

*Species at Risk  
Voluntary Stewardship  
Practices for:*

*Riparian Areas in  
Settled Landscapes*

*Produced in partnership by:*



**STEWARDSHIP CENTRE**  
FOR BRITISH COLUMBIA

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This document does not necessarily represent the views of all individual members of the advisory committee, or the official positions of the organizations with which the individual committee members are associated.

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## The Stewardship Centre for BC

The Stewardship Centre for BC (SCBC) was created to assist governments, businesses, conservation and environmental organizations, and citizens carry out stewardship activities in the most efficient, effective, and rewarding ways. A leader in promoting stewardship values as the foundation for sustainability, the SCBC wants to help make “shared stewardship” – the voluntary adoption of environmentally sustainable practices by all sectors of society – a reality in British Columbia.

We are committed to champion science-based best stewardship so that British Columbians 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, go to [www.stewardshipcentrebc.ca](http://www.stewardshipcentrebc.ca).



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*A riparian area newly planted with willow, cottonwood, and western red cedar.*

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## Preface

This Stewardship Practices guide for species at risk and other wildlife affected by riparian area activities presents options and examples of good stewardship practices to reduce impacts to these species. The guide describes different activities people can undertake to help conserve wildlife and their habitat and also provides links to resources to take action. This guide is one of a series of guides developed by the Stewardship Centre to address threats to wildlife and species at risk. Other guides in this series include:

- Species at Risk Voluntary Stewardship Practices for: ***Guidance for Restoration Activities in Riparian Areas***
- Species at Risk Voluntary Stewardship Practices for: ***Drainage Maintenance in Agricultural Waterways***
- Species at Risk Voluntary Stewardship Practices for: ***Climbing***
- Species at Risk Voluntary Stewardship Practices for: ***Reducing Domestic and Feral Cat Predation***
- Species at Risk Voluntary Stewardship Practices for: ***Reducing Small Animal Road-kill.***

## About this Document

This guide was designed to provide:

- Private landowners with information they can use to inform their actions to conserve species at risk
- Industry specific stewardship practices that the agricultural sector 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 species at risk
- Information for conservation and stewardship organizations that can facilitate their work.



This guide encourages people to take **voluntary stewardship actions**, called stewardship practices, to safeguard wildlife and species at risk. Stewardship can be broadly defined as an ethic that promotes the responsible use, protection, and management of the natural environment through conservation and sustainable best practices.

This guide describes stewardship practices for wildlife and species at risk that addresses the common threat they face in riparian areas. Following an overview of this threat, various actions are described to conserve, enhance, and restore habitat that is impacted. To help implement these stewardship practices additional information resources are provided at the end of the guide.

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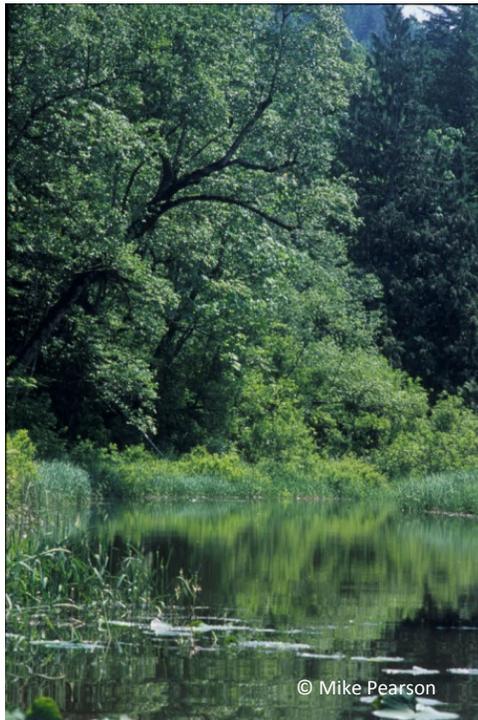
## The Current Situation

### Riparian Zones, Species at Risk, and Waterbody Health

Riparian areas are transition zones between water bodies (e.g., lakes, ponds, wetlands and streams) and drier upland environments. Riparian areas support moisture-loving plants such as aspen, cottonwood, willow, and wild rose. They are vastly more important than the small proportion of the landscape they occupy might suggest.

Riparian areas:

- support exceptionally high numbers of native species including species-at-risk
- maintain the integrity of aquatic habitats
- function as essential habitats and movement corridors for some species, particularly in fragmented landscapes
- are highly effective in moderating stream temperatures which is important for fish and other wildlife
- can be effective at intercepting nutrients.



*Riparian areas are hotspots of species diversity; supporting rare species like the Yellow Breasted Chat and protect waterways from the impacts of adjacent land uses.*

## Riparian Areas Provide Benefits to People

Riparian areas and their associated waterways link habitats together. They are the pathways through which water, nutrients, fish, wildlife, pollinators and even plants move through the landscape. These pathways are especially important when natural habitats are scattered and fragmented, as they often are in agricultural landscapes.

