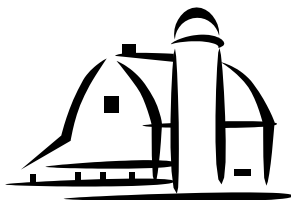


# Wetland Ways



3

## Interim Guidelines for Wetland Protection and Conservation in British Columbia

March 2009

### Chapter Three

## AGRICULTURE

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**These interim guidelines will be updated using experience from pilot testing and feedback from user groups. If you would like to comment on these guidelines, please send your comments to: [wsp@gov.bc.ca](mailto:wsp@gov.bc.ca)**

Cover photos: Sarma Liepens, Judith Cullington.



## CHAPTER 3: AGRICULTURE

### 3.1. INTRODUCTION

This chapter provides guidelines for the protection and management of wetlands that are on or near to agricultural lands. It is intended to be read in conjunction with [CHAPTER 2: GENERAL GUIDELINES](#). The objective is to highlight key areas where agricultural activities and wetland features and functions overlap. It is intended to provide increased understanding of the linkages between agricultural activities and wetlands and provide guidance to farmers on how they can manage their activities to minimize any impacts.

Primary environmental concerns from farm activities related to wetlands and associated riparian areas are:<sup>1</sup>

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

These are the concerns identified by the Environmental Farm Planning Reference Guide.



Wetlands can provide water for irrigation. PHOTO: SARMA LIEPENS

### *Benefits of Wetlands*

Well managed and intact wetlands, including riparian areas, offer a variety of benefits to farmers, including:

- ♦ Providing water for irrigation;
- ♦ Recharging deep aquifers which provide groundwater for irrigation and livestock use;
- ♦ Providing base flows or extending duration of flows to downstream agricultural users;
- ♦ Reducing erosion and thus maintaining soil productivity by providing flood protection and flow stabilization;

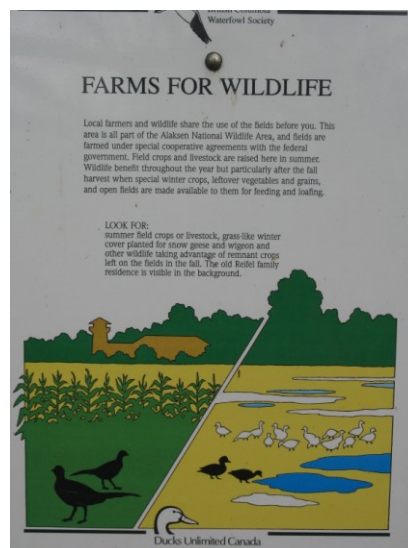
<sup>1</sup> Environmental Farm Planning Reference Guide



[Planning for Biodiversity A Guide for B.C. Farmers and Ranchers](#) provides information to assist farmers in conducting a biodiversity assessment of their property and identify opportunities for enhancing biodiversity values.

- ♦ Maintaining water quality thus increasing animal health and growth;
- ♦ Increasing soil moisture and thus crop yields and forage production;
- ♦ Reducing the spread of surface salts;
- ♦ Recycling nutrients through irrigation and forage production;
- ♦ Providing shelter crops and windbreaks as well as shelter for livestock; and,
- ♦ Provide opportunities for 'eco-sustainable' farm marketing.

Much of the information in this chapter can be found in an expanded form in the Canada-British Columbia [Environmental Farm Planning Reference Guide](#) and other associated guides. The Environmental Farm Planning Program is delivered in B.C. by the B.C. Agriculture Council. There are several chapters with specific information relating to farms and wetlands, including [Stewardship Areas](#), [Water](#), and [Biodiversity](#).



Farms and wildlife can co-exist well. Sign, Alaskan National Wildlife Area.  
PHOTO: ROBERT COX

### BETTER RIPARIAN, BETTER FARMING

A farmer in Saanich's Blenkinsop Valley worked with an aquatic ecologist to move a stream that has become a drainage ditch (bisecting the field and making it hard to work) to the edge of the field. Part of this work involved restoration of the stream and its riparian area. The obvious benefit to the farmer was the reclamation of usable land. Less obvious, but equally significant, was a reduction in pesticide costs. This occurred because the restored riparian area created habitat for birds and other wildlife, which naturally took care of the insect population—and dramatically reduced the need for synthetic pesticides. The cost savings from pesticide reduction alone paid for the restoration work, but there were many other benefits to the farmer, the local environment, and the local residents, including improved water quality, reduction in downstream flooding, and a recreational trail. (Aqua-Tex Scientific Consulting Ltd. and Asset Strategies, pers. comm.) (*Note that the Water Act requires an approval for these types of works.*)



All B.C. legislation can be found at <http://www.bclaws.ca/>.  
Federal legislation can be found at <http://laws.justice.gc.ca/>.

