INTRODUCTION

Farmers, ranchers, and other landowners are responsible for the management of a significant amount of the most productive land in BC. The majority of this land is in the valley bottoms that contain riparian corridors, which are critical for providing a healthy environment for fish and wildlife, along with some livestock grazing. The purpose of this pamphlet is to increase landowners’ knowledge concerning the importance of watershed riparian areas to the health of streams and rivers in British Columbia.

Historically, in BC, land cleared for agriculture was often farmed and/or grazed by livestock to the edge of streambanks. This practice destroyed riparian areas and created an inherent potential for streambank degradation. Continued efforts were made to prevent the banks along rivers and creeks from moving. Practices such as riprapping, dyking, and channelization of streams and their tributaries were considered to be effective solutions to the problem. Landowners, industrial interests, and even government agencies took it upon themselves to protect water corridors without suitable knowledge or consideration for potential consequences. Many of the attempts to control the loss of land failed, riparian areas were destroyed, and the health of many streams and rivers in the province was negatively impacted.

Degraded riparian areas provide significantly less habitat for fish and wildlife than if they were vegetated and healthy. Agriculture productivity is frequently reduced through the loss of farmland to streambank erosion. Water tables are often lowered, potentially reducing forage production on adjacent cropland. Water quality is also jeopardized. Riparian restoration and management benefits everyone!

Both the federal and provincial governments have enacted various pieces of legislation to protect the interests of the general public respecting the importance of the diverse and free attributes of healthy riparian areas. Thus, this publication also outlines to landowners the procedures to follow when undertaking a riparian/fish habitat restoration project, so that they:

• Comply with applicable legislation, regulations, and policies.
• Meet federal and provincial standards of performance.
WHAT IS A WATERSHED?

All of British Columbia is comprised of numerous watersheds. All watersheds collect and store precipitation. The stored water is released into wetlands and streams, which ultimately drain into a river. Watersheds are influenced by various factors, including aspect and steepness of slope, vegetative cover, soil type(s), elevation, and climate.

Plant communities; stream flow; water quality; and the abundance and health of wildlife and fish, all depend upon watersheds working properly, by collecting, storing, and releasing water. Improper management practices in the upper portions of a watershed may cause undesirable events down stream.

Watersheds in healthy condition provide good clean water for domestic use, for wildlife and fish, for plant growth, for agricultural use: irrigation and livestock watering, for recreation, and for industrial use. Most watersheds are made up of many riparian areas (Fig. 1).

WHAT IS A RIPARIAN AREA?

Riparian areas are found next to rivers, streams, wetlands, and lakes. Riparian areas are the transitional zones located between the aquatic (water) and uplands (Fig. 2). Riparian areas have their own, individual, combinations of water, soil, and plant material.

Healthy riparian areas provide habitat and shelter for wildlife, shade and food (insects) for fish, and forage for managed livestock grazing. Many riparian areas, over the years, have been severely damaged by mechanical means and uncontrolled livestock use.

**Riparian Health** is the ability of a stream, river, lakeshore, or a whole watershed to perform certain important functions necessary to sustain a beneficial environment.

Healthy riparian areas perform the following important functions:

- Catch and store sediment to build soil in the riparian area.
- Build and maintain streambanks to help reduce the effects of erosion.
- Store water and energy during floods.
- Recharge aquifers which store, hold, and slowly release water.
- Filter out various contaminants and pathogens so they do not enter a waterbody.
- Reduce and dissipate water velocity and energy to lessen erosion.
- Provide biodiverse habitats for wildlife, fish, plants and insects (native pollinators for crops).
- Create basic plant productivity, plant diversity, and variation in plant age class structure.

Fig. 1 - Watershed mosaic showing wetlands, streams, and their riparian zones.

Upland Riparian Wetland

Fig. 2 - The relationship between upland, wetland (or stream) and riparian areas.
Basic Characteristics of Healthy versus Unhealthy Riparian Areas

**Unhealthy**
- Weeds and undesirable plants present.
- Forage production poor.
- Little, if any, woody plant material.
- Stream channel down-cutting.
- Streambanks eroding and slumping.
- Bare soil exposed.
- Few wildlife or fish.

![Fig. 3](image)

**Healthy**
- No weedy or undesirable plant species.
- Good forage production.
- Woody plant material present.*
- Stream channel stable.
- Streambanks primarily stable.
- Little or no bare soil exposed.
- Wildlife and fish noticeable.

