Lands Near Water

Riparian Restoration & Enhancement

Stewardship Practices Series

STEWARDSHIP CENTRE
FOR BRITISH COLUMBIA

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Written by:

Mike Pearson, PhD, RPBio;
David Zehnder; and
DG Blair, M.Sc.

This guide is part of the **Stewardship Practices Series**.

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The project was overseen by an Advisory Committee whose purpose was to foster shared environmental stewardship. The Committee focused on building a positive working relationship between the Stewardship Centre for BC and other organizations interested in species at risk stewardship by: providing assistance with quality assurance; ensuring relevancy and consistency with other species at risk guidance/initiatives; promoting collaboration; and undertaking promotion and outreach to key audiences.

A huge thank you is extended to organizations on the 2018 project advisory committee for their contributions: Environment and Climate Change Canada; Fisheries and Oceans Canada; District of Maple Ridge; BC Ministry of Agriculture; BC Environmental Farm Plan Program; South Coast Conservation Program; BC Dairy Association; BC Cattlemen's Association/ FRISP program; and the University of British Columbia. Thank you as well to the farmers and ranchers that we profiled in the case studies included in this guide.

This document does not necessarily represent the views of all individual members of the Advisory Committee, the land managers profiled, or the official positions of the organizations in which they are associated. or the official positions of the organizations with which the individual committee members are associated.

A volunteer in a riparian area newly planted with willow, cottonwood, and western red cedar.

The Stewardship Centre for BC

The Stewardship Centre for BC (SCBC) was created to assist governments, businesses, conservation and environmental organizations, and citizens to carry out stewardship activities in the most efficient, effective, and rewarding ways.

A leader in promoting stewardship values as the foundation for sustainability, SCBC wants to make "shared stewardship" – the voluntary adoption of environmentally sustainable practices by all sectors of society – a reality in British Columbia.

We champion science-based, best practices so that British Columbians can understand, enjoy and sustain healthy ecosystems through stewardship.

As good stewardship relies on good decision-making, we work closely with our partners to develop innovative technical, educational and capacity building resources.

For more information about the Stewardship Centre:

Tel. 1.866.456.7222
www.stewardshipcentrebc.ca
info@stewardshipcentrebc.ca

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Introduction

Lands near water, commonly called riparian areas, are found along the shores of lakes, ponds, wetlands and streams and are important transition zones between water and drier upland environments. Riparian areas support moisture-loving plants such as aspen, cottonwood, cedar, willow, and wild rose and provide valuable habitat for birds, wildlife and aquatic species.

Practicing stewardship to protect and enhance these important riparian areas on the land benefits the landowner and their communities, as well as species at risk and other wildlife.

Broadly defined, stewardship is an approach that promotes the responsible use, protection and management of the natural environment through conservation and sustainable best practices.

This guide was designed to provide landowners with information they can use to conserve wildlife and species at risk.

It is also a valuable resource for:

- The agriculture sector with industry-specific stewardship practices they can consider when making land use decisions and developing land management plans;
- Local governments with information to consider when developing mechanisms, such as bylaws and community plans, that help protect wildlife and species at risk; and
- Conservation and stewardship organizations with information that supports their work with landowners and managers.

One of a series

This guide is one of our Stewardship Series of guides intended to encourage people to take voluntary stewardship actions, called stewardship practices, to safeguard wildlife and species at risk.

This series includes another guide for the agriculture sector called *Agricultural Waterways: Drainage Maintenance and Stewardship* (see Web Resources).

Stewardship is about taking responsibility to promote, monitor, conserve and restore ecosystems for current and future generations of all species.

Importance of Riparian Areas

Although riparian areas make up a small part of the landscape, they have a very important role in our environment. Riparian areas and their nearby waterways link habitats together. Water, nutrients, fish, wildlife, pollinators and even plants move through riparian landscapes.

The links riparian areas provide are even more important when natural habitats are scattered, as they often are in agricultural and urban landscapes.

A connected, continuous riparian area can help stream temperatures by providing long stretches of shade and filtering out pollutants that would otherwise enter the water. Even short sections of waterways without riparian vegetation can degrade habitat far downstream. Bank erosion and sedimentation , more extreme water temperatures and reduced summer oxygen levels are common impacts.

Healthy riparian areas usually contain mature trees, dead standing snags, an understory of shrubs and plants, and logs and woody debris on the ground.

Top 10 Benefits of Riparian Areas for Agricultural Producers:

1. Reduces loss of land to erosion
2. Improves flood control
3. Enhances drainage
4. Provides cleaner water for irrigation
5. Improves herd management (with riparian fencing)
6. Improves herd health (better weight gains, less foot rot)
7. Increases income opportunities (Farmland Advantage, agroforestry)
8. Increases pollinator habitat
9. Increases biodiversity
10. Improves public image of land management (assurance program compliance)

Healthy riparian areas form a continuous band of trees, shrubs and understory plants along both sides of a watercourse.

Riparian Areas Provide Benefits to the Environment

Riparian areas are hotspots of species diversity, supporting rare species like the Yellow Breasted Chat and protecting waterways from the impacts of bordering land uses.

Environmental Benefit	Role of riparian area
Increased Biodiversity	Supports very high numbers of native species including species at risk and pollinators.
Protection of Aquatic Habitat	Provides a buffer between waterbodies and human activities on neighbouring lands.
Protection of Wildlife Movement corridors	Allows many species to move through urban agricultural and other areas changed by humans.
Moderation of water temperature	The canopy of riparian trees and shrubs shields small waterways from sun and wind, which moderates water temperatures.
Erosion Control	Prevents excessive erosion as riparian vegetation stabilizes banks.
Nutrient Control	Helps water quality as riparian vegetation can absorb nutrients that may cause problems.

Riparian Areas Provide Benefits to People

Riparian areas provide a wide range of benefits to people. These benefits are also called 'ecosystem services', which our health, well-being and economy need.

Benefits to People	Role of riparian area
Better Drainage	Shade channels prevent the overgrowth of invasive plants which helps maintain drainage of agricultural, urban and other settled lands.
Soil Conservation	Riparian vegetation reduces the loss of valuable topsoil from agricultural lands and controls erosion along stream banks.
Flood Control	Riparian areas store water, slowing run off and reducing erosion during floods.
Healthier Fisheries	Riparian areas provide shade, bank stabilization, nutrient and chemical filtration, and large woody debris needed by fish such as salmon.
Pollinator Production	Riparian areas increase habitat for pollinators that are essential for agricultural fruit and berry production.
Increased Biodiversity	Riparian areas have a lot of biodiversity which benefits pest control, bird watching, hunting, scientific research and a wide variety of other nature-based activities.

There are many benefits of healthy riparian areas from attracting pollinators for healthy crops, to protecting salmon habitat, to providing clean water.