## 3.2. LEGISLATION

See [CHAPTER 2](#) for legislation that applies to all land managers. Legislation that applies to agricultural land includes the following.

- ♦ [\*Environmental Management Act\*](#): Several regulations under this Act apply to farms.
  - ◇ [\*Agricultural Waste Control Regulation\*](#): Establishes the Code of Agricultural Practice for Waste Management which sets out requirements for using, storing and managing agricultural waste in a manner that does not cause pollution.
  - ◇ [\*Code of Practice for Soil Amendments\*](#): Provides consistent provincial requirements for use of industrial residues for use as soil amendments and protects surface and groundwater from contamination.
  - ◇ [\*Organic Matter Recycling Regulation\*](#): Provides guidance for compost and bio-solid producers to protect soil and water; governs facilities, distribution and sales and land application.
- ♦ [\*Farm Practices Protection \(Right to Farm\) Act\*](#): Permits farmers to carry out farming operations using normal farm practices relating to nuisances from dust, noise etc., but requires farmers to comply with other specified legislation. Defines farm operations as including clearing, draining, irrigating, or cultivating land.
- ♦ [\*Integrated Pest Management Act\*](#): Establishes conditions for the sale and use of pesticides, pesticide classification, licensing, certification and permitting as well as the development of Pest Management Plans.
- ♦ [\*Water Act\*](#): The primary provincial statute regulating water resources in B.C. Establishes licensing requirements including fees and through regulation manages changes in and about a stream. ('Stream' includes wetlands.)
- ♦ [\*Agricultural Land Commission Act\*](#): Outlines the use of land in the Agricultural Land Reserve (ALR) and relationships with local governments.
- ♦ [\*Agricultural Land Reserve use, subdivision and procedure regulation\*](#): Defines farm uses that may be regulated but not prohibited by local governments, including land development works such as clearing, levelling, draining, berming, and irrigating land.



### 3.3. OBJECTIVES

As outlined in [CHAPTER 2](#), there are three major objectives for the protection and management of wetlands:

- ♦ Protect and maintain water quantities
- ♦ Protect and maintain water qualities
- ♦ Protect and maintain habitats and species

This can be achieved by:

- ♦ Knowing what you have (inventory and mapping) (see [CHAPTER 2](#))
- ♦ Protecting wetlands with buffer zones
- ♦ Minimizing impacts from external activities, such as agriculture

Following the guidelines in this document will help landowners and land managers demonstrate that they have applied due diligence. Monitoring the impacts of activities will assist in meeting the objectives. For more information, see [CHAPTER 12: MONITORING AND REPORTING](#).



Red winged blackbird. PHOTO: ROBERT COX



## 3.4. GUIDELINES

### 3.4.1. Wetland Buffers

Riparian areas and adjacent buffers are important in filtering out sediments, nutrients and chemicals before they enter the wetland. Properly functioning riparian areas prevent erosion by maintaining bank stability and also provide valuable wildlife habitat and food and shelter for livestock. See [CHAPTER 2](#) for more discussion of buffers, and the Environmental Farm Plan Reference Guide, [Chapter 7: Stewardship Areas](#).

