

7 BIODIVERSITY

CHAPTER 7 TABLE OF CONTENTS

Introduction	7-1
Biodiversity and Habitat	7-1
What is Biodiversity?	7-1
Benefits of Biodiversity to Agriculture	7-2
Agricultural Landscapes are Important to Biodiversity.	7-4
What is Habitat in an Agricultural Landscape?	7-4
Species at Risk	7-6
Impacts of Agriculture on Biodiversity and Habitat	7-7
Biodiversity Plans	7-9
Eight Agricultural Biodiversity Principles	7-10
Aquatic Biodiversity	7-11
Aquatic Biodiversity Concerns	7-11
Aquatic Biodiversity Legislation	7-11
Aquatic Biodiversity Beneficial Management Practices	7-14
Aquatic Habitat	7-15
Aquatic Life and Aquatic Habitat Protection	7-16
Changes In and About a Stream	7-17
Aquatic Life Establishment	7-17
Terrestrial Biodiversity	7-18
Terrestrial Biodiversity Concerns	7-18
Terrestrial Biodiversity Legislation	7-18
Terrestrial Biodiversity	
Beneficial Management Practices	7-21
Wildlife and Wildlife Habitat Protection	7-22
Wildlife Habitat Establishment	7-22
Plant Biodiversity Beneficial Management Practices	7-23
Livestock Management	7-23
Weeds	7-23
Biodiversity Conflicts	7-24
Biodiversity Conflict Concerns	7-24
Biodiversity Conflict Resolutions	7-25

BIODIVERSITY

INTRODUCTION

This chapter defines biodiversity and describes how biodiversity can benefit farm productivity and contribute to long term resiliency and sustainability. The chapter also discusses farm management practices for protection of the biodiversity of aquatic life, wildlife and plants. It contains information on biodiversity, habitat and stewardship, the complex relationship between biodiversity and agriculture and impacts on biodiversity and habitat. It also contains information on environmental concerns, legislation and beneficial management practices related to:

- ◆ Aquatic biodiversity,
- ◆ Terrestrial biodiversity,
- ◆ Biodiversity conflicts.

This chapter is not intended to provide extensive solutions but to raise awareness and to encourage consideration of fish, other aquatic life, wildlife and plants and their habitat where appropriate in farm management. For information on specific local biodiversity concerns and solutions to conflicts refer to AFF, ENV, FLNRORD and DFO staff or other resource people. The following discussion may not apply to all areas of BC.

BIODIVERSITY AND HABITAT

What is Biodiversity?

Biodiversity is the variety of life on Earth, it includes all organisms, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems. Natural processes include pollination, predator-prey relationships, and natural disturbances such as floods and wildfires.

There are three basic levels of biodiversity: ecosystem, species, and genetic diversity.

Ecosystem Diversity. Ecosystem diversity refers to the variety of ecosystems in a given area and the different ways they function. Ecosystems are all the living (e.g., plants, animals) and non-living things (e.g., soil, water, air) in a given area, plus the interactions that occur among them. Ecosystems can be managed or unmanaged. Most agricultural landscapes are managed ecosystems.

It is important to note that ecosystems exist at different scales. You can find an ecosystem within a single tree, or it can extend across a field, an entire farm, or a large region like a major river basin. Interactions between living and non-living things occur at all these scales at the same time.

Ecosystems develop in response to local conditions, which are influenced by such things as climate patterns, soil types, and topography.

Species Diversity. Species diversity refers to the variety of species that occurs within an area or ecosystem. Different types of birds and different types of trees are examples of species diversity. Generally, the greater the number of species in an ecosystem, the more stable it is.

Genetic diversity. Genetic diversity refers to the variety of genes within a species. Genes determine individual characteristics such as size, shape, and colour. The different characteristics that exist among breeds of chickens are an example of genetic diversity. Genetic diversity allows species to adapt to changes in their ecosystem or environment.

All of these levels of diversity are intricately connected. Change in one part of the ecosystem can affect the functioning of other parts.

Benefits of Biodiversity to Agriculture

Biologically diverse ecosystems provide a number of critically important goods and services that benefit humans. While conserving and enhancing biodiversity may come at a cost to producers, there are immeasurable benefits to farmers and ranchers, including:

- ◆ Soil formation and retention processes.
- ◆ Maintaining soil productivity and preventing soil loss due to wind and water erosion.
- ◆ Nutrient breakdown, storage and cycling.
- ◆ Playing a role in sequestering carbon – soil organisms such as mycorrhizal fungi can help retain and build soil organic carbon.
- ◆ Making nutrients available to domestic and native plants, preventing organic debris from accumulating, and maintaining water quality.
- ◆ Helping to control pest populations.
- ◆ Reducing crop losses due to fluctuating climate and extreme weather.
- ◆ Pollination services.
- ◆ Enhancing yields for pollinator-dependent crops such as fruit trees.
- ◆ Supporting wild species that are a source of the genetic material needed to breed crops and livestock that perform better than existing varieties.

The above ecosystem goods and services can reduce the need for inputs such as pesticides and fertilizers, increase the productive capacity of the land, and reduce production risks. They have the potential to maintain or even increase farm profitability. In addition, maintaining biodiversity on agricultural lands can increase land value and provide opportunities to develop agri-tourism and other niche marketing activities.

Managing for biodiversity ensures that agricultural lands can continue to receive the benefits provided by natural systems. Some of those benefits are discussed below.

Enhancing Production. Biologically diverse ecosystems tend to be healthy and productive. Diverse plant communities are generally more productive than communities with little diversity. In modern cropping systems, increased soil biodiversity has been associated with increased soil fertility. Soils with greater biodiversity tend to process and store nutrients and use water more efficiently, and are often less likely to leach nutrients beyond the root zone. Maintaining biologically diverse vegetation and soils can improve productivity by:

- ◆ Improving soil fertility through enhanced nutrient cycling;
- ◆ Improving water infiltration and water holding capacity of soils;
- ◆ Reducing plant and soil pathogen populations;
- ◆ Reducing levels of pollutants;
- ◆ Reducing weed populations;
- ◆ Increasing grazing capacity.

Agricultural productivity also benefits from the presence of diverse populations of wild pollinators, such as hummingbirds, moths, native bees, and other insects. Maintaining a diversity of pollinators increases the quantity, reliability, and duration of pollination services to crops. For example, there are several advantages to maintaining healthy populations of native bees in addition to honeybees:

- ◆ Native bees generally spend more hours during the day pollinating than honeybees.
- ◆ Native bees are usually more active in cold and wet weather than are honeybees.
- ◆ Many native bees use “buzz” pollination, which allows them to pollinate crops that honeybees cannot.
- ◆ When native bees compete with honeybees for the same plant, honeybees can become more efficient pollinators.
- ◆ Native bees have greater species diversity than honeybees; therefore, they are less susceptible, as a group, to pests and disease.
- ◆ Native bees tend to be more efficient at distributing pollen than honeybees.

Agricultural landscapes that have a good mix of cropped and non-cropped, natural and semi-natural areas tend to have higher rates of pollination than less complex landscapes.

