that a Qualified Environmental Professional (QEP) conducts a science-based assessment of proposed residential, commercial, and industrial activities in riparian areas.

With this Act, and through the *Riparian Areas Regulation*, local governments in certain regions of the province are able to protect riparian areas during residential, commercial, and industrial development by ensuring that a Qualified Environmental Professional (QEP) conducts a science-based assessment of proposed activities. This includes residential buildings on land zoned for agricultural purposes. Section 12 provides Provincial directives on streamside protection.

The RAR only applies to the residential portion of the farm and only in the southern half of BC. The RAR does not apply to farm practices as defined in the *Farm Practices Protection Act*. In some cases, this can lead to the misunderstanding that the RAR does not apply to lands zoned for agriculture, or in the Agricultural Land Reserve (ALR). The RAR does apply to these lands for activities that are not *farm practices*, for example residential construction. It is important to note that local governments have the ability to establish bylaws that apply to agricultural lands, and some have implemented setbacks for agricultural buildings that complement the setbacks designated under RAR. Guidelines for [Agricultural Building Setbacks from Watercourses in Farming Areas](#) have been developed and incorporated into the Guide for Bylaw Development in Farming Areas.



## Wildlife Act

The provincial *Wildlife Act* protects wildlife designated under the Act from direct harm, except as allowed by regulation (e.g., hunting or trapping), or under permit. Legal designation as Endangered or Threatened under the Act increases the penalties for harming a species. The Act also enables the protection of habitat in a Critical Wildlife Management Area.



## Fisheries Act

Administered by both Fisheries and Oceans Canada and Environment and Climate Change Canada, this Act is established to manage Canada's fisheries resources, including fish habitat. The Act can also be administered provincially by FLNRORD and ENV. The Act applies to all Canadian waters that contain fish, including ditches, channelized streams, creeks, rivers, marshes, lakes, estuaries, coastal waters and marine offshore areas. It also applies to seasonally wetted areas that provide fish habitat such as shorelines, stream banks, floodplains, intermittent tributaries and privately owned land. The Act includes provisions for stiff fines and imprisonment to ensure compliance.

The purpose of this Act is to provide a framework for (a) the proper management and control of fisheries; and (b) the conservation and protection of fish and fish habitat, including by preventing pollution.

This Act was updated in 2019 and now empowers the Minister to make regulations for the purposes of the conservation and protection of biodiversity.

The definition of fish habitat is: "water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas". The quantity, timing and quality of the water flow that are necessary to sustain fish habitat are also deemed to be a fish habitat. Furthermore, serious harm to fish includes the death of fish or any permanent alteration to, or destruction of, fish habitat.

Provisions of the 2019 *Fisheries Act* relevant to agricultural operations include:

- ◆ Protection for all fish and fish habitats;
- ◆ Prohibition against the death of fish or the 'harmful alteration, disruption or destruction of fish habitat';
- ◆ A permitting framework and codes of practice to improve management of large and small projects impacting fish and fish habitat;
- ◆ Protection of fish and/or fish habitats that are sensitive, highly productive, rare or unique; and
- ◆ Consideration for the cumulative effects of development activities on fish and fish habitat.

Specific sections of the Act include:

SECTION 34.2(1) The Minister may establish standards and codes of practice for:

- (a) The avoidance of death to fish and harmful alteration, disruption or destruction of fish habitat;
- (b) The conservation and protection of fish or fish habitat; and
- (c) The prevention of pollution.

SECTION 34.4(1) No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish.

SECTION 35 (1) No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat.

Every person who contravenes subsection 34.4(1) or 35(1) is guilty of an offence and liable.

Notifying authorities about serious harm to fish or deposit of a deleterious substance:

SECTION 38 (4.1) Every person shall without delay notify an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations of a harmful alteration, disruption or destruction of fish habitat that is not authorized under this Act, or of a serious and imminent danger of such an occurrence, if the person at any material time.

- (a) Owns or has the charge, management or control of the work, undertaking or activity that resulted in the occurrence or the danger of the occurrence; or
- (b) Causes or contributes to the occurrence or the danger of the occurrence.

SECTION 38 (5) If there occurs a deposit of a deleterious substance in water frequented by fish that is not authorized under this Act, or if there is a serious and imminent danger of such an occurrence, and detriment to fish habitat or fish or to the use by humans of fish results or may reasonably be expected to result from the occurrence, then every person shall without delay notify an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations.