Riparian Areas and Species at Risk

In BC, well over 100 species at risk, plus many other wildlife species rely on riparian habitats for all or parts of their lives and may be affected, in a positive or negative way, by land management activities there.

The large number indicates how important these areas are in comparison to the area they occupy on the landscape.

Fish

Fish are highly dependent on riparian areas. Riparian vegetation protects aquatic habitat by moderating water temperature, reducing the input of silt and soil as well as filtering contaminants.

Trees and large branches falling into the water, provide cover and, in flowing water, often help to create and maintain deep pools needed by some species.

Insects falling from riparian vegetation into the water are a primary food source for many fish, including trout and salmon.

Amphibians

Although most amphibians like frogs and salamanders breed in the water, many spend much of their lives in riparian areas. Riparian vegetation provides cover for amphibians on land.

Some species, like Northern Red-legged Frogs and Tiger Salamanders, attach their eggs to sticks and tree roots in the water. Riparian areas also protect aquatic habitat from pollution which amphibians are especially sensitive to.

Brassy Minnows (top) and Bull Trout (right), are species at risk that depend on riparian areas to keep their aquatic habitats healthy.

Many amphibians, like the Blue–listed species at risk in BC, Northern Red-legged Frog (right) and the Great Basin Spadefoot Toad (far right), use riparian areas as their primary habitat.

Birds and Mammals

Many birds and mammals live in riparian areas for all or part of their life. Hundreds of thousands of birds use riparian areas during migration and overwintering periods. Some species, such as the Mountain Beaver and Yellow Breasted Chat, breed in riparian areas.

Even species of birds and mammals that might not be dependent on riparian areas, will regularly use them to access water, food sources or protective cover.

Species at risk use large mature riparian trees like black cottonwood (left) and conifers. These trees are especially valuable as nest sites for large bodied birds like Great Blue Herons and Swainson's Hawks.

These trees can also provide rare breeding sites for cavity nesting species like Western Screech Owl. In the interior almost one third of birds rely on tree cavities. Lewis's Woodpeckers, for example, use large cottonwood in riparian areas.

Species at risk, the Black-throated Green Warbler (centre) breeds in mixed riparian forests in the Peace River region, while the Pacific Water Shrew (bottom) depends on riparian areas of south-western British Columbia.

Invertebrates (animals without backbones)

Many invertebrates, including all dragonflies and many snails and slugs depend on riparian areas either directly or to help protect their aquatic habitats.

For example, native pollinators like bumblebees and the Viceroy Butterfly use willows, which grow predominantly in riparian areas, as an essential early season food source.

The Blue Dasher (above) is known from the South Okanagan, Vancouver Island and the south coast. It feeds in riparian areas. The Banded Tigersnail (left) occurs in riparian forest in the Kootenays. Both are species at risk.

Plants, Mosses and Lichens

Many plants, mosses and lichens are found exclusively in riparian areas. These habitat specialists include species at risk like the Vancouver Island Beggarticks and Bearded Sedge.

Riparian plants also provide cover from predators, places to live and food for animals like Nuttall's Cottontail and for insects that are in turn, eaten by other species at risk, like the Olympic Shrew.

Species at risk, Pacific Waterleaf (lower right) is found in riparian areas of the Fraser Valley and Southern Vancouver Island, while Bog Birds-foot Trefoil (upper right) is limited to a few locations on southeastern Vancouver Island.

Changes to the distribution and movement of water, clearing of riparian vegetation and competition from introduced species are some of the threats they face.

Activities That Threaten Riparian Areas

Clearing of Vegetation

Human activities are often concentrated along waterways and can lead to the removal of native trees and plants along the banks. Waterways and their neighbouring lands provide hydro-electric power, access to water transport, fertile soils for agriculture, desirable views, access to water for domestic, livestock, and irrigation uses, and easy routes for roads and railroads. Some people also consider natural riparian areas to be messy and unsightly so they clear them for visual reasons.

Riparian habitats are linear and continuous by nature. When vegetation is removed, they become narrowed and fragmented, supporting far fewer species and ecosystem services.

Clearing of vegetation in these areas can change flood frequency and increase the inflow of nutrients, pollutants and noise. Many of these impacts spread downstream with the flowing water, affecting areas far larger than just the impacted site.

Loss of riparian vegetation is also loss of habitat for riparian animals. For example, the decline of the Western Screech Owl in the interior is closely linked to the loss of nesting cavities in mature riparian trees near agricultural and urban areas.

Clearing of riparian areas means the loss of trees and shrubs that can lead to increases in erosion and may expose the waterway to increased heating, sediment, chemical contamination, and invasion by introduced species.

As well, clearing of riparian vegetation adjacent to fish habitat may violate Federal and Provincial laws (see Existing Laws and Regulations in Appendix B).

Pesticide and Herbicide Use

Pesticides and herbicides, including glyphosphate products, are harmful to riparian areas and their nearby waterways. These products may kill native plants and insects, including important pollinators and species at risk.

One of the biggest threats to riparian areas is the broadcast use of pesticides and herbicides in or nearby these areas. This practice should be avoided and great care taken to prevent drift of pesticides and herbicides into riparian areas from applications on adjacent lands.

Herbicides should be used with extreme caution in areas adjacent to streams. This stream, flowing through a cranberry field, contains Salish Sucker, Oregon Spotted Frog, Coho Salmon, and other species of fish and amphibians. Note how the streambank on the right indicates broadcast use of herbicide – an illegal practice that harms habitat, including that of species at risk.

Livestock Access

Uncontrolled livestock access to riparian areas can greatly increase bank erosion as vegetation is lost to trampling and grazing.

The sediment released may also degrade spawning habitat for kilometres downstream.

As well, livestock waste in riparian areas can be a source of harmful bacteria (like E. coli) which can have harmful impacts on riparian organisms and downstream water users.

Don't allow livestock to linger and over-use riparian areas. This is especially true when streambanks or shorelines are saturated with moisture and vulnerable to trampling.

See: www.cowsandfish.org

Dumping of Organic Material

Although most people understand that dumping garbage in natural areas is harmful, many still believe that organic material such as grass clippings, pruned branches and other organic waste is 'natural' and acceptable to deposit in riparian areas.

However, dumping organic waste can smother native vegetation, introduce invasive species and possibly contribute to overloading water bodies with nutrients.

Grass clippings and yard waste can smother natural vegetation. Disposing plants improperly can introduce invasive species like English ivy and Knotweed to riparian areas.

Steps to a Successful Stewardship Practices Project

Stewardship Practices are actions that help to conserve, enhance and restore species at risk and wildlife habitat. There are many different practices that can help protect or restore riparian areas.

Stewardship Practices in riparian areas are most beneficial when implemented along the whole length of a riparian area.