Stability in Production. Managing for biodiversity creates the foundation for sustainable agriculture. This stability will take on added importance in adapting to a changing climate. Generally, the more diverse a production system is, the more stable it tends to be. For example:

- ◆ Diverse systems are more resistant to variations in climate, invasive alien species, outbreaks of diseases, and natural disturbances such as floods, wildfires, and windstorms.
- ◆ Increasing the genetic diversity of crop and/or livestock varieties can reduce the risk of production failures.
- ◆ Maintaining diverse bird and insect communities can help in controlling agricultural pests.
- ◆ Studies indicate that birds can suppress insect and rodent populations, at least at medium to low infestation levels.

Flexibility in Production. Maintaining both native areas and a mix of crop varieties on the farm can maintain biodiversity while providing flexibility in production. For example, creating a shelterbelt that has a diversity of plants can provide:

- ◆ Wood fibre;
- ◆ Windbreaks;
- ◆ Reduced risk of erosion;
- ◆ Habitat for pollinators and desirable wildlife species;
- ◆ Habitat connections across landscapes;
- ◆ Favourable growing conditions for crops that require shelter or certain microclimates;
- ◆ Buffers against nuisances such as dust, noise, and odours.

Additionally, maintaining a diversity of crop and/or livestock varieties may provide flexibility in marketing opportunities for agricultural products. Similarly, using environmentally-friendly management practices may provide an opportunity to market specialty products to consumers who are concerned about the environment and how their food is produced.

Agricultural Landscapes are Important to Biodiversity

Agricultural landscapes play a significant role in providing features that are essential for conserving biodiversity. These include:

- ◆ An adequate supply of habitat;
- ◆ Structurally diverse habitats;
- ◆ Connectivity between habitat patches;
- ◆ Healthy, functional habitats;
- ◆ Storehouses of genetic diversity.

Because valley bottoms and coastal lowlands have longer growing seasons and better soils, these landscapes are more biologically productive than other parts of British Columbia. Greater biological productivity makes these landscapes the best agricultural areas of the Province, but it also makes these lands disproportionately important to wildlife. Land conversion from natural ecosystems to agriculture has the potential to impact the Province's biodiversity, but beneficial management practices can help to mitigate those impacts and maintain biodiversity.

While living in areas abundant with fish and wildlife is considered a positive lifestyle amenity, it comes with added environmental responsibilities. The extent of development and the intensity with which we manage the landscape mean that impacts to, and conflicts with, wildlife are inevitable. Good stewardship and effective land management mean considering the effects of our activities and employing means to minimize conflicts and maximize benefits. Some of these impacts have been mitigated by farms that:

- ◆ Provide fish habitat:
 - Constructed ditches that fish colonize, irrigation reservoirs that are stocked with fish, planted riparian vegetation, assured fish passage at weirs and dams, maintenance of functional riparian areas.
- ◆ Provide planted or protected wildlife feed and habitat:
 - Critical winter and early spring forage in feed stacks, pastures and fields, and migratory bird stopover points.
- ◆ Practice plant stewardship:
 - Grassland management and protection.
- ◆ Avoid attracting problem wildlife.
- ◆ Store feed and clean up spills.
- ◆ Dispose of livestock carcasses properly.

While all farming systems have an influence on the surrounding biodiversity, the degree and type of influence will vary greatly by virtue of the many differences between farms. The relationship between fish and wildlife and agriculture is complex and is most usefully viewed as providing both benefits to agriculture as well as having costs to agriculture.

What is Habitat in an Agricultural Landscape?

Environmental concerns are often mentioned in the context of their effect on habitat. Habitats in agricultural landscapes provide the life requisites that all species need to survive: water, food, shelter from predators and adverse weather conditions, and places to safely breed, and rear young. Habitat can include land associated with farms, as well as resources such as constructed ditches, forage areas and woodlots.

➔ see Aquatic Habitat, **page 7-16**

➔ see Wildlife Habitat, **page 7-26**

Aquatic and Riparian Areas. All habitats within the agricultural landscape are important, but aquatic and riparian areas are especially significant to both biodiversity and agricultural production. Aquatic areas are considered to be some of the most productive ecosystems on Earth. Aquatic ecosystems interact closely with riparian zones—the areas of lush, green, moisture-loving vegetation that surround wetlands, lakes, streams, and rivers. Riparian areas form a transition zone between aquatic and dry, upland habitats. In their natural state, these areas typically have higher biodiversity than other habitats in agricultural landscapes because they provide

shelter, food, breeding and rearing habitat, and safe access to water. The riparian areas along streams and rivers also provide travel corridors for a whole range of organisms that use aquatic and upland areas. In some intensively farmed areas of the Province, retained aquatic and riparian areas provide the only opportunity for connecting habitats. Moreover, wetlands, peat lands and riparian zones house very large and important carbon reserves, which help to slow the release of CO₂ into the atmosphere.

Terrestrial Areas. In agricultural landscapes, terrestrial habitat consists of both native areas, such as forests and grasslands, and semi-natural areas, such as farm woodlots, pastures, hedgerows, and cultivated fields. While native areas within and around farms provide the best opportunity for conserving biodiversity, land that is used for agricultural production is also important. Forests and grasslands also have value as soil carbon sinks.

Structurally Diverse Habitats. Structurally diverse habitats have a mix of vegetation types with different heights and forms. This variation in structure provides different types of important habitats for a variety of native species. Farms and ranches that have a mix of cultivated and uncultivated fields, woodlands, hedgerows, fencerows, shelterbelts, and aquatic and riparian areas provide greater structural diversity than operations that have only cultivated fields or native pastures.

Connections between Habitat Patches. Corridors that connect patches of native and semi-natural areas provide safe, sheltered travel routes for animals when they are migrating or searching for food and mates, and they provide routes for pollen and seeds to disperse. These corridors also help maintain ecosystem services by controlling erosion, filtering contaminated runoff, acting as windbreaks, and providing opportunities for economic diversification. Grasslands, shelterbelts, hedgerows, woodlands, fencerows, uncultivated areas, gullies, intact riparian areas, and rock outcroppings can be used effectively to provide connections between habitat patches both within an individual farm and between neighbouring properties.

Healthy, Functional Habitats. Habitats that are healthy and functioning properly support higher levels of biodiversity than habitats that have been compromised. Agricultural management practices such as conservation tillage, off-stream watering, and nutrient management can help maintain the health of both native and semi-natural habitats on the farm.

Storehouses of Genetic Diversity. Agricultural operations can act as sources of genetic diversity both by conserving native species and by managing a variety of crops and livestock species. Agricultural practices such as crop rotation, use of winter cover crops and perennial cover, intercropping, and agroforestry contribute to increased levels of biodiversity. Additionally, areas left in native pasture can support a greater diversity of soil microorganisms, native plants, and pollinators than tame pastures.

Crop and Livestock Diversity. Planting a diversity of flowering crops that bloom at different times can provide food and rest areas for native insects such as wild bees, which are important crop pollinators. Planting genetically diverse crops can help stabilize crop production and provide a buffer during adverse and extreme weather events (e.g., drought, early frost), an important consideration for adapting to climate change.

Adding livestock to a crop-based agricultural production system can also provide many benefits. Manure can be used as a soil amendment. Livestock can be used to control weeds and promote desired plant species and structural diversity in pastures when their levels of grazing, trampling, and rooting are properly controlled. Adding different kinds of livestock to a production system can also increase the effective use of pastures.