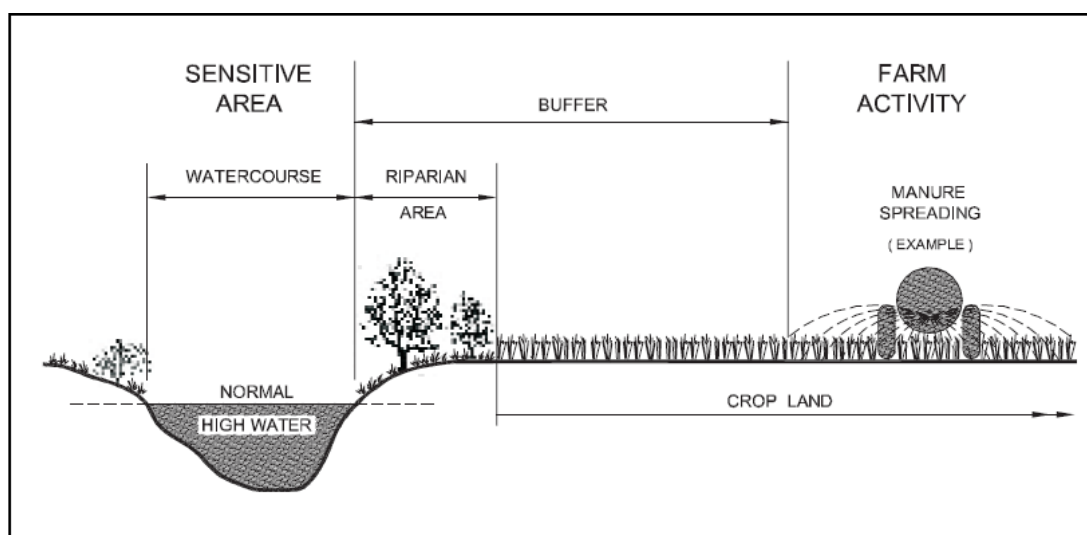
Primary environmental concerns related to ineffective buffers are:

- ♦ contaminated runoff reaching a watercourse
- ♦ pesticide drift causing air, water, or soil pollution
- ♦ soil erosion by wind or water
- ♦ weed, insect, or disease pest invasions
- ♦ disturbances of wildlife at crucial times of the year

#### DETERMINE THE APPROPRIATE BUFFER WIDTH

See [CHAPTER 2](#) for a discussion of buffers and determining buffer width.

Figure 1: Relationship between buffers and riparian area<sup>2</sup>



<sup>2</sup> From Environmental Farm Planning Reference Guide. Section 7. Stewardship Areas.





Required buffer widths and composition are a function of:

- ♦ the pollution or nuisance potential of a given farm activity
- ♦ the effectiveness of the vegetation to reduce pollution or nuisance
- ♦ the time of year an activity is occurring
- ♦ the sensitivity of an area to be protected
- ♦ the soil, topographic and climatic conditions associated with a site

Buffers may be a continuation of a forage field, a separately managed grass area, a planted belt of trees and shrubs, a riparian area along a watercourse, or a combination of the above. When the risk of contaminated runoff flow is high due to conditions such as high rainfall, reduced plant growth, or frozen soil, buffer width and filtering capacity will need to be increased.

Since there are no accepted formulas to determine minimum buffer widths for specific functions, it is best to experiment with varying widths while monitoring effectiveness.

#### **SELECT APPROPRIATE SPECIES FOR VEGETATED BUFFERS**

- ☐ Locate vegetated filter strips on slopes of less than 5%. Filter strips are ineffective on slopes greater than 15%. Filter strips are less effective when plants are not actively growing and taking up nutrients. Vegetated filter strips are areas of grass or other vegetation used to trap or filter sediment, nutrients, pesticides and other pollutants from overland water flows.
- ☐ Select plant species for the following qualities
  - ♦ enhance beneficial insects
  - ♦ non-weedy or non-invasive
  - ♦ not be hosts for pests or diseases which could affect riparian vegetation or adjacent crops
  - ♦ able to be managed (e.g., by pruning, weed control)
  - ♦ have a potential for economic return (e.g., harvest of forage or cuttings) where harvesting does not impact buffer effectiveness

#### **PREVENT RIPARIAN IMPACTS**

- ☐ Minimize impacts and disturbance to riparian vegetation, bank stability and water quality by
  - ♦ eliminating or minimizing equipment operation
  - ♦ limiting intensive crop production

The Alberta "Cows and Fish" program has prepared a workbook on *Riparian Health Assessment for Lakes, Sloughs and Wetlands*. This includes information on how to do the assessment, and why this information is important to farmers.  
<http://www.cowsandfish.org/pdfs/LakeswetlandFieldWkbk2005.pdf>





- ◇ keeping land clearing and development away from riparian vegetation

### MONITOR THE BUFFER ZONE

Ongoing monitoring should be carried out to ensure that a buffer is accomplishing its intended objectives.