However, riparian areas cross property lines and political boundaries so working together to manage riparian areas at the landscape or watershed scale will have greater results.

Action typically starts on one or a few properties and every stewardship effort contributes towards improving the riparian areas.

Taking on a riparian enhancement or restoration project can be complex; however, this section of the guide provides concrete information on how to successfully plan and implement a riparian area enhancement or restoration project.

6 Steps to a Successful Riparian Restoration or Enhancement Project

1. **Get help with project planning.**
2. **Determine which wildlife and species at risk would benefit from the project.**
3. **Determine which Stewardship Practices would work for the project.**
4. **Obtain permits for the project, if necessary.**
5. **Implement the Stewardship Practices project.**
6. **Monitor, maintain and improve the project.**

STEP 1: Get Help with Project Planning

Riparian areas are as diverse as the landscapes they cross. To be successful, it is important to tailor plant species selection, site preparation, timing of planting, and other protective measures to the site's unique conditions. Specific guidance can be obtained from resources such as the Environmental Farm Plan Program (see Web Resources), local environmental or stewardship organizations, or by hiring a qualified professional (typically a Registered Professional Biologist or a Registered Professional Forester who is knowledgeable and competent in the field).

It is a good idea to consult neighbours and the local government early in the planning process. There may be opportunities to coordinate larger scale or multiple projects along a specific riparian area. This will help to better manage riparian areas on a landscape or watershed scale. Every stewardship effort will contribute towards improving these vital areas.

Assess Your Site

There are many site assessment tools available. The resources described below are available to help you choose and implement the right tool for your site.

For example:

- The Cows and Fish riparian health assessment is a very useful tool for agricultural producers.
- The BC government's Riparian Area Regulation (RAR), which applies to some areas of BC, includes an assessment methodology for properties proposing development or redevelopment of areas adjacent to watercourses. These assessments must be completed by a qualified professional.
- Minimum setbacks for agricultural buildings (except farm residences) are described in the factsheet Agricultural Building Setbacks From Watercourses in Farming Areas.

See Web Resources for links to these tools and other resources.

Get Financial Help

There are a number of financial assistance options to help with planning and completing riparian projects:

- The BC Agricultural Research and Development Corporation (ARDCorp)'s Environmental Farm Plan Program will help assess the site and may provide partial funding for the establishment of riparian vegetation, fencing livestock and many other beneficial practices.
- Many landowners and local governments have partnered with local stewardship groups, such as Streamkeepers or local conservation organizations, who have access to funding for habitat improvements, especially for fish and species at risk. Often these groups can access funding for materials and help with volunteer labour to implement a riparian project.
- Environment and Climate Change Canada's Habitat Stewardship Program (HSP) can support landowners financially to protect terrestrial and aquatic critical habitat and species at risk.

  The program provides funding for projects that protect and restore habitat for species at risk and projects that address species not listed under the federal *Species at Risk Act* (SARA), to prevent them from becoming a conservation concern.

  HSP encourages multi-year and multi-partner projects. Private landowners should work with stewardship groups, local government, and/or the provincial government to develop a project funding application.
- Landowners can also negotiate financial support to offset some project costs as part of a stewardship agreement with Environment and Climate Change Canada.
- Landowners can access attractive tax benefits by protecting habitat on land through the federal Ecological Gifts Program.

Consider Farmland Advantage to Protect Riparian Areas on Agricultural Lands

Farmland Advantage pays farmers to maintain and enhance the riparian areas on their land. One example is A Rocha Canada's farm at Brooksdale Environmental Centre.

In this case, Farmland Advantage contracted A Rocha Canada to maintain the stewardship practices they have implemented and pays them annually for their effort.

Farmland Advantage is working with a team of experts to develop this into a long-term program that will be widely available to producers. www.farmlandadvantage.com.

- Species At Risk Partnerships on Agricultural Land (SARPAL) is a pilot program that will enable cattle producers to implement Best Management Practices and projects that will protect habitat for the Yellow Breasted Chat and Lewis's Woodpecker.
- BC also has programs that provide annual payments to farmers rewarding them for the ecosystem services their land or management practices provide. Two examples include: Farmland Advantage (see box) and Delta Farmland and Wildlife Trust.
- Some communities have a local community conservation fund that supports stewardship. The Kootenay Conservation Fund is one example and the South Okanagan Conservation Fund is another.

  If no local conservation fund is available, efforts to establish one can support future conservation in the region.

Agricultural Assurance and Other Programs

There are some programs that can make your project more economically viable. Many producer groups in Canada are initiating assurance programs to assure consumers that their farmers are implementing Best Management Practices.

- For example, Dairy Farmers of Canada, and members initiated the development of proAction to show how farmers responsibly produce milk. With proAction, farmers offer proof to customers that they work to ensure milk quality and safety, and to continually improve animal health and welfare as well as environmental stewardship. Protecting and enhancing riparian areas will help producers meet these assurance program standards.
- Other incentive programs that include payments to farmers for the value of the ecosystem goods and services their land or management practices provides are emerging as a practice in British Columbia.

  Examples include The Delta Farmland and Wildlife Trust (www.deltafarmland.ca) and Farmland Advantage Project (www.farmlandadvantage.com).

For additional funding options and ideas, please visit www.stewardshipcentrebc.ca/stewardship-practices-for-species-at-risk-gallery.

STEP 2: Determine Which Wildlife and Species at Risk Would Benefit

Many species of fish, amphibians, birds, mammals, invertebrates and plants rely on riparian habitats for all or parts of their lives.

Well over 100 species at risk and many more wildlife species may be affected by land management activities in BC's riparian areas.

Generate a list of plants and animals local to the project area using advanced search functions at the:

- BC Conservation Data Centre Ecosystems and Species Explorer http://a100.gov.bc.ca/pub/eswp/ for wildlife and species at risk,
- Government of Canada's Ecosystem and Species Explorer for federally listed species at risk, or
- Stewardship Centre for BC's Species at Risk website www.speciesatriskbc.ca for easy to access information on species at risk in BC.

STEP 3: Determine Which Stewardship Practices Would Work

Stewardship Practices are actions which help to conserve, enhance and restore species at risk and wildlife habitat in riparian areas. Stewardship Practices covered in this guide include:

- Protect Existing Riparian Areas
- Establish New or Restore Degraded Riparian Vegetation
- Plant Native Vegetation
- Protect Plantings from Wildlife
- Fence Out Livestock
- Control Invasive Species
- Install Large Woody Debris
- Create Pits and Mounds
- Create Riparian Wetlands
- Augment Riparian Areas with Agroforestry or Leave Strips

See the next section in this guide on Stewardship Practices for further information.