SECTION 38 (7) As soon as feasible after the occurrence or after learning of the danger of the occurrence, the person shall provide an inspector, a fishery officer, a fishery guardian or an authority prescribed by the regulations with a written report on the occurrence or danger of the occurrence.

## Species at Risk Act

The purposes of the *Species at Risk Act* (SARA) are to prevent wildlife species from becoming extirpated or extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. Once a species is legally listed, the Act requires that recovery strategies be developed for extirpated, endangered and threatened species, and that action plans be developed where recovery is feasible.

- ◆ Schedule 1 of the Act sets out the legal list of species at risk (extirpated, endangered, threatened and special concern) in Canada.

Where the Act applies, it makes it illegal to kill, harm, harass, capture or take a species at risk, or to possess, collect, buy, sell or trade any individual or parts of an individual that is at risk. The Act also prohibits the damage or destruction of either the residence (for example, the nest or den) or the critical habitat of any species at risk. Critical habitat is legally identified in a posted recovery strategy or action plan.

While the Act applies to all land and waters in Canada, these prohibitions only apply to areas of federal jurisdiction including migratory birds, all waters (sea and fresh) in Canada, as well as to all federal lands, including Indian Reserves and national parks, and the airspace above them.

On **private land**, unless an emergency order is made by the federal government, the SARA prohibitions apply only to:

- ◆ Aquatic species at risk; and
- ◆ Migratory birds listed in the *Migratory Birds Convention Act, 1994* and also listed as endangered, threatened or extirpated in Schedule 1 of the Act.

The provisions of the *Species at Risk Act* (known as the 'safety net') could be invoked on BC crown and private lands using a federal order under the Act if provincial action is not sufficient to protect listed species.

While SARA prohibitions do not apply to species of special concern, the Act does require management plans to be developed for these species.

More information about how the Act applies on private land can be found at:

 [Species at Risk Act public registry](#)

## Migratory Birds Convention Act

Under this Act, the federal government is responsible for implementing a Convention between Canada and the U.S. for the protection of migratory birds and nests. The Canadian Wildlife Service of Environment Canada administers the regulations.

- ◆ SECTION 5: of the Act states that, no person shall, without lawful excuse:
  - Be in possession of a migratory bird or nest; or
  - Buy, sell, exchange or give a migratory bird or nest or make it the subject of a commercial transaction.
  - Except as authorized by the regulations.

Under the Regulations:

- ◆ SECTION 6: no person shall: disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird without permit.
- ◆ SECTION 24(1): any person may, without a permit, use equipment, other than an aircraft or firearms, to scare migratory birds that are causing, or are likely to cause damage to crops or other property (other control measures require a permit).
- ◆ SECTION 33: no person shall introduce into Canada for the purpose of sport, acclimatization or release from captivity a species of migratory bird not indigenous to Canada except with the consent in writing of the Director.
- ◆ SECTION 35(1): prohibits the deposit of oil, oil wastes or any other substance harmful to migratory birds in any area frequented by migratory birds.

Migratory waterfowl populations create demands on the use of adjacent agricultural lands. Under the Act, it is an offence to harm the habitat of any migratory bird while the bird is resident at the site or to release any substance (including pesticides) harmful to migratory birds into areas frequented by them.

Native birds not protected by this Act (grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays and kingfishers) are protected by the Provincial *Wildlife Act*. Introduced species are not protected (European starling, house sparrow and crested myna).

## RIPARIAN AREA BENEFICIAL MANAGEMENT PRACTICES

Comply with the applicable riparian area related legislation, including the above, and where appropriate, use the following beneficial management practices to protect the environment.

### Riparian Areas

The areas bordering watercourses and wetlands, known as riparian areas, usually have vegetation that is different and more productive than the surrounding upland area due to the presence of water. Stream or wetland health is closely related to the vigour and composition of the border vegetation, which in turn, is an important factor in the condition of the water table and surrounding land. The health of a stream is an indicator of the conditions of the surrounding watershed; a stream, in effect, is an “end product barometer” of a watershed.

In the Interior of BC, riparian areas are easily identified as the green vegetation that is in stark contrast to the brown and yellow vegetation of the drier uplands. In coastal areas of BC, riparian areas may not always have this vegetation contrast. Some of the most endangered plant communities in the Province occur in riparian areas, especially in very dry regions. In these dry areas riparian areas are particularly important to the health of watercourses and the fish and other aquatic life that depend on them. Healthy riparian areas are critical to protecting stream banks and adjacent farmland from erosion.