Crop rotation provides crop diversity over time. Rotational cropping helps retain normal ecosystem functioning by curbing erosion, improving soil structure, conserving soil moisture, and disrupting insect, disease, and weed cycles. Rotations that include three or more crops usually have fewer problems with pests and require fewer crop inputs. Rotational cropping can also contribute soil nutrients.

Cover Cropping. Using cover crops during crop rotation supports beneficial organisms above and below ground. These organisms help build soils by decomposing organic matter and contributing to nutrient cycling. Additionally, organic matter is often lost from fallow fields that lack vegetation cover because the soil is exposed to wind and water erosion. Using cover crops, such as a fall rye, instead of letting fields remain fallow, can improve water infiltration, storage, and flow, and add to soil nitrogen content. Delayed seeding and the use of winter cover crops can also be beneficial to a number of species, particularly some species of waterfowl, shorebirds and grassland birds.

Perennial Cover. Perennial cover can make a larger contribution to biodiversity than annual crops can because there is generally less disturbance from farm activities such as tillage, seeding, and spraying. This allows plants and animals to follow their life cycles without disruption. Perennial cover can also provide a greater diversity of vegetation structure, which in turn supports more species. Perennial cover can include crops such as hay (tame or native vegetation) or berry bushes. It can also include native and semi-natural areas that have been left for beneficial insects and other wildlife.

Intercropping. Intercropping provides crop diversity and can increase vegetation structural diversity. It can also provide habitat for beneficial insects. For example, sunflowers planted within one metre of vegetable crops can increase the number of beneficial insects found in crops.

Agroforestry. Agroforestry intentionally combines the production of trees or shrubs with other crops and/or livestock. By integrating a diversity of crop and other plant species, agroforestry can contribute significantly to the structural diversity of habitats. Agroforestry systems can also serve important roles in adapting to climate change as buffers and shelters in production zones. Carbon storage in trees and shrubs in agroforestry plantings is also generally higher than conventional farming settings.

Species at Risk

A species at risk is defined by the federal *Species at Risk Act* (SARA) as an extirpated, endangered or threatened species or a species of special concern. The Act protects species at risk by providing legal protection to species at risk and their residences.

Under SARA there are several species listed as either endangered or threatened in BC. A significant number of these occur in areas that could be impacted by agriculture.

 [Species at Risk Public Registry](#)

 [Aquatic Species at Risk](#)

Provincial and local government legislation provides for protection of wildlife on BC Crown and private land. The provincial *Wildlife Act* protects wildlife listed under the Act. There is no stand-alone legislation for protection of species and ecosystems at risk; however, threatened and endangered species are listed in Schedule D and E of the *Wildlife Act Designation and Exemption Regulation*. In addition, the Conservation Data Centre (CDC) provides information on BC's wildlife, plants, and ecosystems, including their conservation status.

 [Wildlife Act](#)

 [Wildlife Act: Designation and Exemption Regulation](#)

 [CDC Data: BC Species & Ecosystems Explorer](#)

To ensure the protection of species at risk, SARA contains prohibitions that make it an offence to:

- ◆ Kill, harm, harass, capture, or take an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated.
- ◆ Possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated.
- ◆ Damage or destroy the residence (e.g., nest or den) of one or more individuals of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated, if a recovery strategy has recommended the reintroduction of that extirpated species.

On private land, these prohibitions apply only to:

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

In some circumstances the prohibitions could also be applied, through an order, to other species when found on private land if provincial/territorial legislation or voluntary measures do not adequately protect the species and its residence. Public consultation would first be sought in accordance with normal federal government regulatory procedure.

 [Species at Risk Act: information note for landowners](#)

IMPACTS OF AGRICULTURE ON BIODIVERSITY AND HABITAT

Every time humans interact with their habitat they interact with biodiversity. This is especially evident in any type of resource use, including agriculture. Therefore, it is important to understand the types of interactions that can occur between agriculture and biodiversity and the impacts they may have.

Agriculture changes the landscape and while farm development typically removes specific habitat types, it also creates other habitat types. For instance, land clearing removes forested habitat and replaces it with fields that may have forage value for some wildlife and waterfowl.

Impacts on habitat may occur as a result of various ongoing general farm activities. Works done near watercourses such as bridge and culvert crossings, or the construction of farm buildings, may pose risks to fish and wildlife habitat. Similar risks may occur as a result of transporting, handling, and storing farm products and chemicals. Some of those impacts are listed in the sections below.

Habitat Loss and Fragmentation. Regions that support agricultural production are among the most altered ecosystems on the planet. Loss of habitat to agricultural development is associated with a disproportionately high number of species at risk in agricultural areas. Agricultural land makes up approximately 7% of Canada's land base, yet more than half of the terrestrial species at risk are found in agricultural areas. Accordingly, agricultural producers, who play an important role in land management, are increasingly being asked to consider practices that help conserve biodiversity.

Agricultural activities can also affect biodiversity by altering the size and shape of habitats and the distances between them. Large areas of connected native vegetation tend to support the highest levels of native biodiversity. However, smaller patches of native and semi-natural vegetation can also support many species and populations. This is particularly true where patches are close to one another or are connected by corridors of perennial cover that allow wildlife to move safely between them.

Tillage Impacts. Tillage tends to degrade the diversity of soil micro-organisms found throughout the soil profile. This reduces the efficiency of nutrient cycling, the breakdown of toxins, and the maintenance of soil structure, which are all needed to sustain the productivity of agricultural soils. Mycorrhizal fungi play an important role in maintaining above and below ground biodiversity and soil productivity. These fungi form associations with approximately 80% of the terrestrial plant species in the world, including legumes, flax, sunflowers, corn, and fruit trees. Generally, the fungi make nutrients (i.e., phosphorus, nitrogen, potassium, magnesium, and some micronutrients) available for plant growth. Undisturbed, mycorrhizal fungi grow into long, intricate networks in the soil. They transport nutrients through these networks to the plants' roots in exchange for carbon.

Irrigation Impacts. Many aquatic species, such as fish and amphibians, rely on the maintenance of certain water regimes throughout the year. Changes in water levels, due to control structures and/or irrigation withdrawals, may negatively impact habitat and water quality. In addition, over-irrigating not only depletes surface water and groundwater, it can drown plant roots. It can also reduce nutrient uptake, cool soils, reduce crop quality, and increase erosion as well as nutrient and chemical runoff into watercourses. These impacts affect both aquatic and terrestrial ecosystems and can be detrimental to biodiversity.

Input Impacts. Production inputs include fertilizers and pesticides. Depending on the timing and intensity of their use, production inputs can have significant effects on biodiversity. Repeated additions of nutrients in excess of what crops use can destabilize soil conditions, reduce soil organism diversity, and impair soil processes. Improper use of production inputs can also cause water and air pollution. Nutrients, such as nitrogen and phosphorus, can reduce surface water quality by causing overgrowth of aquatic plants and algae. When these plants decompose, the resulting loss of oxygen can be lethal to fish and other aquatic organisms. Overgrowth of some types of blue-green algae can result in the release of toxins that are harmful to a variety of species.