STEP 4: Obtain Permits for the Project, If Necessary

If project plans include clearing existing riparian vegetation, building structures or constructing habitat within a riparian area, a number of local, provincial or federal laws and regulations may apply.

Depending on how complex the project is, and what resources are available, it may be advisable to work with a qualified professional consultant to handle permit applications.

See Appendix B for a full list of regulations and permitting requirements that may apply to your project.

STEP 5: Implement Stewardship Practices

The previous steps help to get assistance to plan the project, assess the site, identify the practices to implement and ensure the appropriate permits are in place.

Now it's time to begin the restoration and enhancement work from the plan. Implementing stewardship practices can be expensive and complicated which is why it is important to follow the preparation steps carefully.

As noted earlier, there are funds and resources available to help with implementing practices such as riparian planting and installing large woody debris.

Make sure that details of the plan are followed to help ensure success. For instance, if the plan calls for planting larger trees and smaller stock is planted, then these smaller trees might fail to thrive due to aggressive grass species covering them.

STEP 6: Monitor, Maintain and Improve the Project

Annual maintenance of plantings will likely be required for at least five years, particularly in areas dominated by invasive species such as Himalayan blackberry.

Vole guards should be removed from trees after a few years. The thicker bark on older plants helps them resist voles and their larger root systems allow them to recover from damage more easily.

Unfortunately, many plantings do fail in restoration projects. So replacement of dead plants is usually also necessary after a few years.

As the canopy closes in, the diversity of an older planting site can be increased by planting shade tolerant and smaller understory species that would not have survived earlier in the restoration project.

Monitoring can be as simple as regular walks to check on plant health. It is a good idea to take a few photographs from the same location each season or year so that progress of the vegetation and hopefully the return of different species can be seen.

Photos are also very helpful for reports to funding bodies and they can demonstrate the success of the restoration or enhancement of the project area over time.

Stewardship Practices to Restore or Enhance Riparian Areas

Following are Stewardship Practices that will enhance habitat and protect multiple species in riparian areas. Select those practices that best suit project location and budget.

Protect Existing Riparian Areas

Protecting existing riparian habitat should always be the first priority. This approach is far more cost-effective than restoring lost or damaged areas. A large body of scientific research on the effectiveness of riparian buffers in protecting the aquatic habitats has been published. The general consensus is that, to fully protect aquatic habitats from the impacts of adjacent land uses, buffers need to be at least 30 metres wide. Within this zone, it is also clear that the areas closest to the water are more important than those further out. For example, a 15 metre buffer provides much more than half the benefit of a 30 metre buffer. Even a narrow 5 metre buffer will provide important benefits for species at risk.

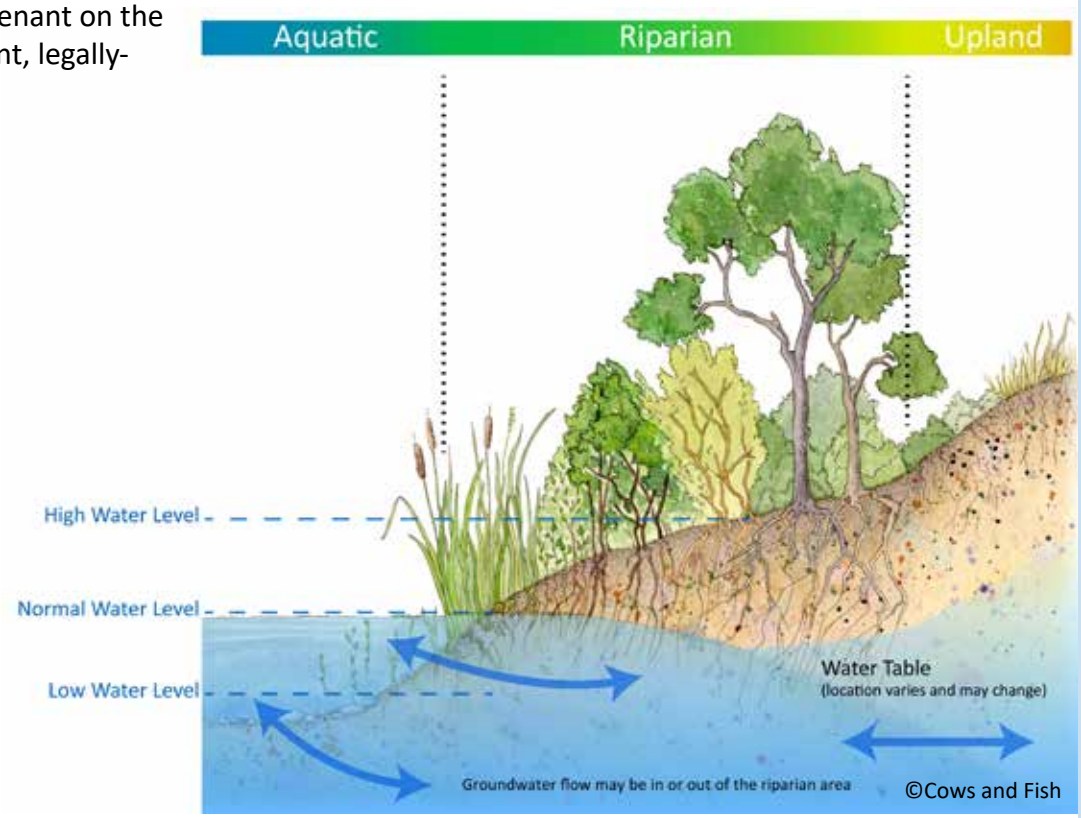
Protection of existing vegetation is especially important in intensively farmed or urban areas where little riparian vegetation remains intact.

One way to permanently protect riparian areas is by registering a conservation covenant on the land title. A covenant is a permanent, legally-binding agreement placed on a property's title to ensure native vegetation on the property is protected forever. A local Land Trust or the Land Trust Alliance of British Columbia (www.ltabc.ca) can provide details on how this might be accomplished.

For farmland, the Agricultural Land Commission must approve covenants on lands within the Agricultural Land Reserve.

As riparian habitat often qualifies as ecologically sensitive under the federal government's Ecological Gifts Program, donors of land and conservation covenants with riparian habitat may be able to access significant income tax reductions. www.canada.ca/en/environment-climate-change/services/environmental-funding/ecological-gifts-program.html.

Riparian area widths vary and generally increase in size as the width of the stream increases. Even a narrow 5 metre buffer will provide important benefits for species at risk.