As pathways, links and remnant habitats riparian zones provide a wide range of benefits from nature to people; also called 'ecosystem services', without which our health, well-being, and economy would suffer. Ecosystem services of riparian areas include:

Drainage	Shade channels preventing overgrowth by invasive plants. This is important in maintaining 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	Store water and energy during floods.
Fisheries	Provide shade, bank stabilization, nutrient and chemical filtration, and large woody debris needed by fish such as salmon.
Pollinator production	Essential for agricultural fruit and berry production. Essential for maintenance of biodiversity.
Biodiversity	Many species at risk depend on riparian areas. Benefit pest control, bird watching, hunting, scientific research and a wide variety of other nature based activities.



## Which Activities Threaten Riparian Areas?

Some of the ways we manage the land can be harmful to species at risk and their habitat. Stewardship practices provide alternative methods to address land management needs while reducing the threats other practices pose. The following section identifies the most common threats to species living in riparian areas.

### Clearing of Vegetation

Human settlement is concentrated along waterways. These locations provided water power, access to waterborne transport for people, goods, timber and other natural resources, the most fertile soils for agriculture, desirable views, access to water for domestic, livestock, and irrigation uses and the easiest routes through rough terrain for roads and railroads. However, along with settlement, these developments have entailed removal of trees and native plants, the filling and drainage of wetlands, the introduction of non-native species, and construction of buildings and roads. Many people also perceive natural riparian areas as messy and unsightly and clear them for aesthetic reasons. Less obvious changes include alterations in flood frequency due to upstream dams or land use changes and increased inflows of nutrient, pollutants and noise.

The impacts of development on riparian habitats, their adjacent waterways, and the landscapes around them have been widespread. Riparian habitats are linear and continuous by nature; when narrowed and fragmented they support far fewer species. Many of the impacts of the loss of riparian areas spread downstream with the flowing water, affecting far greater areas than the originally impacted site. For example, un-managed livestock access to riparian areas can greatly increase stream bank erosion, and the sediment released may degrade spawning habitat for kilometres downstream.



*Clearing of riparian vegetation adjacent to fish habitat may violate Federal and Provincial law.*

*Loss of trees and shrubs increases erosion and may expose the waterway to increased heating, sediment, chemical contamination, and invasion by introduced species.*

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

## Pesticide and Herbicide Use

Pesticides and herbicides, including glyphosphate based Roundup, are harmful to riparian areas and their adjacent waterways. They often kill native plants and insects, some of which are important pollinators, and which may be species at risk. Localized and very careful use of herbicide in riparian zones may be justified in the control of invasive plant species, if part of a plan to restore native riparian vegetation to the area. Seek the advice of your regional invasive plant council before proceeding.



*Herbicides should never be used 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.*

## Dumping of Organic Waste

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 permissible to deposit in riparian areas. The piles smother native vegetation, often introduce invasive species, and may contribute to overloading water bodies with nutrients.



*Grass clippings and yard waste should never be dumped in riparian areas. Disposing household plants inappropriately can introduce invasive plants like English ivy to riparian areas. Photos © Mike Pearson.*

## Which species at risk are most vulnerable to these activities and Why?

### Fish

Fish are highly dependent on riparian areas, even though they do not occupy them directly. Riparian vegetation protects the integrity of aquatic habitat by moderating water temperature, reducing sediment release, and filtering contaminants. Large woody debris falling into the channel from the riparian area provides cover and in flowing water causes concentrates flow to scour out the deep pools occupied by some species, especially larger individuals. Insects falling from riparian vegetation into the water are the primary food source for many fish, including trout and salmon.



*Brassy Minnows (left) and Bull Trout (right) depend on riparian areas to keep their aquatic habitat healthy. .*

### Amphibians

Although most amphibians breed in the water, many spend most of their lives on land. In riparian areas, native vegetation maintains the quality of aquatic breeding sites and adult habitats.



*Many amphibians, including the Red Legged Frog (left) and the Spadefoot Toad (right), use riparian areas as their primary habitat.*

## Birds and Mammals

Many birds and mammals are riparian specialists for all or part of their life histories. Species, such as Mountain Beaver and Yellow Breasted Chat, breed in riparian areas, while hundreds of thousands of birds use riparian areas seasonally during migration and overwintering periods. Other species that are not strictly dependant on riparian areas, regularly use them to access water, food sources, or cover for travel in otherwise hostile landscapes.



*The Black-throated Green Warbler (left) breeds in mixed riparian forests in the Peace River region, while the Green Heron (right) nests and forages in riparian areas of south-western British Columbia.*

Large mature trees like black cottonwood and conifers are especially valuable as nest sites for large bodied birds like Great Blue Herons and Rough-legged Hawks. These trees can also provide rare breeding sites for cavity nesting species like Western Screech Owl. In the interior almost one third of vertebrates rely on tree cavities and up to 95% of these are found in trembling aspen. Lewis's Woodpeckers, for example, use large aspen in riparian areas.