- ☐ Check buffers regularly to ensure that the contaminant or nuisance factor is not reaching sensitive areas. If a buffer is not providing adequate protection of a sensitive area, alter the buffer and/or the farm activity causing the impact.

Water Conservation Fact Sheets are available at the B.C. Ministry of Agriculture and Lands website at: <http://www.al.gov.bc.ca/res/mgmt/publist/Environment.htm>

Reducing water use also benefits farmers. With climate change concerns, limited water supplies and increasing demand, use and conservation of water is critical. Wise use of water can enhance water availability as well as reduce licensing and pumping. For more information see [Living Water Smart](#).

## 3.4.2. Water Use and Conservation

Agricultural activities are the largest water users in B.C. (approx 70% of licenced water usage). Reduced pressure on water supplies will help to maintain groundwater levels critical for wetland function.



Reducing water use benefits farmers. PHOTO: SARMA LIEPENS



## Surface Water

Water resources in B.C. are owned by the Province and are managed under the [Water Act](#). Diversion and use of surface water or springs for agriculture or other purposes requires a [licence](#) from the Ministry of Environment, Water Stewardship Division.

- ☐ Ensure that you have a licence to divert and use water.
- ☐ Only use the amount of water that you are licenced for—overuse can impact downstream wetlands and other water users.

## MAINTAIN WETLAND WATER LEVELS

Maintenance of wetland water levels is critical for maintaining habitats and for species that rely on natural flood/dry cycles for breeding, rearing and other life cycle requirements. Flood control and downstream base flows can also be affected.

- ☐ When pumping from wetlands, ensure that water levels remain sufficient to maintain ecological and hydrological functions. See [CHAPTER 1](#) for impacts of reduced water levels. Be particularly vigilant during critically dry periods such as late summer and early fall or during drought conditions.
- ☐ Maintain water levels in vernal (seasonal) ponds, especially during the critical breeding and rearing seasons (springtime).
- ☐ Where springs are used to supply water, ensure that diversion of water will not cut off critical water supplies to adjacent wetlands or streams. Note that use of water from springs requires a water licence.
- ☐ Maintain seasonally flooded areas as much as possible. These areas provide valuable resting and forage areas for waterfowl and breeding areas for amphibians and other species.

### SEASONALLY FLOODED FIELDS

Seasonally flooded agricultural fields are lands that have been modified for agricultural use, but have important wildlife habitat value during specific times of the year. They are often former wetlands, and in many cases, are located adjacent to surviving wetlands such as marshes, swamps, and wet meadows. These ecosystems provide surrogate wetland habitat for wildlife. For example, in southwest B.C. these fields provide an important area for migration stops and overwintering grounds for birds and waterfowl along the Pacific Flyway. For more information see

[http://www.env.gov.bc.ca/sei/van\\_gulf/flooded.html](http://www.env.gov.bc.ca/sei/van_gulf/flooded.html).



Seasonally flooded fields provide wetland values.  
PHOTO: JUDITH CULLINGTON



Minimize water use. PHOTO: SARMA LIEPENS

#### MINIMIZE WATER USAGE

- ☐ Protect wetland water levels by using the most efficient water delivery system to reduce drawdown. Ensure that systems are properly maintained to prevent leakage.
- ☐ Avoid excessive watering that can lead to erosion and sedimentation and overland flow that can transport pesticides and fertilizers to watercourses.
- ☐ Install backflow prevention valves (irrigation systems, water storage tanks) to prevent source water contamination where wetland water supply systems are being used to deliver pesticides or fertilizers. For more information see the [B.C. Irrigation Management Guide](#).
- ☐ Install fish screens on water intakes to prevent fish entry. No screen guidelines have been developed for non-fish aquatic organisms—note that current screen sizing may not protect other species.

#### *Groundwater*

Wetland areas contribute to the recharge of groundwater resources. Some groundwater is directly connected to wetlands and streams and provides important base flows to aquatic resources during dry periods. Over-pumping or re-directing groundwater can significantly alter wetland hydrology. See [CHAPTER 2](#) (Section 2.4.5) for more information on groundwater management.





The Okanagan Water Board is currently developing groundwater BMPs which should be available later in 2009.