Case Study: Fraser Common Farm - Glorious Organics

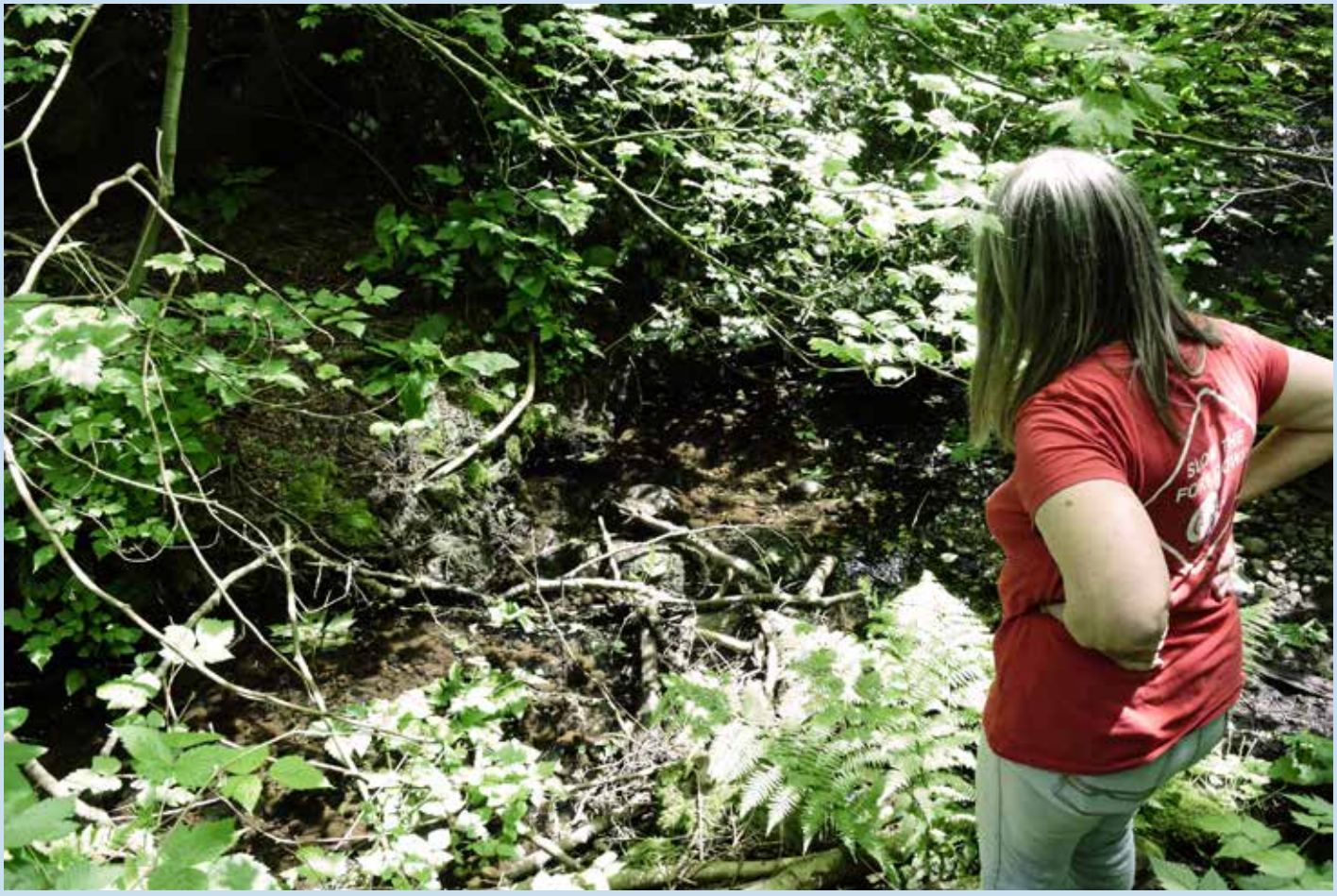
The Fraser Common Farm is farmland owned by Glorious Organics. The greatest 'problem' on the successfully managed farm, which has been cooperatively owned for many years, is that they are not able to keep up with demand for their products. The farm is a mixed farming operation with five acres of intensive, annual row crops. Employing stewardship practices has been core to how the cooperative has operated since it started.

This commitment is easily observed as one walks past the farm's bee mason 'hotels' and solar panels for their electric fences, which are used to contain sheep who 'mow' their orchards. Perhaps the most prominent example of their commitment to being good stewards of the land, is the large area of the farm that has been left wild. This protected habitat includes over four acres of water courses and riparian areas. The farm has also benefitted enormously from selectively harvesting wild food products in these wild areas.

"We are doing a lot of wild crafting. From the forests and from the perennial plants that we haven't planted that just volunteer themselves around the farm. We have a good start up in spring because we do nettles, elder flowers and we do day lily shoots (for market)."

Heather Pritchard

See: http://stewardshipcentrebc.ca/glorious-organics-fraser-common-farm/



Establish New or Restore Degraded Riparian Vegetation

Native riparian vegetation should be established or restored next to waterways where it has been removed.

Restoration of vegetation along ditches will reduce the chance of sediment, nutrients and chemicals getting into the water as anything that enters a ditch will typically end up in a river.

This section of the guide describes stewardship practices that help to establish a new area or restore existing riparian areas. These practices include:

- planting native vegetation,
- protecting plantings from wildlife,
- fencing out livestock,
- controlling invasive species,
- installing large woody debris,
- creating pits and mounds, and
- creating riparian wetlands.

Volunteers plant native trees and shrubs along a creek on a Fraser Valley farm.

Case Study: Okanagan Falls Biodiversity Ranch

Ryan and Erin Culligan and The Nature Trust of BC (TNTBC) work together to manage the Okanagan Falls Biodiversity Ranch. Ryan and Erin ensure that the ranch remains a working ranch, while TNTBC focuses on their core mission of protecting the "natural diversity of wildlife and plants."

The partnership between The Nature Trust of BC and the Culligans has successfully protected and enhanced many riparian areas at the Biodiversity Ranch.

For example, Rankin Spring, which crosses the property, was fenced off and a riparian area next to a man-made reservoir was restored.

Ryan has noticed that the reed and slough grass recover quickly after riparian areas are fenced off. However, he also noted that weeds can become a problem over the long-term in these protected areas and require control. For other ranchers interested in doing similar projects Ryan thinks a good place to start is the completion of an Environmental Farm Plan. Completion of the program also allows producers to access funding to help complete some of these projects.

One of the best things to do to get started is to do an Environmental Farm Plan. Sometimes just having a look at what you're doing will make you see places to improve. Often if people recognize it, people will do it. I think most ranchers have that pride in their ownership of the land.

Ryan Culligan

See: http://stewardshipcentrebc.ca/okanagan-falls-biodiversity-ranch/

Plant Native Vegetation

Native species provide the most habitat value. When re-establishing native riparian areas, early colonizing, or 'pioneer' species, such as willows, alder, native roses, aspen or cottonwood and other sun-loving species are likely to do best.