*This Great Blue Heron nesting colony is located in the crowns of a large black cottonwood trees.*



## Invertebrates

Many invertebrates including molluscs and all dragonflies are dependent on riparian areas either directly or to protect the health of their aquatic habitats. Willows, for example, provide native pollinators like bumblebees with an essential early season food source and Viceroy butterfly larvae feed exclusively on willow and aspen species.



*The Blue Dasher (left) is known from the South Okanagan, Vancouver Island and the south coast. It forages in riparian areas. The Black Gloss (right) is threatened by loss of riparian vegetation.*

## Plants

Many plants, mosses and lichens are found exclusively in riparian areas. These habitat specialists include species at risk such as Vancouver Island Beggarticks and Bearded Sedge. Plants also provide cover, habitat structures, and food for riparian animals like Nuttall's Cottontail and for insects eaten by other species at risk, like the Olympic Shrew.



*Pacific Waterleaf (left) is found in riparian areas of the Fraser Valley and Southern Vancouver Island, while Bog Birds-foot Trefoil (right) is limited to a few locations on southeastern Vancouver Island. Changes to hydrology, riparian clearing, and competition with introduced species are among the threats they face.*

## Existing Regulation and Policy

If clearing existing riparian vegetation, building structures or constructing habitat within a riparian area is contemplated, a number of laws and regulations may apply. **Depending on project complexity and resources available, it may be advisable to engage professional consultants to handle permit applications.**

Government	Legislation	Permits/Authorizations
BC	Water Act	Section 9 Authorization required for works 'in or about' a stream.
	Fish Protection Act	The Riparian Area Regulation (RAR) protects and may require restoration of riparian area vegetation during non-agricultural land development including activities such as adding decks or docks. <a href="#">Setbacks for agricultural buildings</a> 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 has the potential to harm fish habitat and depending on the circumstances may require authorization under the habitat protection provisions of the <i>Fisheries Act</i> . For the most current information on <i>Fisheries Act</i> reviews and permitting processes refer to DFO's website: <a href="http://www.dfo-mpo.gc.ca/habitat/habitat-eng.htm">http://www.dfo-mpo.gc.ca/habitat/habitat-eng.htm</a> .
	Species at Risk Act (aquatic species)	<p>Killing, harming, harassing, capturing, taking, collecting or possessing any aquatic Endangered, Threatened or Extirpated aquatic species protected under the Species at Risk Act is prohibited. As a result, a permit may be required for activities that may affect an aquatic species at risk (<a href="http://www.dfo-mpo.gc.ca/species-especies/permits-permis/permits-eng.htm">http://www.dfo-mpo.gc.ca/species-especies/permits-permis/permits-eng.htm</a>).</p> <p>Destruction of an aquatic species at risk's identified and protected critical habitat is prohibited. Activities can take place in critical habitat, but these activities must occur in ways that do not result in destruction. For information on critical habitat refer to DFO's website: <a href="http://www.pac.dfo-mpo.gc.ca/consultation/sara-lep/orders-decrets-eng.htm">http://www.pac.dfo-mpo.gc.ca/consultation/sara-lep/orders-decrets-eng.htm</a>.</p>
	Species at Risk Act (terrestrial species)	<p>It is prohibited to kill, harm, harass, collect or possess 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 <a href="http://www.sararegistry.gc.ca/sar/permit/permits_e.cfm">http://www.sararegistry.gc.ca/sar/permit/permits_e.cfm</a> for more information.</p> <p>Critical habitat is identified in final recovery strategies and action plans for all groups of listed species at risk. 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. 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 Canada office and visit <a href="http://www.sararegistry.gc.ca">www.sararegistry.gc.ca</a>.</p>
	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.

		<p>Environment Canada recommends that you:</p> <ol style="list-style-type: none"> <li>1. Know your legal obligations;</li> <li>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;</li> <li>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.</li> </ol> <p>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.</p> <p>For more information, please visit the information page on the MCBA: <a href="http://www.ec.gc.ca/Nature/default.asp?lang=En&amp;n=7CEBB77D-1">http://www.ec.gc.ca/Nature/default.asp?lang=En&amp;n=7CEBB77D-1</a> and the EC Incidental Take website: <a href="http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&amp;n=C51C415F-1">http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&amp;n=C51C415F-1</a></p>
Local Government	Tree Bylaws 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.

## Stewardship Practices

Following are various actions, called Stewardship Practices, which help to conserve, enhance, and restore species at risk and wildlife riparian area habitat. Riparian areas cross property lines and political boundaries. By working together to manage riparian areas the landscape or watershed scale, greater results will be seen. Stewardship Practices are most beneficial when implemented on all of the channel length. Action typically starts on one or a few properties and every stewardship effort counts towards improving these waterways. The following voluntary stewardship practices for riparian areas will enhance habitat for species at risk. Information on possible funding sources to implement these practices is provided in the *Finding the Money* section later in the document.