#### MINIMIZE GROUNDWATER USE

- ☐ Avoid withdrawing groundwater in quantities that would affect surface water flows to wetlands or impact subsurface recharge to wetlands, especially during summer dry periods.
- ☐ Monitor water tables regularly by measuring the static water level in wells at the same time of the year (note that some variations are normal). Where a persistent drop in water levels occurs, reduce consumption to sustainable levels.
- ☐ Discourage or minimize pumping from wells located near wetlands, especially during times of the year when watercourse levels are critically low. Of particular concern are wells whose water levels are sensitive to water withdrawal rates.

### 3.4.3. Runoff and Water Quality

#### *Drainage Systems*

Drainage structures such as ditches and sub-surface drains allow early access to flooded agricultural lands. Historically, drainage has allowed agricultural activity on former wetlands. Drainage management is also important as drainage structures can carry contaminated farm run-off to wetlands.

#### ENSURE DRAINAGE SYSTEMS ARE NOT ALLOWING NUTRIENTS OR CONTAMINANTS INTO WETLAND AREAS

- ☐ When planning drainage systems, consider potential impacts on the overall watershed drainage and water quality.
- ☐ Ensure contaminated drain water does not enter wetlands or streams. Install controlled drainage systems with the capacity to isolate and manage contaminated runoff.
- ☐ Carry out drainage system maintenance activities during low flow periods when risk of wetland contamination is minimized.
- ☐ Plant a vegetative filter strip along the channel to trap contaminants before they reach the drainage system.
- ☐ Improve subsurface drainage to reduce overland flow, which in turn can reduce the potential transport of contaminants, including pesticides, fertilizers and soil particles, to surface waters.
- ☐ Monitor the water quality in drainage system outlets particularly after a long dry spell and after manure has been applied. Where contaminants (manure, fertilizers, pesticides etc.) pose a pollution



risk, implement control measures such as containment and treatment prior to discharge.

- ☐ Where wetlands are spring-fed, install a grassed buffer or berm to prevent entry of farm runoff and direct spring flow away from contaminated farm areas.

### MANAGE SURFACE RUNOFF

If runoff water becomes polluted it must be managed as contaminated water. This typically entails considerable effort and expense, so it is preferable to prevent the creation of contaminated water in the first place.

- ☐ Where practical, collect contaminated water before allowing it to directly enter a wetland or stream by
  - ◇ sloping outdoor areas into a catchment basin
  - ◇ isolating and closing drainage systems and/or
  - ◇ diverting irrigation runoff to a reservoir for reuse



Pesticides can affect non-target species. PHOTO: SARMA LIEPENS

### Pesticides

Pesticides are any kind of material used to kill, control, or manage pests. Impacts from pesticides can be short term and sudden, or may occur at gradually at sub-lethal levels over an extended period. Even in small amounts pesticides can have significant effects on non-target species. Amphibians seem to be particularly susceptible to pesticides.

### MINIMIZE PESTICIDE USE

- ☐ In areas where there is a high risk of pesticides entering wetlands, try to select crops that require little or no pesticide application.
- ☐ Read and follow the label directions before applying any pesticide.
- ☐ Use selective or targeted rather than broad-spectrum pesticides and apply only the amounts required by the crop and specified on the label.

### BIRD LOSS DUE TO PESTICIDE USE

Birds are 100 times more sensitive than mammals to the common insecticide diazinon. Mass bird kills are poorly reported let alone broader, more dispersed impacts. For more information see Canadian Wildlife Service, 1998. Pesticides and Wild Birds.. <http://www.hww.ca/hww2.asp?pid=0&id=230&cid=4>




Use integrated pest management approaches.  
PHOTO: DAVE POLSTER

### USE INTEGRATED PEST MANAGEMENT (IPM) TECHNIQUES

Integrated Pest Management (IPM) is an approach or program that uses a combination of pest management techniques in an organized program to suppress pest populations in effective, economical and environmentally sound ways.

- ☐ Apply the following IPM process
  - ◇ Correctly identify the problem
  - ◇ Monitor pest populations and environmental conditions
  - ◇ Determine the unacceptable amount of damage, or injury level, for a particular pest
  - ◇ Determine the action or treatment level
  - ◇ Apply the appropriate the treatment(s): (biological, physical and mechanical, cultural or chemical controls). Where pesticides are used, choose for compatibility with IPM practices.
  - ◇ Evaluate the effectiveness of the pest management program. With follow-up monitoring to determine how successful the IPM program has been and identify where improvements should be made.