Attempts to establish understory plants from the onset, especially herbaceous or shrubby species, are likely to fail - wasting effort and money.

Planting is best done in early spring or in fall, although winter planting works well in warmer areas along the coast. Additional species can be added after the 'pioneer' species are established – this will then allow understory species to thrive.

Willow, cottonwood and red osier dogwood have the additional advantage of readily rooting from cuttings (also called 'whips'). These whips can be harvested locally at much less expense than purchasing potted stock. See Web Resources for further information on the planting of whips or cuttings.

For plants started from seed, local seed sources are always preferable, as the plants will be well adapted to site conditions. For large sites, wholesale nurseries are often willing to harvest local seeds and grow potted stock from them, although one to two years lead time is required.

Use relatively large stock, as they have a much better chance of surviving. For plantings in habitats dominated by invasive reed canary grass or Himalayan blackberry, trees in 5 gallon pots and shrubs in two gallon pots and at least 1 metre of top growth are preferred. In these conditions willow and cottonwood whips 1.5 to 2 metres in length are best. Smaller plant material is generally overwhelmed by the grasses within the first year.

It is also better to do high density plantings (e.g. 2 trees and 4 shrubs per 10m2), as the habitat value is higher and plants will be more likely to outcompete invasive species.

Annual maintenance of plantings, such as invasive species removal, beaver guard repairs and supporting weak plants with stakes, will likely be required for at least five years, particularly in areas dominated by invasive species such as Himalayan blackberry.

Thick plantings of relatively large stock have higher survival rates (left). On agricultural lands an outer row of conifers will minimize debris fall on fields and clearly define the edge of the riparian area (right). Where shading is a concern lower growing species should be used.

Case Study: Bruce and Patty Kiloh

Jacobsen Creek runs through the Kiloh's small farm, home to horse and cattle production. Bruce has been carrying out a planting program in the riparian zones, planting coniferous and deciduous trees throughout the area for over a decade. He has also used bioengineering techniques to stabilize the bank and prevent soil erosion.

In 2016, the Kilohs and A Rocha Canada, a local conservation organization, devised a plan to accelerate the work in the riparian area including the removal of large areas of Himalayan Blackberry that had taken hold. They also planted over 300 native plants (22 species) to revegetate the riparian zone and prevent the regrowth of invasive plant species. A few hundred metres of livestock fencing was also built to prevent cattle and horses from entering the riparian area.

Enjoy it while you can, be part of something that's positive and you will personally feel a lot better about the environment and what you are doing and long-term it has huge benefits. It enhances property (value) too!
Bruce Kiloh

See: http://stewardshipcentrebc.ca/kiloh/

Protect Plantings from Wildlife

Little is more depressing than returning to a freshly planted site to find stumps or wilted leaves on lifeless trees. Guarding trees and shrubs from wildlife can consume one third to one half of a planting budget, which seems very expensive until one considers that mortality is often close to 100% without these measures.

Beavers will take trees and large stemmed shrubs within 50 metres of a waterway. They have a preference for willows, cottonwood and alder but, if little else is available, they will take even spruce, cedar and other conifers.

Plants can be protected by fencing, which should be at least one meter high (1.5 metres is best), with openings not more than 4 inches square, and be anchored to the ground with stakes or small diameter fence posts. It is best to encircle individual or small groups of trees. This allows wildlife free movement through the habitat and is more secure. If a fence encircling a large number of plants fails (e.g. a tree falls on it), everything within it may be lost.

Voles eat the inner bark of trees and shrubs during the winter and typically there are a lot of them in riparian areas dominated by thick grass cover. Plastic guards can be installed to prevent them from girdling plants (removing a band of bark and cambium around the entire circumference of the stalk) and killing them. Spiral-style guards are best, as they will expand with trunk growth.

Well secured fencing encircling trees is an effective way of preventing beaver damage.

Fence Out Livestock

Fencing livestock out of agricultural riparian areas prevents damage to existing and newly planted native vegetation or allows it to recover from past damage.

It also improves water quality, reducing entry of nutrients and disease causing organisms including faecal coliforms, giardia, and cryptosporidium.

It also benefits animal health, particularly foot and hoof problems, by keeping them out of the water and mud.

Drinking water can be supplied to animals using commercially available off-channel watering stations (some of which are solar powered) or by limiting access to a very small area of the channel. Diverting surface water to a watering station may require a license under the BC *Water Sustainability Act*.

Fences can be made more wildlife friendly by leaving space for smaller animals to pass beneath the lowest wire or leaving gaps between two posts wide enough for wildlife but too narrow for cattle to pass through.

A riparian area before (top) and three years after (below) cattle were fenced out of a riparian area.

Willows and other native species were planted in the riparian area at the time of fencing. Photos courtesy of the Langley Environmental Partners Society.

Case Study: Semiahmoo Stables

Wayne Morris is owner of Semiahmoo Stables and was having trouble with his horses going into the ditch on his property, a feeder ditch to the Little Campbell River. The horses would go into the ditch to eat the nearby grass and then could not get out.

Wayne worked with a local conservation organization to create a riparian buffer and to fence the area to keep the horses out. The project also improved water quality by keeping horse manure out of the watercourse and included removing blackberries as well as planting native species. Wayne worked together with the volunteer team: he taught the volunteers how to put in a fence and the volunteer team manually cut up all the blackberries in the ditch and planted native species. It was a "win – win" solution all around!

I want it pristine on the front end but it's nice to have something that looks like Mother Nature out the kitchen window.
Wayne Morris

See: http://stewardshipcentrebc.ca/semiahmoo-stables/

Control Invasive Species

Invasive plant species such as Himalayan Blackberry, Purple Loosestrife, Yellow Flag Iris or Reed Canary Grass are one of the most common problems in riparian areas.

These species can overgrow and out-compete native plants, especially if the native vegetation has been disturbed. This destroys habitat for wildlife that rely on native vegetation.

There are different control methods for invasive plants depending on the species.

As these invasive species are close to water, chemical methods must be used sparingly and with great care to avoid contamination of the water. Always refer to the pesticide or herbicide label and seek the advice of your regional invasive plant council before proceeding.

For further information and to find your local invasive species council go to www.bcinvasives.ca.

Japanese Knotweed (left) is highly invasive introduced plants that thrive in disturbed areas and prevents native vegetation from becoming established.

The site had large areas of Himalayan blackberry (top) that were removed (centre) with an excavator prior to planting native species (bottom).

Note that sites near water may require authorization from Federal and Provincial authorities. See the 'Existing Regulation and Policy' in Appendix B.

Case Study: A Rocha Canada, Brooksdale

A lot of effort has been used to control weeds mechanically at Brooksdale Centre in Surrey, BC.