## Protect Existing Riparian Areas

Protecting existing riparian habitat should always be the first priority; this is far more cost effective than restoring lost or degraded areas. This is especially important in intensively farmed or urbanized landscapes where little intact riparian vegetation remains. Continuity of riparian areas is more important than width in many of the ecological functions of riparian zones, including moderating stream temperature and filtering nutrients.

Permanent protection can be achieved by registering a restrictive covenant on the land title. Contact your local Land Trust for details on how this might be accomplished through the Land Trust Alliance of British Columbia [www.ltabc.ca](http://www.ltabc.ca). The Agricultural Land Commission must approve covenants on lands within the Agricultural Land Reserve. Riparian habitat often qualifies as ecologically sensitive under Environment Canada's Ecological Gifts Program, making it possible for donors of land and conservation covenants with riparian habitat to access attractive income tax reductions [www.ec.gc.ca](http://www.ec.gc.ca).

## Establish New or Restore Riparian Buffers

Riparian buffers consisting of native vegetation should be restored adjacent to waterways where it has been removed. They should also be established along constructed ditches to reduce the entry of sediment, nutrients and chemicals – as anything that enters a ditch, will typically end up in a river.

Riparian zones are as diverse as the landscapes they traverse. Layout, plant species selection, site preparation, timing of planting, and protective measures must be tailored to site conditions to be successful – see companion document *Guidance for Restoration Activities in Riparian Areas*. Specific guidance can also be obtained from published material associated with the Riparian Area Regulation or Environmental Farm Plan Program (see WEB Resource below), or by retaining a qualified professional (typically a Registered Professional Biologist, or Forester). Care must be taken to allow access for drainage maintenance work. Neighbours and the local government should be consulted in the planning process.



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

## Control Invasive Species

Overgrowth of riparian areas by invasive plant species such as Himalayan blackberry, purple loosestrife, yellow flag iris or reed canary grass is one of the most common causes of degradation. These species can overgrow and out-compete native plants, especially if the native vegetation has been disturbed. The impacts often extend to animals that are dependent on particular native plant species.

Control methods for invasive plants vary among species, but due to the proximity to water, chemical methods must be used sparingly and with great care to avoid contamination of the waterway. Advice on control methods for most species can be obtained from your regional Invasive Species Council

[http://www.for.gov.bc.ca/hra/Publications/invasive\\_plants/Reg\\_Weed\\_Comm\\_Map.pdf](http://www.for.gov.bc.ca/hra/Publications/invasive_plants/Reg_Weed_Comm_Map.pdf)

*Japanese knotweed is highly invasive introduced plants that thrive in disturbed areas and prevents native vegetation from becoming established.*



*Large areas of Himalayan blackberry can be removed with an excavator prior to planting, but may require authorization from Federal and Provincial authorities. See the 'Existing Regulation and Policy' above.*

### Augment Riparian Areas with Agroforestry or Leave Strips

Riparian ecosystem services can be enhanced by planting agroforestry crops (e.g., Christmas trees or Hazelnuts) or by maintaining unmown/seldom mown" leave strips" between intensively farmed lands and native riparian areas. These will contribute to many of the ecosystem services provided by riparian areas while providing the landowner with income generating products. A 3-6 m wide strip of unsprayed area on the side of fields can reduce herbicide and insecticide drift into more sensitive habitats by 95% at low wind speeds; promote the presence of insectivorous birds, butterflies and agricultural forbs and grasses.



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.

See also companion document *Guidance for Restoration Activities in Riparian Areas* for further information.

## Finding the Money

Maintaining and improving riparian areas can be costly. There are a number of existing and emerging financial assistance options:

- The Environmental Farm Plan Program will provide partial funding for the establishment of riparian vegetation, fencing livestock and many other beneficial management practices.
- Many landowners and local governments have partnered with local stewardship groups, such as Streamkeepers, Pacific Salmon Foundation, and the Habitat Conservation Trust Foundation who have access to funding for habitat improvements, especially for fish and species at risk. Often these groups will provide funding for materials and volunteer labour to implement the project.
- Environment Canada can support landowners financially to protect critical habitat and species at risk through:
  - a. The Habitat Stewardship Program (HSP) which provides funding for projects that protect and restore habitat for species at risk. Multi-year and multi-partner projects are encouraged. Private landowners should aim to develop their funding application with: stewardship groups, local government, and/or provincial government
  - b. Landowners can also negotiate financial support to offset some of their costs as part of a stewardship agreement.
  - c. Landowners can access attractive tax benefits by protecting habitat on their land through the Ecological Gifts Program
- Payments to farmers for the value of the ecosystem goods and services their land or management practices provide are just emerging as a practice in British Columbia; examples include The Delta Farmland and Wildlife Trust (<http://www.deltafarmland.ca/>) and the Kootenay Conservation Program <http://kootenayconservation.ca/>