### APPLY PESTICIDES CAREFULLY

-  Don't store or mix pesticides in riparian areas or where potential spills may be transported to wetlands or streams.
- ☐ Apply pesticides well back from riparian areas and water bodies. Leave a 15 m buffer or no-spray zone strips between your treatment area and riparian and other sensitive habitats. Follow label requirements for buffer zones to sensitive habitats.
- ☐ Spray only when weather conditions (wind, rain) are not likely to cause drift or runoff into riparian areas.



Water sensitive paper is yellow and is stained blue by exposure to aqueous spray drops. These specially coated papers are used for monitoring spray coverage and droplet size.  
[http://www.dpi.nsw.gov.au/data/assets/pdf\\_file/0011/186392/spray-coverage.pdf](http://www.dpi.nsw.gov.au/data/assets/pdf_file/0011/186392/spray-coverage.pdf)

- ☐ Use the right equipment, properly maintained and calibrated, to prevent over-application and drift that might impact wetlands.
- ☐ Monitor spray distribution. Use techniques such as water-sensitive paper near riparian buffers and other sensitive areas.

#### AVOID AND MANAGE SPILLS

- ☐ Be prepared to handle spills by having a pesticide spill cleanup kit when transporting, storing or using pesticides.
- ☐ Be ready to act fast. If a pesticide spill occurs, proper cleaning and decontamination of the area may avoid environmental contamination. Prevent the spread of the pesticide into a wetland, stream, or sub-surface drain.
- ☐ Develop a contingency plan when storing any quantities of pesticides. The plan should provide a timely and effective response to any emergencies involving the release of pesticides into the environment.

#### PROPERLY STORE AND DISPOSE OF PESTICIDES

- ☐ Follow regulations and label directions when storing pesticides and locate the building away from yard drains, ditches, wells, and 15 m or more from wetlands and streams.



Apply pesticides carefully. This farm is part of the Pacific Coast Joint Venture Program to make the farm wildlife friendly.  
 PHOTO: ROBERT COX





## ***Fertilizers and Soil Conditioners***

Fertilizers, including soil conditioners, are materials that are added to the soil to provide nutrients required for plant growth or to improve the biological, chemical or physical nature of the soil.

Elevated levels of nitrates and phosphorus in water bodies stimulate algae growth which may result in toxic conditions later in the season. Leaching of nitrates into the groundwater may also increase groundwater pollution.

### **CONTROL RUNOFF**

- ☐ Stop application, or reduce the application rate, if runoff occurs because of site and weather conditions. Enlarge buffers to address persistent runoff events.

### **ESTABLISH SETBACKS**



Do not apply manure within:

- ◇ 3 m or more of a bank or a slope leading to a dry ditch or dry watercourse; or
- ◇ 5 m or more of a bank or a slope leading to wet ditch or wet watercourse.<sup>3</sup>

- ☐ Increase setbacks where risks for transport of contaminated runoff to wetland are higher. Consider:
  - ◇ Soil texture, porosity and moisture;
  - ◇ Soil cover conditions;
  - ◇ Slope toward a watercourse, particularly if slope exceeds 5%; and,
  - ◇ Sensitivity of the watercourse.



Do not apply manure to frozen or snow-covered land or to wet fields when tile drains are running, if manure can be carried with the melt water or drainage and contribute to wetland contamination.

- ☐ Ensure that sub-surface drainage systems are not transporting contaminated water to wetlands. Simple field test kits are available for sampling many common contaminants. Check with local suppliers such as scientific supply houses.




PHOTO: JUDITH CULLINGTON

<sup>3</sup> [Environmental Farm Planning Guide: Chapter 6. Soil Amendments](#)



## ***Fuel Management***

### **AVOID AND MANAGE FUEL SPILLS**

-  Do not fuel or service farm equipment within riparian areas or in an area where spills may readily enter a wetland.
- ☐ Minimize the possibility of contamination by providing secondary containment for fuel tanks and absorbent mats for water pumps located near wetlands. Even small quantities of petroleum products can cause extensive water pollution.
- ☐ Store bulk fuel in accordance with Fuel Handling regulations and guidelines. For more information see the [Farm Storage and Handling of Petroleum Products](#) Factsheet.