*Most all riparian areas in BC have woody vegetation, such as trees and shrubs, in their natural state.

![Fig. 4](image)

Some Problematic Weeds to Look For In a Riparian Area

- **Knapweed**
- **Canada thistle**
- **Common burdock**
- **Hound’s tongue**
- **Nodding thistle**
- **Purple loosestrife**

The extent and species of weeds in riparian areas will vary within the numerous ecological regions of the province. The amount and severity of soil disturbance influences the magnitude of weed infestations (Fig. 5). Weeds are not present in early spring to catch sediment during the freshet. Weeds also prevent desirable deep-rooted plants, which bind soil and prevent excessive streambank erosion, from establishing. Healthy riparian areas prevent weeds and other undesirable plants from gaining the upper hand.

![Fig. 5](image)

Other plant species that may influence riparian health when in abundance

- **Kentucky Bluegrass**
- **Clovers**
- **Dandelion**
- **Timothy**
- **Cheatgrass**
- **Foxtail Barley**

These plants are often found in small amounts in healthy riparian areas, but tend to increase with disturbance and indicate a change in the natural plant community. These plants do not provide for good soil binding because they are shallow rooted, and they inhibit beneficial plants from establishing.
Importance of Natural Plant Mixes in a Riparian Area

Riparian areas function best under a natural mix of healthy perennial plants that contribute to all the necessary functions noted before, and in particular to bind soil and prevent abnormal erosion activities during high water levels (Fig. 6). The plants noted below only represent some of the desirable species found in healthy riparian areas throughout BC.

- Perennial Grasses and Forbs - Certain bunchgrasses, indigenous sod forming grasses, sedges, rushes.
- Shrubs - Willow, alder, red-osier dogwood, Saskatoon, wild roses.
- Trees - Aspen, balsam poplar, various conifers.

Woody materials, such as trees and shrubs, have deep root systems that are excellent for streambank stabilization. The presence of woody material in various age classes is an indication of a healthy and stable riparian area.

Riparian areas And Streambank Stability

The proper management of riparian areas prevents unwanted erosion of streambanks. Moving water has energy that can disrupt and agitate banks depending upon the volume and speed at which the water flows. Flooding or high water events create the greatest problem due to the volume and speed of the water. If floodwater cannot access the floodplain and if the associated riparian areas are in poor condition, severe erosion will likely occur.

Some erosion is normal and acceptable, particularly if any lost riparian areas are revegetated within a year. Continuous erosion, year-after-year, with no revegetation occurring is a clear indication of unhealthy riparian areas (Fig. 7). Riparian vegetation needs to be included in any program to rectify the problem.
Floodplain
The floodplain extends beyond the stream or river channel and allows for the brief storage of excess water (Fig. 8). On the floodplain water slows down, thus reducing its energy, allowing for sediment to be deposited outside the channel itself. Down cutting of a channel inhibits the ability of rivers and streams from accessing their flood plains during high water events. This can result from vegetation removal, water volume alteration from activities upstream, dams, culvert installations, and landslides, to mention a few examples. This affects the health of the riparian vegetation by lowering the water table. It also increases the stream energy, which often causes more erosion and stream sediment deposits detrimental to fish.

Natural Streams, Channelized Streams, And Ditches
Natural streams are watercourses that have not been subjected to alteration by man. These streams when on agriculture land, usually have gentle slopes, meander, and display bends along their course. The water can be fast flowing in the riffles or slow flowing in the pools. Riffles gather oxygen, which is important for fish and aquatic invertebrates. Large woody debris in a stream can lower stream energy, and also provide habitat for fish and nutrients for other stream organisms.

As streams meander, energy is reduced which reduces streambank erosion. If there is severe riparian damage along the streambank, erosion will likely be of serious concern.

Channelized streams have an appearance that differs depending upon the amount they have been altered through diversion, dredging, or straightening. Some look like natural streams, other than they may have berms or dykes along the streambanks. They may be straight channeled, or meander and have riffles and pools. These streams usually do not flood over their banks. Channelized streams are part of a natural drainage system and may contain fish habitat, however, it is no longer an acceptable practice to channelize a stream.

Constructed ditches are usually more-or-less straight, and have a more constant water volume and flow rate. Channelized streams may sometimes look like a ditch. Ditches usually carry drainage or irrigation water to or from a property and may not contain water at all times of the year (Fig. 9).