## Appendix A: Web Resources

### Riparian Stewardship

**Cows and Fish** <http://www.cowsandfish.org/>

**Agroforestry Industry Development Initiative** <http://www.woodlot.bc.ca/agroforestry/whatis.htm>

**Center for Wetlands and Stream Restoration** <http://www.wetlandsandstreamrestoration.org/>

**BC Cattlemen's Association Farmland-Riparian Interface Stewardship Program**  
<http://www.cattlemen.bc.ca/frisp.htm>

**BC Riparian Area Regulation Website and Guidebook**  
[http://www.env.gov.bc.ca/habitat/fish\\_protection\\_act/riparian/riparian\\_areas.html](http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/riparian_areas.html)

**BC Ministry of Agriculture Riparian Website** <http://www.al.gov.bc.ca/resmgmt/riparian/index.htm>

**BC Invasive Plant Council:** <http://www.bcinvases.ca/>

**BC Ministry of the Environment Stewardship Resources** <http://www.env.gov.bc.ca/wld/info.htm#>

**Stewardship Center for BC** <http://www.speciesatrisk.bc.ca/>

### Species at Risk

**SARA and You private landowner information:** [www.sararegistry.gc.ca/involved/you/privland\\_e.cfm](http://www.sararegistry.gc.ca/involved/you/privland_e.cfm)

**BC Conservation Data Centre** [www.env.gov.bc.ca/cdc](http://www.env.gov.bc.ca/cdc)

### Funding Sources:

**Habitat Stewardship Program** funds stewardship activities on private land: [www.ec.gc.ca/hsp-pih/](http://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/](http://www.ec.gc.ca/ecoaction/)

### Tax Incentives:

**Ecological Gifts Program** offers significant tax benefits to landowners who donate ecologically sensitive land or a partial interest in land <http://www.ec.gc.ca/pde-egg/>

**Land Trust Alliance** provides support for landowners to make charitable donations of ecologically sensitive land <http://ltabc.ca/>

## Appendix B: Species at Risk Potentially Impacted by Riparian Management in Settled Landscapes

English Name	Scientific Name	BC List	COSEWIC	SARA
<b>Mammals</b>				
Pacific Water Shrew	<i>Sorex bendirii</i>	Red	E	1
American Water Shrew, <i>brooksi</i> subspecies	<i>Sorex palustris brooksi</i>	Red		
Mountain Beaver, <i>rainieri</i> subspecies	<i>Aplodontia rufa rainieri</i>	Blue	S	1
Mountain Beaver, <i>rufa</i> subspecies	<i>Aplodontia rufa rufa</i>	Blue	S	1
Roosevelt Elk	<i>Cervus canadensis roosevelti</i>	Blue		
Snowshoe Hare, <i>washingtonii</i> subspecies	<i>Lepus americanus washingtonii</i>	Red		
Ermine, <i>anguinae</i> subspecies	<i>Mustela erminea anguinae</i>	Blue		
Long-tailed weasel, <i>altifrontalis</i> subspecies	<i>Mustela frenata altifrontalis</i>	Red		
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	Blue		
Keen's Myotis	<i>Myotis keenii</i>	Red	D	3
Fringed Myotis	<i>Myotis thysanodes</i>	Blue	D	3
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	S	1
Preble's Shrew	<i>Sorex preblei</i>	Red		
Olympic Shrew	<i>Sorex rohweri</i>	Red		
Trowbridge's Shrew	<i>Sorex trowbridgii</i>	Blue		
Nuttall's Cottontail	<i>Sylvilagus nuttallii</i>	Blue	S	1
<b>Birds</b>				
Nelson's Sparrow	<i>Ammodramus nelsoni</i>	Red	N	
Great Blue Heron, <i>fannini</i> subspecies	<i>Ardea herodias fannini</i>	Blue	S	1
Great Blue Heron, <i>herodias</i> subspecies	<i>Ardea herodias herodias</i>	Blue		
American Bittern	<i>Botaurus lentiginosus</i>	Blue		
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	Red		
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	Blue		
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Blue		
Short-eared Owl	<i>Asio flammeus</i>	Blue	S	1
Rough-legged Hawk	<i>Buteo lagopus</i>	Blue	N	
Swainson's Hawk	<i>Buteo swainsoni</i>	Red		
Green Heron	<i>Butorides virescens</i>	Blue		
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Red		
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Blue	T	1
Northern Pygmy-Owl, <i>swarthi</i> subspecies	<i>Glaucidium gnoma swarthi</i>	Blue		