-  [BC Riparian Areas website](#)
-  [Biodiversity and Riparian Areas – Life in the Green Zone](#)
-  [Caring For the Green Zone: Riparian Areas and Grazing Management](#)
-  [Riparian Areas – A Users Guide to Health](#)
-  [Riparian Health Assessment for Streams and Small Rivers – Field Workbook](#)
-  [Stream Stewardship](#)
-  [Access Near Aquatic Areas](#)
-  [Land Development Guidelines for the Protection of Aquatic Habitat](#)
-  [Riparian Areas: Providing Landscape Habitat Diversity](#)
-  [Develop with Care – Environmental Guidelines for Urban and Rural Land Development in BC](#)
-  [Lands Near Water – Riparian Restoration and Enhancement](#)
-  [Agricultural Waterways – Drainage Management and Restoration](#)



**Riparian Functions.** A healthy riparian area will demonstrate some of the following key ecological functions:

- ◆ Builds and maintains stream banks:
    - Stores floodwater and reduces stream flow energy;
    - Recharges groundwater;
    - Traps sediments;
    - Filters nutrients from water;
    - Increases biodiversity opportunities.
  - ◆ Shades the stream to reduce solar heat gain.
  - ◆ Provides overhead cover and protection from raptors.
  - ◆ Provides important nesting, cover and feeding habitat for breeding and migratory birds and other wildlife.
  - ◆ Supports insect life for fish.
  - ◆ Provides large woody debris from riparian areas, which:
    - Provides shelter and resting places for fish;
    - Adds diversity to the in-stream habitat by allowing the formation of pools and spawning areas;
    - Reduces stream flow velocity.
  - ◆ Sequesters carbon in vegetation and riparian soils, offsetting greenhouse gas emissions.
- ➔ see Other Concepts Related to Climate Change, **page 12-2**



**Riparian Management Field Workbook** is a publication that forms a part of the Environmental Farm Plan series on Beneficial Management Practices. Its purpose is to provide an assessment checklist and guidelines for managing farm activities around riparian areas. This information should be used by producers with watercourses on their farms or those who have intensive livestock operations or crop production near riparian areas. **Table 11.2**, below, gives four basic riparian assessment questions found in the Planning Workbook that direct producers to the use of this publication..

**TABLE 11.2 Basic Riparian Assessment Questions ★**

**Are the banks of the watercourse free of damage that results in exposed soil or bank slumping?**

Exposed soil or bank slumping can be caused by concentrated overland flow, recreational use, farm equipment or hoof action of livestock. Riparian areas with any exposed soil or bank slumping should be assessed in more detail.

**Are all areas of the banks of the watercourse covered with some type of vegetation?**

Vegetation protects soil from the impact of storm events that could carry soil from stream banks into the watercourse. Any riparian areas missing some vegetation should be assessed in more detail.

**Are shrubs and trees present on all watercourse banks? (not applicable if trees or shrubs are not native in that location or if the watercourse is a constructed ditch)**

Shrubs and trees have deeper roots than grass and other herbaceous plants providing a root mass that is more resilient to the impact of flood events and stream scour on stream banks. Any riparian areas that have less than 15% total canopy cover of trees and shrubs (where they should occur naturally) should be assessed in more detail.

**Do shrubs along or near the watercourse edge grow without a mushroom or hedged appearance?**

Mushroom or hedge shaped riparian shrubs are an indication of over grazing. Riparian areas with shrubs in this condition should be assessed in more detail.

★ Producers with riparian areas lacking these features should refer to the *Riparian Management Field Workbook* publication for detailed assessment and management ideas to improve riparian conditions.

**Riparian Functioning Condition.** To evaluate the health of a riparian area, the functioning condition of the area is assessed. Functioning condition is a term that refers to the interactions between the soil, water, geography and vegetation of a site. There are three levels of functionality as shown in **Figure 11.7**.

- ◆ **Healthy or proper functioning condition:** healthy riparian areas with the most stable, non-eroding lands, the best fish and wildlife habitat and the best agricultural productivity.
- ◆ **Healthy but with problems or functional but at risk:** areas that are lacking in some healthy features, and may be experiencing some stream bank erosion, lowering of the water table and fish and/or wildlife habitat may be at risk.
- ◆ **Un-healthy or non-functional:** areas that have few if any healthy features, likely to have eroding banks, deepening channels and subsequent lowering of the water table over time, poor fish habitat and poor agricultural productivity.