The use of pesticides (particularly insecticides) can have toxic effects on soil organisms, which can impair soil biological processes. Some pesticides can also have adverse effects on beneficial insects, including pollinators such as bees. Most pollinating insects are especially vulnerable to insecticide applications in the cool of the early morning and when their forage plants are flowering. They can also be affected by chemical drift into non-cropped areas where they nest.

Grazing Impacts. When the intensity and timing of grazing and browsing are not properly managed, biodiversity can be negatively affected. When grazing is too intense or too frequent, individual plants become less vigorous. Over time, plant diversity decreases, and grazing-resistant or less preferred species increase in abundance. These impacts can lead to a loss of food and habitat for beneficial insects, amphibians, reptiles, birds, and mammals.

Different species require different types of vegetation structure. Historically, vegetation structural diversity across the landscape was created by fire and a variety of wild herbivores. In agricultural systems, structural diversity can be achieved by managing grazing intensity to maintain mosaics of lightly grazed, moderately grazed, and more heavily grazed areas. This can support greater biodiversity than areas that are grazed uniformly or left ungrazed.

Grazing that is too intense or that occurs at the wrong time of year can affect soils and site productivity by impacting soil organisms, compacting soils, reducing infiltration of water and associated minerals and nutrients, and affecting the exchange of oxygen, carbon dioxide, and other gases in the root zone. Unmanaged grazing can also create areas of bare soil, which can result in increased erosion and be prime sites for invasive plants to establish. Additionally, unmanaged grazing in aquatic and riparian areas can impact biodiversity and water quality.

The timing of grazing activities must also take into consideration the fact that plants and animals can be especially sensitive to disturbance at certain periods during their life cycle. Some animal species may also be vulnerable during certain times of the day.

Introduction of Invasive Species. The introduction and spread of invasive species poses a threat to ecosystems around the world. These species are sometimes also called "exotic," "introduced," "non-native," "non-indigenous", or "noxious" species. Invasiveness refers to the ability of a plant or animal species to spread beyond its introduction site and become established in new locations. Invasive alien species compete with native species for available resources, and in some cases, contribute to the decline or loss of native species. Some invasive plant species are referred to as "noxious" because of the harm they can do to the environment, animals, or people. Invasive plant species, such as spotted knapweed, are well known for their ability to spread rapidly in disturbed and inappropriately grazed areas. They have the potential to reduce agricultural production by competing with native plants for moisture and soil nutrients but often do not provide suitable forage for wildlife or livestock. Invasive plant species reduce native biodiversity and can be extremely difficult and costly to control once established.

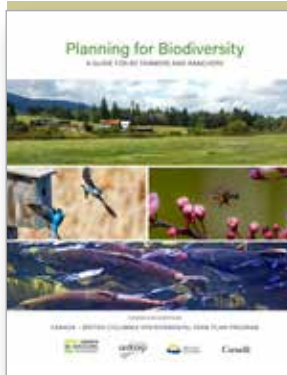
Impacts of Genetically Modified Organisms. Genetically modified organisms (GMOs) are plants, animals, bacteria, or viruses whose genetic makeup has been deliberately altered in a way that does not occur naturally through mating or natural gene recombination. Modification is often designed to improve yield and production by making the organism resistant to disease, insects, and/or pesticides, but it can also be used to enhance or reduce certain traits such as fibre quality or fat content. The growing of GMOs reduces biodiversity because all of the plants within a single species come from a genetically modified source plant, so they are all genetically identical. The overall effects that GMOs have on biodiversity are not fully understood, and they can differ among crops, environments, and the types of modifications made to the organism.

Impacts on Wildlife. Agricultural activities can have impacts on native wildlife species in addition to causing habitat loss. For example:

- ◆ Wild sheep and goats that come into contact with domestic sheep, llamas, or alpacas can be exposed to diseases that do not naturally occur in wild populations and for which they have no natural resistance.
- ◆ Agricultural activities can disturb wildlife and cause them to move or be displaced, or can upset their normal life cycle.
- ◆ Livestock can trample bird nests.
- ◆ Equipment used for haying, cultivating, tree harvesting, etc., can injure or kill wildlife.
- ◆ Fencing can cut off wildlife access to travel corridors, winter/spring ranges, feeding areas, and water. Animals can also be injured or killed when trying to jump over or go under fences; birds can be harmed by accidentally flying into fences.
- ◆ Runoff polluted with manure or fertilizer can harm fish and amphibians.
- ◆ Pesticide sprays can injure or kill native pollinators.

Biodiversity Plans

Biodiversity in and around the farm operation can provide varying degrees of environmental benefit. In order for producers to gain a better understanding of biodiversity and plan for biodiversity a more detailed assessment is outlined in the Planning for Biodiversity publication.



Planning for Biodiversity: A Guide for BC Farmers and Ranchers is a publication that forms part of the Environmental Farm Plan series on Beneficial Management Practices. The guide is designed for farmers and ranchers who wish to increase their understanding of biodiversity and what it means to their operations. It offers ideas on how agricultural producers can manage for biodiversity, and it provides some tools for doing so. The guide is the next step beyond the EFP process and is not intended to address regulatory issues specifically. The guide provides an opportunity to assess how the farm operation fits within the eight principles of agricultural biodiversity (see Figure 7.1, next page).

 [EFP Biodiversity Guide Webpage](#)

Eight Agricultural Biodiversity Principles

Managing for agricultural biodiversity is about conserving the variety and number of all living things, including both native and domestic species, and the relationships and interactions among them. The principles on the following pages reflect the key relationships and interactions that need to be considered when managing for biodiversity on farms and ranches.



FIGURE 7.1 Eight Principles of Agricultural Biodiversity

AQUATIC BIODIVERSITY



AQUATIC BIODIVERSITY CONCERNS

Primary environmental concerns related to protection of fish and other aquatic life are:

- ◆ Contaminants, such as manure, pesticides and sediments, in water that results in fish health concerns.
- ◆ Reduced water quantity or low watercourse flows or velocities causing fish habitat loss resulting in reduction of fish food production, fish, and number of fish species.
- ◆ Dredging, dyking and channelizing streams that results in fish habitat loss.
- ◆ Loss of riparian vegetation that provides shade, leaf litter and insects for fish food.
- ◆ Lack of screens or incorrectly-sized screens on water intakes that result in fish population losses.
- ◆ Lack of assured fish passage through or around control structures such as dams or weirs.

For information on these concerns:

- ➔ see Impacts on Biodiversity and Habitat, **page 7-7**, and refer to Farm Activities and Impacts
- ➔ see Water Quality and Quantity Factors, **page 9-1**, and refer to Contaminants
- ➔ see Buffers, Riparian Areas, and the Environment, **page 11-15**, and refer to Riparian Areas

AQUATIC BIODIVERSITY LEGISLATION

The following is a brief outline of the main legislation that applies to aquatic biodiversity.

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



Environmental Management Act

The Code of Practice for Agricultural Environmental Management, which is concerned with agricultural wastes, makes no direct references to fish habitat. **Compliance with the AEM Code does not necessarily ensure habitat protection.**



Riparian Areas Protection Act

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

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

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



Water Sustainability Act

The *Water Sustainability Act* (WSA) is the principal law for managing the diversion and use of water resources. Non-domestic groundwater users are required to apply for a water licence to maintain their right to use groundwater.