Barn Swallow	<i>Hirundo rustica</i>	Blue	T	
Yellow-breasted Chat	<i>Icteria virens</i>	Red	E	1
Hudsonian Godwit	<i>Limosa haemastica</i>	Red		
Western Screech-Owl, <i>kennicottii</i> subspecies	<i>Megascops kennicottii kennicottii</i>	Blue	T	1
Western Screech-Owl, <i>macfarlanei</i> subspecies	<i>Megascops kennicottii macfarlanei</i>	Red	T	1
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Red	T	1
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	Blue	S	1
Purple Martin	<i>Progne subis</i>	Blue		
Cape May Warbler	<i>Setophaga tigrina</i>	Red		
Black-throated Green Warbler	<i>Setophaga virens</i>	Blue		
Sharp-tailed Grouse, <i>columbianus</i> subspecies	<i>Tympanuchus phasianellus columbianus</i>	Blue		
Barn Owl	<i>Tyto alba</i>	Blue	T	1
Common Nighthawk	<i>Chordeiles minor</i>	Yellow	T	1
<b>Reptiles</b>				
Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	T	1
Gopher Snake, <i>deserticola</i> subspecies	<i>Pituophis catenifer deserticola</i>	Blue	T	1
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	S	1
<b>Amphibians</b>				
Western Toad	<i>Anaxyrus boreas</i>	Blue	S	1
Wandering Salamander	<i>Aneides vagrans</i>	Blue		
Northern Red-legged Frog	<i>Rana aurora</i>	Blue	S	1
Oregon Spotted Frog	<i>Rana pretiosa</i>	Red	E	1
<b>Fish</b>				
Chiselmouth	<i>Acrocheilus alutaceus</i>	Blue	N	
Salish Sucker	<i>Catostomus</i> sp. 4	Red	T	1
Northern Redbelly Dace	<i>Chrosomus eos</i>	Blue		
Shorthead Sculpin	<i>Cottus confusus</i>	Blue	S	1
<i>Columbia Sculpin</i>	<i>Cottus hubbsi</i>	Blue	S	1
<i>Brassy Minnow - Pacific Group</i>	<i>Hybognathus hankinsoni - Pacific group</i>	Blue		
Pearl Dace	<i>Margariscus nachtriebi</i>	Blue		
Cutthroat Trout, <i>clarkii</i> subspecies	<i>Oncorhynchus clarkii clarkii</i>	Blue		
Cutthroat Trout, <i>lewisi</i> subspecies	<i>Oncorhynchus clarkii lewisi</i>	Blue	S	1
Nooksack Dace	<i>Rhinichthys cataractae - Chehalis lineage</i>	Red	E	1
Bull Trout	<i>Salvelinus confluentus</i>	Blue	S	
Bull Trout - Coastal Lineage	<i>Salvelinus confluentus - coastal lineage</i>	Blue	S	
<i>Bull Trout - Interior Lineage</i>	<i>Salvelinus confluentus - interior</i>	Blue	S	

	<i>lineage</i>			
Speckled Dace	<i>Rhinichthys osculus</i>	Red	E	1
<b>Dragonflies and Butterflies</b>				
Emma's Dancer	<i>Argia emma</i>	Blue		
River Jewelwing	<i>Calopteryx aequabilis</i>	Red		
Beaverpond Baskettail	<i>Epitheca canis</i>	Blue		
Olive Clubtail	<i>Stylurus olivaceus</i>	Red	E	
Autumn Meadowhawk	<i>Sympetrum vicinum</i>	Blue		
Vivid Dancer	<i>Argia vivida</i>	Red	C	
Common Ringlet, <i>benjamini</i> subspecies	<i>Coenonympha tullia benjamini</i>	Blue		
Pronghorn Clubtail	<i>Gomphus graslinellus</i>	Blue		
Viceroy	<i>Limnitis archippus</i>	Red		
Dione Copper	<i>Lycaena dione</i>	Red	C	
Lilac-bordered Copper	<i>Lycaena nivalis</i>	Blue		
Western River Cruiser	<i>Macromia magnifica</i>	Blue		
Blue Dasher	<i>Pachydiplax longipennis</i>	Blue		
Greenish Blue, <i>insulanus</i> subspecies	<i>Plebejus saepiolus insulanus</i>	Red	E	1
Tawny-edged Skipper, <i>themistocles</i> subspecies	<i>Polites themistocles themistocles</i>	Blue		
Coral Hairstreak, <i>titus</i> subspecies	<i>Satyrrium titus titus</i>	Red		
Mormon Fritillary, <i>eurynome</i> subspecies	<i>Speyeria mormonia eurynome</i>	Red		
<b>Molluscs</b>				
Rocky Mountain Ridged Mussel	<i>Gonidea angulata</i>	Red	E	1
Swamp Fingernailclam	<i>Musculium partumeium</i>	Red		
Rocky Mountain Fingernailclam	<i>Sphaerium patella</i>	Red		
Ashy Pebblesnail	<i>Fluminicola fuscus</i>	Red		
Attenuate Fossaria	<i>Fossaria truncatula</i>	Blue		
Barren Juga	<i>Juga hemphilli</i>	Red		
Umbilicate Sprite	<i>Promenetus umbilicatellus</i>	Blue		
Abbreviate Pondsnaill	<i>Stagnicola apicina</i>	Blue		
Warty Jumping-slug	<i>Hemphillia glandulosa</i>	Blue	S	1
Black Gloss	<i>Zonitoides nitidus</i>	Blue		
<b>Vascular Plants</b>				
scarlet ammannia	<i>Ammannia robusta</i>	Red	E	1
chaffweed	<i>Anagallis minima</i>	Blue		
cut-leaved water-parsnip	<i>Berula erecta</i>	Blue		
tall beggarticks	<i>Bidens vulgata</i>	Red		
western water-milfoil	<i>Myriophyllum hippuroides</i>	Blue		
Ussurian water-milfoil	<i>Myriophyllum ussuriense</i>	Blue		
toothcup meadow-foam	<i>Rotala ramosior</i>	Red	E	1