Note: Natural streams, channelized streams, and ditches are all subject to the Fisheries Act.
ASSESSING THE HEALTH OF RIPARIAN AREAS

It is not the intent of this pamphlet to present detailed information on the process commonly used to assess the health of riparian areas. The objective is to acquaint landowners with a basic approach that they can use to identify unhealthy riparian areas with streambanks that have been subjected to erosion, and riparian areas that are at risk of becoming unhealthy. There are publications available that provide an in-depth approach to the subject; they are listed under “Selected References and Further Reading”.

When to Do An Assessment?

• During normal flow levels; not during high water.

• During the growth stage of plants, so they can be identified. Obviously the coastal regions have a longer growing season than the BC Interior.

What Type Of Watercourse Is Being Assessed?

• Natural stream or river.

• Channelized stream.

• Constructed ditch.

The BC Ministry of Environment (BCMOE), or Fisheries and Oceans Canada (DFO) or the BC Ministry of Agriculture and Lands (BCMAL) may be able to assist in identifying these types of watercourses. Property history also helps.

Site Selection for Assessment

A basic assessment relies on what the landowner observes visually, rather than a detailed measurement approach. With practice landowners can become quite proficient at their observations. Natural or channelized streams and rivers are the primary waterbodies addressed in this pamphlet. Type and amount of vegetative cover and streambank stability are two of the most important factors to consider. Property owners may already know that some riparian areas and associated stream or riverbanks are declining or are in poor health. If unsure an owner may contact a local stewardship group, the BCMAL district office, or FRISP.
Identifying an Unhealthy Riparian Area

Select a site that already appears to have problems. Such sites can be obvious and easy to identify (Fig. 10).

- These sites usually have no trees or, dead or dying trees. Determine if trees are a natural component of the riparian area; in BC they usually are.
- Are shrubs present or not? They should generally be considered as part of the natural vegetation. Most often shrubs are not present in severely degraded riparian areas.
- Have undesirable plants established on the site? What type of plants exist and how heavy is the infestation? Plants such as knapweed, Canada thistle, and common burdock are found in the BC Interior. Japanese knotweed and blackberry can be a problem in the South coastal area of BC.
- What other plants are present that are impacting, or have impacted, the site? Plants such as Kentucky bluegrass, dandelion, and cheatgrass.
- Has the site been heavily grazed or disturbed mechanically by machinery or other types of vehicles? Is there bare soil present?
- Is quality forage and browse for wildlife low or non-existent?
- Are the stream or riverbanks of the site being severely eroded?
- Has the stream channel been down cutting? Lower water table!
- Streams exhibiting the above problems have unhealthy riparian areas and usually have declining fish populations, as fish rely on healthy riparian areas to supply food, shade, and cover habitat.

All of the components noted above, or a combination of them, when observed on a selected site contribute to a degraded riparian area. This would confirm what the landowner has suspected all along! A riparian site, such as shown in Figure 10, can be mended and returned to a healthy state that is functioning properly. It does take time for riparian vegetation to re-establish, even with help, in order to have the riparian/fish habitat system working properly again.

Fig. 10 - Degraded riparian area.
Identifying a Riparian Area at Risk of Becoming Unhealthy

Site selection for this assessment involves a longer stretch (reach) of a river or stream. The reach should represent what is commonly seen along a stream as it passes through a landowner’s property (Fig. 11). As noted previously, the condition of the vegetative cover is important. The purpose is to determine if a riparian area is healthy, or at risk of becoming unhealthy. The assessment should address the same items as mentioned previously.

- Are trees and shrubs present? Are shrubs being damaged as a result of livestock browsing?
- Are there weeds or other undesirable plants establishing? Is heavy grazing by livestock evident? Are there obvious mechanical disturbances that are man made?
- Is there good forage production and adequate habitat to support wildlife and fish?
- Are the streambanks showing signs of erosion that is beyond normal? Note: If the assessment site is located on the outside curve of a reach, overestimation of streambank problems can occur. The reverse is true for an inside curve.
- What is the stream channel doing? Is it starting to down cut?

This basic assessment is to determine if riparian areas and associated streambanks are deteriorating (at risk). If so, there is a need to identify the factors causing the problem and implement appropriate management strategies. For livestock grazing issues such strategies may include:

- A change in grazing time and duration.
- Developing alternate watering sources.
- Developing controlled access watering points (Fig. 12).
- Salting away from riparian areas.
- Improving the upland forage base.

Landowners should also check for any obvious physical barriers to fish movement in a stream. For example: do any culverts, dams, or logjams hinder or prevent fish passage?