Fast growing species such as alder, cottonwood and willow, as well as slow growing ones, such as red cedar, Douglas fir and spruce have been planted in areas where invasive species have been removed.

An experimental project using different types of mulching, especially cardboard and mattress fiber, was tried on one of the banks of the Neufeld Brook to control weeds amongst planted seedlings. This experiment was very successful to control invasive plants and staff at Brooksdale will continue to use mulching in areas where invasive species have been removed.

By watching and following natural cycles, restoration work can help nature to heal itself.
Jesse Wildeman, Environmental Restoration Specialist at Brooksdale Centre.

See: http://stewardshipcentrebc.ca/a-rocha-canada/

Riparian Wetlands are widely used by overwintering fish and by breeding amphibians and birds, including the Western Toad (above) and the American Bittern (right).

Install Large Woody Debris

Dead wood is a fundamental part of natural riparian areas in forested landscapes. These habitats are thick with branches, trees, uprooted stumps, downed logs and standing snags. Birds excavate cavities for nests, bats roost under loose bark, and vast numbers of insects live in the decaying wood, providing food for vertebrates. Amphibians and reptiles find cover under logs, and an array of plants, lichens and mosses are nourished by decaying wood.

However, most riparian areas in agricultural and urban settings lack this important large woody debris. If riparian restoration sites are simply planted with native trees, more than a century will pass before they will have nearly as much dead wood as today's natural riparian forest.

Large woody debris is readily available, usually for the cost of trucking, from land clearing companies or debris traps at dams in large rivers. Typically an excavator is required to place these materials in the site being restored. If large woody debris is placed within the channel or floodplain an approval or authorization from federal or provincial authorities may be required (see Appendix B: Existing Regulation and Policy).

Tips on installing large woody debris:

- Debris must either be placed on the ground high enough up that it will not float away during floods, or be anchored in place.
- Snags can be installed in soft ground by an excavator. The thicker end is grasped and the narrower end driven in a minimum of 2.5 metres. Do not attempt to install them perfectly vertical: it takes too much time and will appear less natural.
- Logs placed with the tips in the water and the bases on high ground provide important cover for animals moving between aquatic and upland areas.
- Place debris and snags in clusters rather than evenly spacing them. Dense patches of debris are more valuable as habitat than pieces that are spread out.
- Gather the smaller branches that inevitably litter the worksite into brush piles above the high water mark. They will be well used as cover by a variety birds and mammals.
- Use logs to link patches of debris or brush piles to one another

Large woody debris was trucked in and placed with an excavator in this riparian area before native trees and shrubs were planted.

Create Pits and Mounds

Uprooted stumps, decomposing logs and abandoned stream channels all create a complex landscape in natural riparian areas.

Pits that hold water during wet periods, mounds that dry out quicker than surrounding areas and variable slopes all provide a wide range of micro-habitats that support more species.

In contrast, riparian areas in cleared landscapes are typically graded flat or have a smooth slope.

Riparian naturalization projects aimed at restoring biodiversity can recreate a complex landscape by digging small pits that mimic those created by tree-fall, and piling the excavated material into small mounds.

Soils should be left loose and rough. It is best to do this kind of work when installing large woody debris, as described above.

Small pits and mounds were dug by an excavator as it placed large woody debris in this project.

Create Riparian Wetlands

Wetlands are areas where water covers the soil, or is very near the surface, at least part of the year.

All wetlands have riparian areas just like streams do. Riparian wetlands provide habitat for additional species and for different life stages of some species.

For example, many stream fish like Cutthroat Trout move into 'off-channel' wetlands to escape strong currents and predators during cold winter weather when they are not able to feed or move much.

Construction of ponds and wetlands is a common and effective fisheries habitat enhancement method.

Wetland restoration may require approval from regulatory agencies (see Existing Regulations and Legislation Appendix B).

This small wetland was built in a low corner of a pasture within the riparian area of a creek in Langley.

Enhance Riparian Areas with Agroforestry or Leave Strips

Agroforestry crops, like these hardwoods planted in Agassiz to produce veneer logs can augment the benefits of native riparian areas while providing income to landowners.

The benefits of riparian ecosystems can often be increased by planting agroforestry crops (e.g. high value hardwoods or hazelnuts), in the area between intensively farmed lands and riparian areas.

These forested areas can provide the landowner with income-generating products.

Leaving a 3-6 metre wide strip of unmown or seldom mown "leave strips" also provides benefits. Unsprayed plants and grasses along the edge of a field can reduce the drift of herbicides and insecticides into more sensitive habitats by as much as 95%.

This helps increase the local population of insectivorous birds, butterflies and important pollinators.

Conclusion

Practicing stewardship on the land will protect and enhance important riparian areas. The benefits for the landowner and their communities, as well as species at risk and other wildlife, can be significant.

By following the six step process outlined in this guide, a property owner, farmer or other land manager can implement these nine beneficial stewardship practices, leading to restored and enhanced riparian habitat.

"We're trying to show that agriculture and the environment aren't mutually exclusive; you can have both.

For example, a narrow riparian strip can prevent top soil loss, act as a nutrient filter, shade out invasive plants, provide a windbreak, and improve the scenery."
Holberg Farm

Appendix A: Web Resources

Riparian Stewardship

Cows and Fish
www.cowsandfish.org

Cows & Fish Assessment tool
www.cowsandfish.org/riparian/health.html

Agroforestry Systems in BC
www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/agroforestry

Center for Wetlands and Stream Restoration
www.wetlandsandstreamrestoration.org

BC Cattlemen's Association Farmland-Riparian Interface Stewardship Program
www.cattlemen.bc.ca/frisp.htm

BC Riparian Area Regulation Guidebook
www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/rar-guidebook-local-government_web_final_aug_2016.pdf

BC Ministry of Agriculture Riparian Website
www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/riparian-areas

ARDCorp Environmental Farm Plan
www.ardcorp.ca/programs/environmental-farm-plan/efp-program-resources

Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia:
www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-planning-strategies/wetlands-in-bc

BC Invasive Plant Council
www.bcinvasives.ca

BC Ministry of the Environment Stewardship Resources
https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship

BC Ministry of Environment's Develop with Care series
http://www.env.gov.bc.ca/lower-mainland/ecosystems/land_development/develope_care.htm

British Columbia Working Around Water
www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water

Best Management Practices (BMPs)
www.env.gov.bc.ca/wld/BMP/bmpintro.html

Stewardship Centre for BC: Agricultural Waterways: Drainage Maintenance and Stewardship
www.stewardshipcentrebc.ca/resources

Stewardship Centre for BC
www.stewardshipcentrebc.ca

Stewardship Series, Stewardship Centre for BC
www.stewardshipcentrebc.ca/bc-stewardship-series

Species at Risk

SARA and You: Information for private landowners
https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=96E43121-1