SECTION 6: Prohibits diverting water without a licence except in limited circumstances for fire suppression, domestic use and mineral prospecting.

SECTION 11: Requires approvals for making changes in and about streams.

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

There are a number of purposes for this regulation, which include:

- ◆ Establishing application requirements for WSA authorizations, including licences and use approvals for stream water and groundwater;
- ◆ Defining processes for making changes in and about streams, and in particular delineating changes that can be made by notification to government and those that must be made after making application for and being granted a Change Approval;
- ◆ Defines “sensitive streams” in British Columbia;
- ◆ Establishes procedures for licence holders to expropriate land reasonably required for the construction, maintenance, improvement or operation of works authorized or necessarily required under the licence; and
- ◆ Defines certain water uses that may occur under the regulation rather than under a licence or use approval, such as short term use of water for well drilling purposes and use of deep saline groundwater in north east BC.



Wildlife Act

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



Fisheries Act

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

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

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

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

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

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

Specific sections of the Act include:

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

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

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

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

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

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

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

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

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

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

Species at Risk Act

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

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

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

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

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

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

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

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

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

 [Species at Risk Public Registry](#)

AQUATIC BIODIVERSITY BENEFICIAL MANAGEMENT PRACTICES

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

Protection of fish and other aquatic life on farm operations includes practices that not only directly protect them but also protect water quantity and quality, riparian areas, and habitats as well.

When planning work in or near a watercourse, seek advice from a Qualified Environmental Professional and/or Fisheries and Oceans Canada to ensure that work does not contravene the *Fisheries Act*. Designs for works in and about a stream should be submitted to Front Counter BC where an approval or licence is required; or to ENV where works are being carried out under regulation (*Water Sustainability Act*, SECTION 11, and *Water Sustainability Regulation*, Part 3).

 [Fisheries and Oceans Canada- Projects Near Water](#)

 [FrontCounter BC - Guide to Changes in and about a stream](#)

Aquatic Habitat

For fish and other aquatic life, habitat clearly refers to the water and physical features in watercourses. A holistic view of aquatic habitat includes grassed and wooded areas adjacent to the water that provide various services to aquatic life, the water and the watercourse. Habitat concerns include water quantity, water quality, and the loss of in-stream habitat and riparian vegetation.

Where farm activities are adjacent to watercourses, they will vary from low to high risk but all will require careful management to protect fish and other aquatic life.

Lakes, Ponds and Wetlands. These still and slow moving water environments vary widely through the Province but share important functions within an ecosystem that should be considered when addressing farm impacts. They typically:

- ◆ Receive and hold water in a watershed reducing runoff peak flows.
- ◆ Depending on their size, have low tolerance for contaminants; water quality may easily be impacted.
- ◆ Provide important habitat for a wide range of aquatic life and wildlife.
- ◆ Have vegetation that varies greatly, some that may be grazed or browsed by livestock.
- ◆ Will have reduced functionality if riparian and buffer areas are impacted.



Wetlands in BC tend to be small and dispersed across the landscape. Some of our most important wetlands occur in off-channel riverine areas. Draining and filling in of wetlands is a major conservation concern, for wetlands tend to be disproportionately important to wildlife, particularly in the more arid regions of the Province.

 [Understanding Wetlands: A Wetland Handbook for BC's Interior \(available as a book only, not online\)](#)

 [A Wetland Keeper's Handbook](#)

 [Wetlands of British Columbia: A Guide to Identification](#)

Streams, Ditches and Floodplains. These moving water environments vary considerably through the Province but share similar important features:

- ◆ Stream bank stability, in-stream structure and sinuosity to dissipate the energy of flowing water without significant erosion.
- ◆ Riparian vegetation to provide habitat, organic debris inputs and shade.
- ◆ Water quality and quantity for multiple uses, including fish and other aquatic organisms, wildlife, and drinking water supply.
- ◆ Floodplains that provide high-water relief to help reduce down-stream erosion and flooding, and to provide nutrients and seasonal rearing habitat for fish.
- ◆ Groundwater influence in controlling and moderating watercourse flow and temperature.

Riparian Areas. These areas bordering watercourses usually have vegetation that is different than the surrounding upland area due to the presence of water. Healthy riparian areas are important to aquatic life.

➔ see Riparian Areas, **page 11-17**

Aquatic Life and Aquatic Habitat Protection

To protect stream habitat and riparian areas implement the following practices:

- ◆ Protect water quality and quantity by following the water quality protection practices listed.
- ◆ Limit the number and use of in-stream crossings by constructing bridges or culverts wherever feasible.
- ◆ Perform an annual assessment of riparian health, implement changes identified, and monitor the results of any changes or improvements made (consider the assistance of local environmental enhancement groups).

 [Riparian Management Field Workbook](#)

- ◆ Use planned grazing systems with separate riparian and upland pastures.
- ◆ Avoid grazing in riparian areas or schedule grazing in riparian areas to maintain vegetation diversity.

 [Drainage Management Guide](#)

Water Quality. To protect water quality in watercourses that fish and other aquatic life depend on, implement the following practices:

- ◆ Keep both dissolved and suspended water contaminants out of watercourses.
- ◆ Establish and maintain adequate vegetated buffers directly alongside watercourses.
➔ see Buffers, **page 11-4**
- ◆ Use special nutrient management practices in buffer areas such as avoiding the spreading of manure in the fall.
- ◆ Manage stormwater to maintain watercourse hydrology and water quality in the state it was prior to land development as much as possible.
- ◆ Maintain wetlands for reducing peak runoff flows and purifying the water:
 - Where wetlands have been drained, resulting in marginal agricultural land, re-establish the wetland (conservation incentive programs may be available, such as from Ducks Unlimited Canada).
- ◆ On annual croplands located near vegetative buffers and riparian areas, use cover crops to limit bare soil areas created by late-season crop harvesting.
➔ see Cover Crops, **page 4-8** and
➔ see Buffers, **page 11-4**
- ◆ Design livestock watering systems to reduce watercourse impacts either by providing controlled access points or no access whatsoever, if appropriate.
- ◆ Use pesticide application methods that reduce the risk of direct drift into watercourses or indirect drift onto runoff flows entering riparian areas.
- ◆ Manage and control grazing programs to avoid negative impacts such as manure deposition or contaminated runoff flow.

Fish Passage at Control Structures. Water control structures such as reservoir dams, weirs, flood boxes and pump stations on fish bearing watercourses may require fish passage structures. Such structures will be specific to fish species requirements and should be developed after consultation with DFO. Depending on the structure and location, ENV may provide recommendations.

Water Withdrawals. Withdraw irrigation and livestock water at or below the licensed rates, and use acceptable water management practices. During exceptionally dry years, consider the unusual impacts to aquatic life from normal water withdrawals.

➔ see Licensing of Surface Water, **page 9-10**

Surface water withdrawals require screened intakes to protect fish. They are designed for opening size to prevent fish entry and for low water velocity across the screen to prevent fish loss from being drawn against the screen.