For a detailed assessment of a stream reach the reader is referred to the Riparian Management Field Workbook, EFP Program, BC Agriculture Council.

Procedure For Implementing A Riparian/fish Habitat Restoration Project

This publication does not go into detail regarding the mechanics of riparian/streambank restoration. The best approach to erosion control is the restoration and management of the most suitable vegetation for a site. In addition, rock and trees can be used to help stabilize the streambank and reduce water flow energy. The successful restoration of an unhealthy site will increase wildlife and fish habitat, reduce further erosion, and increase forage values for livestock and wildlife (see before and after pictures Figs. 13 and 14).

Identify The Site To Be Restored and Prepare a Proposal

The following will be required when the landowner applies for the appropriate approval (Section 9) from the BC Ministry of Environment (BCMOE), in order to undertake a restoration project:

- Select the site, and record the name and location of the stream.
- Take pictures of the site from different angles.
- Prepare a detailed drawing of the site, and its location on the property.
- Confirm the legal description of the property.
- Explain the reason for doing the project.
- Describe in detail how the work will be done; designs and plans.
- Provide habitat assessments.
- Address channel stability and flood levels.
- Identify fish and wildlife resource values as appropriate.
- Confirm who is doing the work; they must also understand the necessary regulations and legal requirements.
- Acquire the necessary documents and proceed with the application, and include the fee. Applications should be submitted to the Front Counter BC Office located closest...
Applicable Acts, Regulations, And Policies Controlling Works In And About A Watercourse

Currently the BC Water Act and the Fisheries Act govern landowners who wish to undertake a riparian/fish habitat project in the province of British Columbia. Both Acts set out clear goals, objectives, meaningful performance measures, and science-based tools and guidelines. Thus an applicant, when applying for a permit, must provide a plan or prescription describing the works to be done, setting out clear and reasonable environmental outcomes, with some discretion as to how the outcomes will be achieved. Regulatory frameworks allow resource agency staff to set and report on standards for protecting environmental quality, which includes limiting discharges and emissions to air, land, and water.

The BC Water Act

- The Water Act is administered by the Water Stewardship Division, BC Ministry of Environment, which is responsible for regulating water resources. The Act and Regulations can be found at: [http://www.qp.gov.bc.ca/statreg/stat/W/96483_01.htm](http://www.qp.gov.bc.ca/statreg/stat/W/96483_01.htm).
- Under the Water Act a “stream” includes a natural watercourse or source of water supply, whether usually containing water or not. This includes ground water, and a lake, river, creek, spring, ravine, swamp, or gulch.
- Section 9 of the Water Act requires that a person may only make “changes in and about a stream” under an Approval in accordance with Part 7 of the water regulation, including Notification where required, or under a Water License or Order. Information on Section 9 can be found at: [http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf](http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf).
- The Water Act also applies to streams that may have no fish habitat, yet still meet the definition of a stream. These streams are important for the complex ecosystem functions they provide, which could include the support of amphibians and rare and endangered species.

Applicable Acts, Regulations, And Policies Controlling Works In And About A Watercourse

Prior to receiving approval the information supplied in the application will be assessed to determine if the proposed project will have any impact on the legal rights of downstream water license holders. The application is routinely referred to other regulatory agencies such as the Ecosystem Branch of BCMOE and DFO for comment during the approval process.

- Make sure the conditions outlined in Section 7 of the Water Act Regulation are read and understood.
- Under the Water Act “changes in and about a stream” means any modification to the nature of the stream; including the land, vegetation, natural environment or flow of water within the stream, or any activity or construction within the stream channel that has or may have an impact on the stream. An applicant should refer to BCMOE: Standards and Best Practices for Instream Works, available on the following website: [http://env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf](http://env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf)
- An Approval is a written authorization for “changes in and about a stream” that are of a complex nature. A landowner wanting to complete a riparian/fish habitat restoration project that would include some streambank stabilization or alteration would require this authorization. In addition, an applicant needs to establish the appropriate work window times and other terms and conditions for their region. These can be found at [http://www.env.gov.bc.ca/main/regions.html](http://www.env.gov.bc.ca/main/regions.html).
- Enforcement of the Water Act can involve fines and penalties if a person(s) is convicted of an offence under the Act. A court, for the most serious of offences, can impose a fine of $200,000 per offence per day, up to $1,000,000 per offence per day, or to imprisonment not exceeding 12 months, or to both. However, the Water Act also allows for creative sentencing: courts may require a convicted party to take action to remedy damage done, or to engage in an activity to prevent a repeat of the offence, such as paying for compensation, performing community service, or paying a bond to ensure compliance.
The Fisheries Act

• The Fisheries Act provides for the protection of fish habitat which is defined as: “spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.” Information regarding any specific requirements (operational statements can be found at: http://www-heb.pac.dfo-mpo.gc.ca/decisionsupport/os/os-notification_form_e.htm

• Under the Fisheries Act no one may carry out any work or undertaking that results in harmful alteration, disruption or destruction (HADD) of fish habitat, unless the HADD has been authorized by the Minister of Fisheries and Oceans Canada.