 [Riparian Management Field Workbook](#)

Negative impacts on, or loss of, riparian health may also affect the surrounding uplands. Proper functioning condition of riparian areas is the result of good management and benefits all the users within the area, including the landowner.

Some of the key components to management of riparian areas are directly linked to maintaining good soil and water conservation practices across the landscape and preserving, as much as possible, the integrity of the natural riparian zone. Specific land management practices that protect riparian areas include:

- ◆ Maintaining a vegetative cover over the soil throughout the year.
- ◆ Minimizing animal trampling or vehicle traffic on wet soils.
- ◆ Avoiding overuse of fertilizers or manure that may be transported into riparian areas.
- ◆ Avoiding applying or disposing of toxic substances on soils.
- ◆ Protecting against loss of plant diversity and vitality in riparian areas.
- ◆ Protecting against the establishment of exotic or non-water-loving species in riparian areas.
- ◆ Avoiding practices that artificially alter streamflow.

## Riparian Area Management

In some cases, the condition of the riparian area has diminished to the point that it may require some investment to bring the area up to a healthier or proper functioning condition. Improvement of agricultural riparian areas can occur by implementing the following practices:

- ◆ Plant new vegetation.
- ◆ Control invasive weeds.
- ◆ Encourage a diverse mix of plant species and age that:
  - Are adapted to the climate, soil and water conditions;
  - Fosters a good rooting system for bank stability.
- ◆ Protect vegetation from livestock overgrazing or trampling through a grazing management plan by:
  - Considering grazing duration and density in relation to plant growth;
  - Considering stream bank soil moisture content;
  - Consider improving water supply for livestock by providing an off-stream water system or a restricted watercourse access.
- ◆ Protect vegetation from harmful pesticide or nutrient management applications.

- ◆ Improve stability with erosion control structures by:
  - Contouring terraces with earthworks and seeding;
  - Stabilizing gullies and waterways with erosion control matting, silt fencing, seeding;
  - Stabilizing banks through bank shaping, revetment, gabions, riprap, crib walls, re-vegetation, and blanketing;
  - Utilizing drop inlet and in-channel control structures;
  - Improving infiltration of concentrated water flow with filter trenches, filter wells, diffusing wells, etc.;
  - Installing or upgrading retention ponds and erosion control dams.

**Integrated Riparian Management.** Agricultural use of riparian areas can occur when the function of the riparian area is maintained. Implement the following practices:

- ◆ If livestock are well managed, forages grown in riparian areas can be harvested by grazing such as in riparian pastures.
  - ➔see Outdoor Livestock Areas, **page 3-8** and
  - ➔see Watering Livestock Directly from Watercourses, **page 9-17**
- ◆ Traditional crops that are planted, managed and harvested appropriately can be grown in riparian areas, such as hay.
  - ➔see Nutrient Application, **page 6-1**
  - ➔see **Chapter 5**, Pest Management
- ◆ Specialty crops that can be harvested by hand can be grown in riparian areas and can include:
  - Floral crops (pussy willow, contorted willow, ferns);
  - Medicinal crops (cascara bark, hawthorn leaves and fruit);
  - Food crops (fiddleheads, berries, nuts) and conifer boughs for the Christmas market.





### Healthy or Proper Functioning Condition

- ◆ healthy riparian areas with the most stable, non-eroding lands, the best fish habitat and the best agricultural productivity. Other attributes are the ability to: reduce stream energy therefore reducing erosion and improving water quality; filter sediment; capture bedload and aid in floodplain development; improve water retention and groundwater recharge; develop root masses to stabilize banks; develop ponding and channel characteristics to provide fish habitat; support greater biodiversity. This riparian area would probably score as “healthy”



### Healthy But With Problems or Functional But At Risk

- ◆ areas in a “healthy but with problems condition” are lacking some healthy features indicating that some of their water, soil and vegetation characteristics are at risk, thus leading to some potential stream bank erosion, lowering of the water table or putting fish habitat at risk. This riparian area would probably score as “healthy but with problems”



### Non-Functional

- ◆ areas that have few if any healthy features, likely to have eroding banks, deepening channels and subsequent lowering of the water table over time, poor fish habitat and poor agricultural productivity. This riparian area would probably score as “unhealthy”.

FIGURE 11.7 Examples of Functioning Conditions of Riparian Areas