BC Conservation Data Centre
www.env.gov.bc.ca/cdc

Species at Risk: a primer for British Columbia
www.speciesatriskbc.ca

South Coast Conservation Program
www.sccp.ca

South Okanagan Similkameen Conservation Program:
www.soscp.org

Kootenay Conservation Program:
www.kootenayconservation.ca

Sunshine Coast Wildlife Project:
www.coastwildlife.ca

Regulatory Requirements

Fisheries and Oceans Canada Projects Near Water
www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html

Permitting under the *Species at Risk Act* for Aquatic Species
www.dfo-mpo.gc.ca/species-especes/sara-lep/permits-permis/index-eng.html

Permitting under the *Species at Risk Act* for Terrestrial Species
www.registrelep-sararegistry.gc.ca/sar/permit/permits_e.cfm

FAQ on SARA permits, including "When is a SARA permit needed?"
www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=EA35A22E-1#wsAC0439AB

Funding Sources:

Habitat Stewardship Program funds stewardship activities on private land– work in collaboration with a local stewardship or agricultural organization
www.ec.gc.ca/hsp-pih

EcoAction Community Funding Program provides financial support for projects that have measurable, positive impacts on the environment.
www.ec.gc.ca/ecoaction

Pacific Salmon Foundation supports volunteer organizations that undertake habitat projects, including riparian restoration, that benefit salmon through their Community Salmon Program.
www.psf.ca

Species at Risk Partnerships on Agricultural Land (SARPAL) pilot program assists cattle producers in adopting management practices that benefit their ranch operation as well as species at risk in the south interior.
www.cattlemen.bc.ca/SARPAL.htm

Habitat Conservation Trust Fund provides funding for projects that maintains conserve or restore indigenous fish and wildlife species and their habitats.
www.hctf.ca

Farmland Advantage is a research and development project working to establish a program that pays farmers to take extra ordinary action to enhance the environment.
www.farmlandadvantage.com

Tax Incentives:

Ecological Gifts Program offers significant tax benefits to landowners who donate ecologically sensitive land or a partial interest in land.
www.ec.gc.ca/pde-egp

Land Trust Alliance provides support for landowners to make charitable donations of ecologically sensitive land.
www.ltabc.ca

Appendix B: Existing Regulations and Policies

If project plans include clearing existing riparian vegetation, building structures or constructing habitat within a riparian area is, a number of laws and regulations may apply.

Please note that this list is current at time of publication; people should contact local authorities to confirm required permits and authorizations.

Also, depending on project complexity and resources available, it may be advisable to engage qualified professional consultants to help with project planning and permit applications.

Government	Legislation	Permits/Authorizations
BC	*Water Sustainability Act*	To store groundwater and/or to make changes in and about a stream you must hold a licence, use approval or change approval; or be in compliance with an order; or in accordance with Part 3 of the *Water Sustainability Regulation*.
	Riparian Areas Protection Act	The *Riparian Areas Regulation* (RAR) protects and may require restoration of riparian area vegetation during non-agricultural land development including activities such as adding decks or docks. Setbacks for agricultural buildings depend on the type of building and watercourse and vary from 5 to 30 m. Although the RAR is provincial, it is administered by local governments.
Federal	*Fisheries Act*	Removal of existing riparian vegetation that has the potential to cause serious harm to fish and their habitat, as defined under section 35 of the *Fisheries Act*, may require an authorization by the Minister of Fisheries and Oceans. For the most current information on *Fisheries Act* review and authorization processes refer to DFO's website: www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html
	Species at Risk Act (terrestrial species)	It is prohibited to kill, harm, harass, collect or possess a terrestrial species, including a migratory bird, that is listed as Endangered, Threatened or Extirpated. Destroying the nest or residence of those listed migratory birds is also prohibited. Permits may be issued for certain purposes: see www.sararegistry.gc.ca/sar/permit/permits_e.cfm for more information. Critical habitat is identified, to the extent possible, in final recovery strategies and action plans for all species listed as Endangered, Threatened or Extirpated. There are a variety of ways critical habitat may be protected on non-federal lands. Voluntary stewardship activities can help prevent destruction of critical habitat. Depending on the species, provincial laws may apply, or there could be a federal regulation or order in place which prohibits destruction of critical habitat. If a protection measure under SARA is in place, some activities may take place in critical habitat, but must occur in ways that do not result in destruction of critical habitat. For more information contact your regional Environment and Climate Change Canada office at ec.ep.rpy-sar.pyr.ec@canada.ca and visit www.sararegistry.gc.ca.

	Species at Risk Act (aquatic species)	It is prohibited to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual or any part of an individual of an aquatic species listed under SARA as Extirpated, Endangered or Threatened anywhere the species occurs in Canada. Note that under SARA aquatic species means a wildlife species that is a fish, shellfish, crustacean, marine animal, or marine plant. It is also prohibited to damage or destroy the residence of one or more individuals, or to destroy any part of the critical habitat of an aquatic species listed as Extirpated, Endangered or Threatened. Critical habitat is the habitat necessary for the survival or recovery of the species, and is identified to the extent possible and described in the recovery strategy or action plan for that species. For some aquatic species at risk, riparian habitat is identified as critical habitat. Activities such as clearing riparian vegetation can take place in critical habitat, but these activities must occur in ways that do not result in the destruction of critical habitat function when it is required by the species. If you are planning to carry out activities that may trigger prohibitions under SARA, a SARA permit may be obtained if the purposes of the activity meet SARA requirements and if SARA preconditions are met. For information on species at risk permitting, refer to DFO's permitting website: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/permits-permis/index-eng.html
	Migratory Bird Act	General prohibitions under the Act and its regulations protects most species of migratory birds, and their nests and eggs, anywhere they are found in Canada, regardless of ownership. The deposit of substances harmful to migratory birds in waters or areas frequented by them is also prohibited. Environment and Climate Change Canada recommends that you: 1. Know your legal obligations; 2. Avoid engaging in potentially destructive or disruptive activities in key sensitive periods and locations, in order to reduce the risk of affecting birds, their nests or eggs; 3. Develop and implement appropriate preventive and mitigation measures to minimize the risk of incidental take and to help maintain sustainable populations of migratory birds. Note that appropriate measures need to be decided on a case-by-case basis. It is the responsibility of the individual or company undertaking the activities to determine these measures. For more information, please visit the information page on the MCBA: www.ec.gc.ca/Nature/default.asp?lang=En&n=7CEBB77D-1 and the ECCC Incidental Take website: www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1
Local Government	Tree Bylaws and Development Permit Processes	Local governments may regulate removal of trees through a dedicated bylaw and/or through development permit processes. Details differ widely among jurisdictions, so it is prudent to check with the relevant municipality or regional district.

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