• The Act also states that: “no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish.”

• Where adverse effects to fish habitat cannot be avoided through project relocation, redesign or mitigation; habitat compensation options may be required and a Sub-section 35(2) Fisheries Act authorization issued. Where the HADD is not acceptable, the authorization may be refused.

• An authorization under subsection 35(2) protects an individual from prosecution under the Fisheries Act, provided the conditions of the authorization are met.

• Violations of Subsection 35 can result in substantial fines, risk of imprisonment, and a requirement to cover the costs of returning the project site to its original state or other court ordered remedies.

The Navigable Waters Protection Act

When a riparian/fish habitat project is being considered on the shores of navigable waters, authorization for the project may require approval from the Canadian Coast Guard. Information respecting this Act can be found at: http://www.pacific.ccg-gcc.gc.ca.

Forest Practices Code Act

Culvert installations require that landowners use the Forest Practices Code Act: Fish Stream Crossing Guidebook which can be found at: http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf.

BC Programs To Assist Landowners With Projects

The Farmland-Riparian Interface Stewardship Program (FRISP)

The FRISP program, administered by the British Columbia Cattlemen’s Association (BCCA), focuses on agriculture impacts to riparian areas, and their associated streambanks, and fish habitat. The program also addresses waste management issues relevant to water quality and fish habitat. The objective of FRISP is to foster a common ground approach to environmental land management and watershed /riparian concerns by the agriculture sector.

FRISP Has The Capacity To:

• Cooperate with landowners to identify unhealthy riparian/fish habitat sites.

• Assist landowners with project design, restoration prescription(s), and budget estimates.

• Help individuals to prepare applications to acquire the necessary approvals and authorizations from the BCMOE and DFO.

• Supervise the implementation of a project.

• Mitigate issues between landowners and government agencies, neighbors and various interest groups.

Project Funding Sources

For information on current funding sources for individual projects contact the BC Agriculture Research & Development Corporation (ARDCORP) at 1-866-522-3447 or view their website at http://www.ardcorp.ca. Their address is #230-32160 South Fraser Way, Abbotsford, BC, V2T 1W5.
Can I fix an Unhealthy Riparian Area?

Yes! A landowner can fix a badly damaged riparian area. Identify the site, write a prescription for the works to be done, fill out the appropriate Section 9 application, and follow all the rules and guidelines under the Water Act & Fisheries Act. Make sure that all the I's are dotted and T's crossed before starting any work in and about a watercourse. There is help available to write prescriptions and fill out Section 9 applications under the FRISP Program. Many riparian restoration projects have been implemented and completed with great success in BC.

Process For Project Approval

Contact Front Counter BC to find out which Best Management Practices and Operational Statements might apply and whether to apply for Notification or Approval under the Water Act.

Read and understand requirements under the BC Water Act and Federal Fisheries Act.

Prepare appropriate document with complete details (Procedure for Implementing – page 8) for submission to Front Counter BC. Include which Best management practices or operational statements you will be following.

Send in completed Section 9 Approval application or Notification to Regional Front Counter BC office 45 days prior to scheduled works.

Your project will be referred to MOE Ecosystems section and/ or DFO Canada for review.

Wait for letter of Approval from the Ministry of Environment, Water Stewardship Division outlining conditions.

Complete works as you identified in your submission and those identified in the Section 9 Approval under the Water Act from the Ministry of Environment.
Selected References and Further Reading


Protecting Shorelines & Streambanks – Naturally! Cows and Fish Fact Sheet. Alberta Cows And Fish Program.

Rangeland Handbook for BC. C. Campbell and A. Bawtree (eds.). 1998. BC Cattlemen’s Association, Kamloops, BC.


Riparian Planting Factsheets (1-10). Resource Management Branch, BC Ministry of Agriculture and Lands, Abbotsford, BC.

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