➔ see Water Intakes, **page 9-19**

Changes In and About a Stream

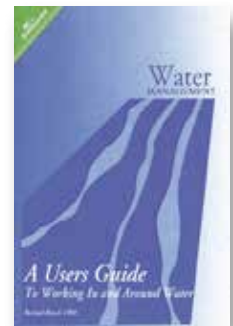
When planning work in or near a watercourse, contact Fisheries and Oceans Canada to ensure that it does not cause serious harm to fish.

Provincial Requirements. Work that involves “changes in and about a stream” (such as water intakes, stream crossings, etc) requires an approval or licence from FrontCounter BC under the *Water Sustainability Act*, Section 11. Notification to ENV is required for works that may be done in compliance with the *Water Sustainability Regulation*, Part 3, such as those that do not involve any diversion of water, can be completed in a short period of time, and have little impact on the environment:

- ◆ Installation, maintenance or removal of stream culverts, clear span bridges, docks or wharves, ice bridges, stream fords, and fences;
- ◆ Installation or maintenance of pipeline crossings, drain tile outlets;
- ◆ Repair and maintenance of dykes, bridge superstructures;
- ◆ Cutting of annual vegetation;
- ◆ Beaver dam removal for drainage purposes with specific restrictions and in compliance with the *Wildlife Act*.

 [Working In and Around Water in BC](#)

 [Standards and Best Practices for Instream Works](#)



Federal Requirements. The *Fisheries Act* requires authorization for work that may impact fish habitat (from Fisheries & Oceans Canada, DFO).

 [Projects Near Water – Department of Fisheries and Oceans Canada website](#)

Aquatic Life Establishment

Farm projects that include water impoundment or conveyance, such as reservoirs, ditches, etc., may also provide habitat for aquatic life. Consider consulting with Fisheries and Oceans Canada to see if measures can be taken (consistent with the farm goals) that may assist in creation of aquatic habitat.

TERRESTRIAL BIODIVERSITY



TERRESTRIAL BIODIVERSITY CONCERNS

Primary environmental concerns related to terrestrial biodiversity are:

Wildlife

- ◆ Contaminants, such as manure, pesticides and sediments, in water from agriculture that results in wildlife health concerns.
- ◆ Grazing intensity and timing not properly managed.
- ◆ Reduced riparian health that results in wildlife habitat loss.
- ◆ Land clearing, drainage of wetlands and introduction of weeds that result in:
 - Wildlife habitat loss,
 - Loss of habitat connectivity,
 - Reductions in woody vegetation or organic soils that are important stores of terrestrial carbon to help mitigate climate change.
- ◆ Pesticide management that results in loss of beneficial insects.

Plants

- ◆ Invasive pests that result in reduced populations of native plants.
- ◆ Pesticide management that results in a loss of beneficial native plants.

For information on these concerns:

- ➔ see Pest Management and the Environment, **page 5-1**
- ➔ see Impacts on Biodiversity and Habitat, **page 7-7**, and refer to Farm Activities and Impacts
- ➔ see Water Quality and Quantity Factors, **page 9-1**, and refer to Contaminants
- ➔ see Climate Change Factors, **page 12-1**

TERRESTRIAL BIODIVERSITY LEGISLATION

The following is a brief outline of the main legislation that applies to terrestrial biodiversity.

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



Environmental Management Act

The Code of Practice for Agricultural Environmental Management, which is concerned with agricultural wastes, makes no direct references to wildlife habitat. **Compliance with the AEM Code does not necessarily ensure habitat protection.**

Regulations under this Act provide for the prevention of the spread of designated pests (i.e., insect, plant or pathogen) destructive to specific plants.



Weed Control Act

Administered by AFF, this Act places the responsibility for the control of noxious weeds on the occupiers of the land. It provides for the appointment of inspectors to ensure compliance and, failing that, for a method by which they can control weeds and recover the costs from the occupier. Weed Control Committees may be established by municipal councils to administer the Act within a municipality. Committees report to the municipal council and the Minister.



Wildlife Act

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

- ◆ SECTION 4: allows designation of wildlife management areas.
- ◆ SECTION 6: regulates endangered and threatened species.
- ◆ SECTION 7: makes it an offence, in a wildlife management area, to alter, destroy or damage wildlife habitat; or to deposit a substance harmful to wildlife or wildlife habitat.
- ◆ SECTION 9: makes it an offence to disturb, molest or destroy a muskrat or beaver house, den or dam unless you are a licensed trapper or have lawful authority to protect property or maintain irrigation or drainage facilities.
- ◆ SECTION 33.1: makes it an offence to intentionally feed or attract dangerous wildlife to any land or premises
- ◆ SECTION 34: makes it an offence, except by regulation, to possess, take, injure, molest or destroy a bird or its egg; the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl; or the nest of any bird not mentioned above when the nest is occupied by the bird or its egg.



Migratory Birds Convention Act

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

- ◆ SECTION 5: of the Act states that , no person shall, without lawful excuse,
 - Be in possession of a migratory bird or nest; or
 - Buy, sell, exchange or give a migratory bird or nest or make it the subject of a commercial transaction;
 - Except as authorized by the regulations.
- ◆ The *Migratory Birds Regulations* under this Act also has sections of importance:
- ◆ SECTION 6: no person shall: disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird without permit.
- ◆ SECTION 24(1): any person may, without a permit, use equipment, other than an aircraft or firearms, to scare migratory birds that are causing, or a likely to cause damage to crops or other property (other control measures require a permit).
- ◆ SECTION 33: no person shall introduce into Canada for the purpose of sport, acclimatization or release from captivity a species of migratory bird not indigenous to Canada except with the consent in writing of the Director.

Plant Protection Act

This Act protects plant life and the agricultural and forestry sectors of the Canadian economy by preventing the importation, exportation and transportation of pests.

- ◆ The *Plant Protection Regulations* under this Act outline requirements for the importation and/or domestic movement of plant species to avoid transporting pests (e.g., hay and straw may harbour the cereal leaf beetle).

Species at Risk Act

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

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

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

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

- ◆ On **private land**, unless an order is made by the government, the SARA prohibitions apply only to:
 - Aquatic species at risk; and
 - Migratory birds listed in the *Migratory Birds Convention Act, 1994* and also listed as endangered, threatened or extirpated in Schedule 1 of the Act.

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

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

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

 [Species at Risk Public Registry](#)

TERRESTRIAL BIODIVERSITY BENEFICIAL MANAGEMENT PRACTICES

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

Wildlife habitat concerns include the reduction or loss of habitat due to the establishment or expansion of farms, such as drainage of wetlands for crop production. Wildlife protection on farm operations includes practices that protect both wildlife and their habitat. Assess the type and density of wildlife on or around a farm to ensure that a desired agricultural development, activity, or operation does not cause adverse effects.

Grasslands. Grasslands cover only 1.5% of BC's land area, and about 70% is located on privately owned land. Nevertheless, grasslands are important both as wildlife habitat and as forage for grazing livestock. Grasslands often contain species at risk.

 [BC Grasslands Stewardship Guide](#)

Woodlands. Farm woodlots may be operated on privately owned and/or Crown land. Impacts from harvesting trees may affect both fish and wildlife. Specific concerns include the growth management activities, the timing and method of tree removal, the size of harvest area, and post-harvest activities.