pink water speedwell	<i>Veronica catenata</i>	Red		
nettle-leaved giant-hyssop	<i>Agastache urticifolia</i>	Blue		
Canada anemone	<i>Anemone canadensis</i>	Blue		
riverbank anemone	<i>Anemone virginiana</i> var. <i>cylindroidea</i>	Blue		
western mugwort	<i>Artemisia herriotii</i>	Red		
angled bittercress	<i>Cardamine angulata</i>	Blue		
Atkinson's coreopsis	<i>Coreopsis tinctoria</i> var. <i>atkinsoniana</i>	Red		
Joe-pye weed	<i>Eutrochium maculatum</i> var. <i>bruneri</i>	Red		
Oregon ash	<i>Fraxinus latifolia</i>	Red		
bog bird's-foot lotus	<i>Hosackia pinnata</i>	Red	E	1
Pacific waterleaf	<i>Hydrophyllum tenuipes</i>	Red		
orange touch-me-not	<i>Impatiens aurella</i>	Blue		
spurless touch-me-not	<i>Impatiens ecalcarata</i>	Blue		
false-pimpernel	<i>Lindernia dubia</i> var. <i>anagallidea</i>	Blue		
streambank lupine	<i>Lupinus rivularis</i>	Red	E	1
finebranched popcornflower	<i>Plagiobothrys leptocladus</i>	Red		
water-plantain buttercup	<i>Ranunculus alismifolius</i> var. <i>alismifolius</i>	Red	E	1
peach-leaf willow	<i>Salix amygdaloides</i>	Red		
meadow willow	<i>Salix petiolaris</i>	Blue		
American sweet-flag	<i>Acorus americanus</i>	Blue		
river bulrush	<i>Bolboschoenus fluviatilis</i>	Red		
bearded sedge	<i>Carex comosa</i>	Red		
green-sheathed sedge	<i>Carex feta</i>	Blue		
green-fruited sedge	<i>Carex interrupta</i>	Red		
lakeshore sedge	<i>Carex lenticularis</i>	Blue		
pointed broom sedge	<i>Carex scoparia</i>	Blue		
many-headed sedge	<i>Carex sychnocephala</i>	Blue		
Nuttall's waterweed	<i>Elodea nuttallii</i>	Blue		
marsh muhly	<i>Muhlenbergia glomerata</i>	Blue		
sheathing pondweed	<i>Stuckenia vaginata</i>	Blue		
Geyer's onion	<i>Allium geyeri</i> var. <i>tenerum</i>	Blue		
porcupine sedge	<i>Carex hystericina</i>	Blue		
red-rooted cyperus	<i>Cyperus erythrorhizos</i>	Red		
bent spike-rush	<i>Eleocharis geniculata</i>	Red	E	1
ovate spikerush	<i>Eleocharis ovata</i>	Red		
beardless wildrye	<i>Elymus curvatus</i>	Red		
giant helleborine	<i>Epipactis gigantea</i>	Blue	S	3
small-flowered lipocarpha	<i>Lipocarpha micrantha</i>	Red	E	1

nodding semaphoregrass	<i>Pleuropogon refractus</i>	Blue		
Smith's fairybells	<i>Prosartes smithii</i>	Blue		
prairie wedgegrass	<i>Sphenopholis obtusata</i>	Red		
Nuttall's quillwort	<i>Isoetes nuttallii</i>	Blue		
Mexican mosquito fern	<i>Azolla mexicana</i>	Red	T	1
upswept moonwort	<i>Botrychium ascendens</i>	Red		
Linear-leaf moonwort	<i>Botrychium lineare</i>	Red		
stalked moonwort	<i>Botrychium pedunculatum</i>	Red		
crested wood fern	<i>Dryopteris cristata</i>	Blue		

## Bibliography

De Snoo, G. R. De. (1999). Unsprayed Field margins : effects on environment, biodiversity and agricultural practice. *Landscape and Urban Planning*, 46, 151–160.

Dosskey, M., Wells, G., Bentrup, G., & Wallace, D. (2012). Enhancing ecosystem services: Designing for multifunctionality. *Journal of Soil and Water Conservation*, 67(2), 37A–41A. doi:10.2489/jswc.67.2.37A

Herzon, I., & Helenius, J. (2008). Agricultural drainage ditches, their biological importance and functioning. *Biological Conservation*, 141(5), 1171–1183. doi:10.1016/j.biocon.2008.03.005

Hickey, M. B. C., & Doran, B. (2004). A Review of the Efficiency of Buffer Strips for the Maintenance and Enhancement of Riparian Ecosystems. *Water Quality Research Journal of Canada*, 39(3), 311–317.