Riparian Areas. Healthy riparian vegetation supports a diversity of bird and wildlife species with both food and shelter. This vegetation is particularly important to wildlife, including species at risk, as it is very productive and located next to water. → see Riparian Areas, **page 11-15**

Wetlands. These still, and slow moving water environments vary widely through the Province but share important fundamentals when considering farm impacts. Many wetlands do not have fish, and as such do not have direct legal protection, except as they relate to the *Species at Risk Act* and to bird nests.

Wetlands are important to biodiversity because of the presence of a vast range of plant and animal species and the important climate moderating functions they provide.

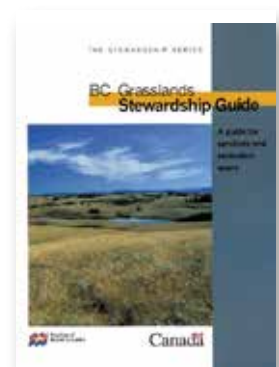
They typically:

- ◆ Receive and hold water in a watershed, reducing runoff peak flows or precipitation events that occur outside normal seasonal patterns, an important adaptation function under a changing climate.
- ◆ Depending on their size, have low tolerance for contaminants; water quality may easily be impacted.
- ◆ Provide important habitat for a wide range of aquatic life and wildlife.
- ◆ Have vegetation that varies greatly, some that may be grazed or browsed by livestock.
- ◆ Store large amounts of carbon in wetland vegetation and organic soils.
- ◆ Will have reduced functionality if riparian and buffer areas are impacted.
- ◆ Perform an annual assessment of habitat health, implement changes identified, and monitor the results of any changes or improvements made.

 [Understanding Wetlands: A Wetland Handbook for BC's Interior \(book only – not available online\)](#)

 [A Wetland Keeper's Handbook](#)

 [Wetlands of British Columbia: A Guide to Identification](#)



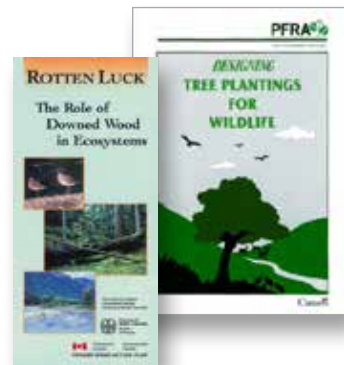
Wildlife and Wildlife Habitat Protection

To protect wildlife habitat, implement the following practices:

- ◆ Follow the beneficial practices to protect water quality as previously mentioned in the fish protection section.
- ◆ Know the wildlife species on the farm and what habitats are present to determine if there are any threatened or endangered species.

- 📄 [BC Conservation Data Centre](#)
- 📄 [Canada Species at Risk Public Registry](#)
- 📄 [BC Species and Ecosystem Explorer](#)
- 📄 [Riparian Management Field Workbook](#)
- 📄 [Planning for Biodiversity: A Guide for BC Farmers and Ranchers](#)

- ◆ Use planned grazing systems that consider impacts on wildlife habitat, woody vegetation or soil organic matter.
 - ◆ Improve livestock management to minimize impacts on habitat by:
 - Using cross fencing to move livestock;
 - Installing off-stream or off site-watering.
 - ◆ Use devices such as flushing bars when cutting hay to reduce wildlife mortality.
 - ◆ Buffer sensitive habitats from loss or alteration due to road and building construction, outdoor livestock areas, land clearing, wetland drainage, cultivation, crop harvest, soil erosion, compaction, and air contaminants that result from agricultural activities.
- ➔ see Buffers, **page 11-4**
- ◆ Provide wildlife with corridors for moving across the landscape (where appropriate, work with neighbours to establish continuous corridors).
 - ◆ Conserve wildlife trees and other habitat features.
 - ◆ Contain and treat livestock diseases.
 - ◆ Use Integrated Pest Management (IPM) to decide when and how to control pests.



Wildlife Habitat Establishment

Under some circumstances land owners may choose to plant trees and other vegetation specifically for wildlife.

Conservation organizations such as Ducks Unlimited Canada, The Nature Conservancy, The Nature Trust of BC, The Land Conservancy of BC, the Grasslands Conservation Council of BC, or local land trusts work in partnership with producers and may have access to funds or incentives to support stewardship activities, particularly for species at risk.

- 📄 [Rotten Luck: The Role of Downed Wood in Ecosystems](#)
- 📄 [Agriculture and Agri-Food Canada: Agroforestry – Wildlife Plantings](#)

PLANT BIODIVERSITY BENEFICIAL MANAGEMENT PRACTICES

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

Livestock Management

Livestock may have an impact on plant biodiversity. The main concerns are over grazing and trampling of sensitive vegetation on native grasslands, rangelands and riparian areas.

➔ see Outdoor Livestock Areas, **page 3-8**

 [Grazing Management Guide](#)

Weeds

Noxious weeds are typically non-native (invasive) plants that have been introduced into British Columbia without the insect predators and plant pathogens that help keep them in check in their native habitats. For this reason, and also because of their aggressive growth characteristics, these invasive plants can be highly destructive, competitive, and difficult to control. Non-native weeds are among the leading causes associated with loss of the natural diversity in the environment.

It is important that any unusual or unfamiliar weeds be reported to AFF or the Canadian Food Inspection Agency so that the species can be identified for appropriate action to be taken to eradicate the pest before it spreads.

 [CFIA Plants, Pests, and Invasive Species](#)

To reduce the possibility of introducing new weeds to a farm, implement the following practices:

- ◆ Before importing plant material from other countries or provinces, check with the Canadian Food Inspection Agency for permit requirements and other restrictions.

 [Canadian Food Inspection Agency](#)

- ◆ Report the presence of any unusual weeds to the nearest AFF office as soon as possible.

To reduce the impact of weeds, implement the following practices:

- ◆ Learn to identify weeds, particularly at the seedling stage.
- ◆ Prevent problem weeds from going to seed.
- ◆ Always use clean certified seed sources.
- ◆ Practice crop rotation to discourage build up of specific weeds.
- ◆ Use Integrated Pest Management (IPM) to decide when and how to control weeds.
- ◆ Apply appropriate controls at the recommended stage of crop and weed development.
- ◆ Control perennial weeds prior to planting crops.
- ◆ Prevent the movement of weeds to new locations:
 - Prevent movement that can occur when livestock move from a weed infested area to an uninfested area.
 - By cleaning farm equipment before moving from one location to another.
- ◆ Control weeds along farm roads and trails.

➔ see Invasive Pests, **page 5-8**

 [A Guide to Weeds in British Columbia](#)

 [Invasive Plants Identification Field Guide](#)

 [Field Guide to Noxious Weeds and Other Selected Plants of British Columbia](#)

 [BC Invasive Species Council](#)



BIODIVERSITY CONFLICTS



This chapter has outlined environmental impacts that may occur to biodiversity from a farm operation. However, farms may be affected by impacts from biodiversity.

BIODIVERSITY CONFLICT CONCERNS

While there are many benefits of managing for biodiversity, it is important to recognize that not all species have a positive effect on agricultural production. There a number of animal species, both native and introduced, that can cause significant impacts on agricultural operations, including damage to infrastructure, loss of growing or stored crops, transmission of diseases, and harassment, injury, or death of livestock. The type of impact often varies by species. Examples of concerns related to biodiversity and agriculture conflicts are:

- ◆ Deer and rabbits damaging fruit trees.
- ◆ Coyotes damaging drip irrigation lines and emitters.
- ◆ Birds raiding fruit crops and contaminating feeders.
- ◆ Deer and elk consuming standing crops and stored forage.
- ◆ Elk damaging fences, irrigation systems and causing pugging and hummocking in fields due to hoof action.
- ◆ Bears damaging apiaries and fruit crops.
- ◆ Large carnivores such as wolves, coyotes, cougars and bears killing or maiming livestock; or causing damage to fences, equipment and water piping.
- ◆ Waterfowl consuming standing crops and compacting soils of cropped fields, particularly during fall migration or overwintering.
- ◆ Waterfowl transmitting infectious disease.
- ◆ Bats, birds, rodents, skunks, beavers and raccoons and other small wildlife damaging buildings by roosting and nesting in attics, digging and denning under foundations, or sheltering within walls:
 - Causing damage to feed and crops;
 - Carrying pathogens that cause disease in humans, such as Tularemia (rodents, rabbits, hares, Hantavirus (mice), Salmonella (rodents).
- ◆ Birds causing a nuisance concern for affected neighbours from the need to use noise makers for bird control.
- ◆ Crows and ravens causing harm to newly born livestock and damage of wrapped round bales.
- ◆ Starlings flocking inside barns and fouling livestock watering areas and other structures.
- ◆ Large predators causing safety concerns for farm workers, visitors, children and pets.
- ◆ Bears damaging round bale silage in stack yards and standing silage corn in the field as corn matures and early season oats and barley.
- ◆ Bears increasing forage activity in the fall as they prepare for hibernation and frequenting inhabited areas more readily.

When viewed on a provincial scale, most wildlife do not negatively affect agricultural production, but when they do, the impacts to individual producers can be significant. It is important to note that producers can manage for biodiversity without necessarily increasing the risk of wildlife-related conflicts. The key is to find an acceptable balance between the benefits and potential costs of managing for biodiversity.

BIODIVERSITY CONFLICT RESOLUTIONS

Minimize Wildlife Damage. To aid in reducing conflicts or damage, implement the following practices:

- ◆ Minimize waterfowl damage:
 - Delay fall tillage of already harvested fields (waterfowl will use the waste grain or crop residue);
 - Straight combine grain crops instead of swathing;
 - Plant lure or sacrifice crops;
 - Post harvested fields as “no-hunting” areas thereby creating your own lure crop and preventing damage to the unharvested crop;
 - Relay crop when possible (i.e., interseeding Italian ryegrass with corn).
- ◆ Minimize ungulate (i.e., deer and elk) damage:
 - Stack bales at least two tiers high, keeping stack edges as straight as possible (prevents climbing) and stack bales near human habitation;
 - Use farm machinery to prevent access to stacks;
 - Clean up spilled grain, loose forage and other food sources which may attract wildlife.
- ◆ Follow the pest management strategies in Chapter 5.
- ◆ Minimize the impact of problem beavers by:
 - by excluding them from habitat, such as screening culverts to exclude beavers.

[Control of Beaver Damage](#)

Mitigate Large Predator Impacts and Damage. Large predators such as bears, coyotes, wolves, and cougars are of increasing concern in some areas of BC. In order to reduce potential for conflict or damage, implement the following practices:

- ◆ Explore what large predator species may live near your farm operation and familiarize yourself, and any farm workers, with their food and behaviour preferences.
- ◆ Identify any problem individual predators and report these to the Conservation Officer Service in your area.
- ◆ Use steel hopper bottomed bins or steel bins with a concrete floor and bear-proof door and base to store feed.
- ◆ Clean up any feed spills within 24 hours.
- ◆ Keep all feed bins in good condition and securely closed when not in use.
- ◆ Locate feed bins away from any farm residences and family recreational areas where possible.
- ◆ Ensure domestic pet food is kept inside secured buildings and/or bear-proof containers.
- ◆ Ensure seed-stock, harvested produce, related supplies and waste materials are stored in bear-proof containers in buildings that are clean, secured, and well-maintained.
- ◆ Keep all household garbage inside secured buildings and/or in bear-proof containers.
- ◆ Keep barbecues and other recreational outdoor cooking equipment clean and stored inside when not in use.
- ◆ Ensure all hunting, trapping, fishing, and home butchering/processing areas and equipment are kept clean and secure. Immediately process and store all carcasses, fish, or other food items in secure buildings and containers.

- ◆ Fence growing and beekeeping areas with electrified fencing, where possible, in order to exclude large predators and other wildlife.
- ◆ Utilize high-voltage fencing around round bale silage in stack yards to prevent damage by bears.
- ◆ Utilize guardian animals (such as donkeys or llamas) that are bonded with livestock to help protect from predators.
- ◆ Train domestic pets to herd and discourage predators.
- ◆ Monitor regularly for sick or lame livestock, move to secure shelter for treatment.
- ◆ Move all livestock to secure on-farm protected areas during birthing season, or if sick and/or injured, and ensure they are frequently monitored.
- ◆ Night-pen livestock and use sufficient lighting to illuminate pens and adjacent outside perimeter where possible.
- ◆ Dispose of dead stock within 48 hours properly through off-site transport, protected on-farm composting systems, burial to a depth of 2.75 m or incineration.
- ◆ Ensure farm workers and family members are trained for and educated in predator conflict prevention.

 [Mitigating Cattle Losses Caused by Wild Predators in British Columbia: A Field Guide for Ranchers](#)

 [Preventing and Responding to Conflicts with Large Carnivores](#)

Producers are encouraged to follow normal farm practices as defined by the *Farm Practices Protection (Right to Farm) Act* and as outlined by previous Farm Industry Review Board rulings.

See  [Farm Industry Review Board](#)

 [Wildlife Damage Control – Interior BC](#)

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

 [BC Agricultural Fencing Handbook](#)

 [Bird Predation Management Plan for Blueberries](#)

 [Netting for Bird Control in Blueberries – A Decision-making Guide](#)

 [Netting for Bird Control in Cherries – A Decision-making Guide](#)

 [Netting for Bird Control in Grapes – A Decision-making Guide](#)

 [Farm Practices – Pest Management Factsheet](#)

- ◆ Various projects and programs have been developed in BC to solve local wildlife conflicts including the following examples:
 - The **Delta Farmland and Wildlife Trust** is voluntary on-farm stewardship organization that encourages demonstration and research. The Trust has supported planting lure crops, grassland set-asides, buffers, and public education and awareness projects.
 - The **Livestock Protection Program** is run by the BC Cattlemen’s Association. It provides verification and mitigation services to cattle and sheep producers for injury, harassment or death loss caused by wolves and coyote or other large predators.
 - The **Migratory Waterfowl Stewardship Project** was started by the Cowichan Land Trust to address the ongoing regional issues with migratory waterfowl. It is critical that local stakeholders, including farmers, are included in the development, implementation, and monitoring of the stewardship action plan.

Additional wildlife management projects may be found on the Investment Agriculture Foundation website:

 [Investment Agriculture Foundation](#)