Hietala-Koivu, R., Järvenpää, T., & Helenius, J. (2004). Value of semi-natural areas as biodiversity indicators in agricultural landscapes. *Agriculture, Ecosystems & Environment*, 101(1), 9–19. doi:10.1016/S0167-8809(03)00273-1

Kovacic, D. a., David, M. B., Gentry, L. E., Starks, K. M., & Cooke, R. a. (2000). Effectiveness of Constructed Wetlands in Reducing Nitrogen and Phosphorus Export from Agricultural Tile Drainage. *Journal of Environment Quality*, 29(4), 1262–1274. doi:10.2134/jeq2000.00472425002900040033x

Latta, S. C., Howell, C. a, Dettling, M. D., & Cormier, R. L. (2012). Use of data on avian demographics and site persistence during overwintering to assess quality of restored riparian habitat. *Conservation biology : the journal of the Society for Conservation Biology*, 26(3), 482–92. doi:10.1111/j.1523-1739.2012.01828.x

Lee, K., Isenhardt, T. M., Schultz, R. C., & Mickelson, S. K. (2000). Multispecies Riparian Buffers Trap Sediment and Nutrients during Rainfall Simulations. *Journal of Environment Quality*, 29, 1200–1205.

Marczak, L. B., Sakamaki, T., Turvey, S. L., Deguise, I., Wood, S. L. R., & Richardson, J. S. (2010). Are forested buffers an effective conservation strategy for riparian fauna? An assessment using meta-analysis. *Ecological applications*, 20(1), 126–34. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/20349835>

- Martin, K., Aitken, K. E. H., & Wiebe, K. L. (2004). Nest Sites and Nest Webs for Cavity-Nesting Communities in Interior British Columbia, Canada : Nest Characteristics and Niche Partitioning. *The Condor*, 106(1), 5–19.
- Naiman, R. J., DeCamps, H., & McClain, M. E. (2005). *Riparia: Ecology, conservation and management of streamside communities* (p. 430). Burlington, MA: Elsevier Academic Press.
- Newlon, K. R., & Saab, V. a. (2011). Nest-Site Selection and Nest Survival of Lewis's Woodpecker in Aspen Riparian Woodlands. *The Condor*, 113(1), 183–193. doi:10.1525/cond.2011.100056
- Randall, G. W., Iragavarapu, T. K., & Schmitt, M. A. (2000). Nutrient Losses in Subsurface Drainage Water from Dairy Manure and Urea Applied for Corn. *Journal of Environment Quality*, 29, 1244–1252.
- Richardson, J. S., Taylor, E., Schluter, D., Pearson, M., & Hatfield, T. (2010). Do riparian zones qualify as critical habitat for endangered freshwater fishes? *Canadian Journal of Fisheries and Aquatic Sciences*, 67(7), 1197–1204. doi:10.1139/F10-063
- Schmidt, J. P., Dell, C. J., Vadas, P. A., & Allen, A. L. (2007). Nitrogen export from Coastal Plain field ditches. *Journal of Soil and Water Conservation*, 62(4), 235–243.
- Small Woodlot Program of BC. (2001). *A guide to agroforestry in BC* (p. 320). Vancouver: Small Woodlands Program of BC, Forest Renewal BC.
- Sunohara, M. D., Topp, E., Wilkes, G., Gottschall, N., Neumann, N., Ruecker, N., Jones, T. H., et al. (2011). Impact of riparian zone protection from cattle on nutrient, bacteria, F-coliphage, and loading of an intermittent stream. *Journal of environmental quality*, 41(4), 1301–14. doi:10.2134/jeq2011.0407
- Tufekcioglu, M., Isenhardt, T. M., Schultz, R. C., Bear, D. a., Kovar, J. L., & Russell, J. R. (2012). Stream bank erosion as a source of sediment and phosphorus in grazed pastures of the Rathbun Lake Watershed in southern Iowa, United States. *Journal of Soil and Water Conservation*, 67(6), 545–555. doi:10.2489/jswc.67.6.545
- Urban, M. A. (2005). Values and Ethical Beliefs Regarding Agricultural Drainage in Central Illinois, USA. *Society & Natural Resources*, 18(2), 173–189. doi:10.1080/08941929590894570
- Ward, J. V, Tockner, K., Arscott, D. B., & Claret, C. (2002). Riverine landscape diversity. *Freshwater Biology*, 47(517-539).
- Western Screech-Owl macfarlanei subspecies Recovery Team. (2008). *Recovery Strategy for the Western Screech-Owl, macfarlanei subspecies ( Megascops kennicottii macfarlanei ) in British Columbia* (p. 14pp). Victoria, BC.