## ***Agricultural Waste Management***

Agricultural operations can be large generators of waste products. Prior to 'off-site disposal' of agricultural wastes all effort should be made to reduce the amount of waste generated; use or reuse wastes on-site where practical (manure, wash water) or recycle products (plastics) off-farm in an environmentally acceptable manner.

Improper handling, storage and spreading of manure can pollute surface and groundwater leading to oxygen depletion and harmful effects on fish and other aquatic organisms; nutrient enrichment (nitrates and phosphates) of water causing algal blooms and delivery of pathogenic organisms.

Manure contains about 75% of the nutrients fed to livestock, including nitrogen, phosphorus and potassium. Animals use only 25% of nutrients and excrete the rest.  
[http://www.gov.pe.ca/photos/original/af\\_bmp\\_wastemgt.pdf](http://www.gov.pe.ca/photos/original/af_bmp_wastemgt.pdf)

### **LOCATE WASTE MANAGEMENT FACILITIES IN APPROPRIATE AREAS**

- ☐ Plan the location of livestock facilities and manure storage to maximize the separation distance from wetlands, watercourses and wells. This is particularly important with earthen storages and where groundwater tables are shallow or where bedrock is located close to the surface.
- ☐ Locate facilities in areas that are not subject to flooding nor receive significant runoff. Locate in such a way that upslope water can be diverted away from the feeding area which will minimize the volume of contaminated water to contain.



Prevent contamination of surface water that enters wetland areas.  
PHOTO: CLARE DE LA SALLE, DUCKS UNLIMITED

### AVOID IMPACTS FROM WASTE MANAGEMENT FACILITIES

An indoor structure allows for convenient collection and containment of livestock manure and waste feed. However, inappropriate barn location, improper construction practices or improper management can contribute to pollution from wastes or leachate.

- ☐ Site manure storage facilities at least 15 m from watercourses, including wetlands, as specified in the Code of Agricultural Practice for Waste Management (Agricultural Waste Control Regulation) Environmental Management Act. [Agriculture Waste Control Regulation](#). Site specific conditions including slope and soil conditions may justify further separation.
- ☐ Keep clean roofwater (if collected) and surface water separated from contaminated drain water. Clean water may be directed to wetland areas if it will not adversely impact natural hydrological cycles.
- ☐ Collect and divert surface water runoff away from livestock and manure storage areas to prevent contamination of surface water that enters wetland areas. Appropriate choices could include perimeter ditches, grassed swales or waterways and dykes, depending on the nature of the site.
- ☐ Contain any manure storage or overflow to prevent it from being transported to wetlands or streams.
- ☐ Develop a contingency plan when storing any amount of manure. The plan should outline a timely and effective response to any emergencies involving the release of manure products into the environment.

### AVOID IMPACTS FROM CONFINED LIVESTOCK AREAS

Confined livestock areas (also called pens, yards, loafing areas, or exercise areas) are often used for short or longer periods of time to house, feed or water livestock, or give indoor-housed livestock fresh air and sunshine.



A large database of documents and factsheets on BMPs for the ranching industry are provided on the Ministry of Agriculture and Lands website.  
[http://www.agf.gov.bc.ca/re/smgmt/publist/Publ\\_List\\_Home.htm](http://www.agf.gov.bc.ca/re/smgmt/publist/Publ_List_Home.htm)

- ☐ Locate facilities away from yard drain inlets, ditches, wells and at least 30 m from a watercourse or high tide watermark, as specified in the [Code of Agricultural Practice for Waste Management](#) (Agricultural Waste Control Regulation of the *Environmental Management Act*).
- ☐ Establish and maintain buffers between the outdoor area and any wetland or watercourse that will keep wastes, or leachate from the wastes, from entering the water.
- ☐ Use hard surfaced yards rather than soil-based yards as they are easier to manage and do not create the same potential for water contamination. Site and maintain yards to adequately manage manure build-up and contaminated drainage.
- ☐ Provide off-site water (see [CHAPTER 4](#)) as watercourse access is not permitted from confined livestock areas.

#### AVOID IMPACTS FROM UNCONFINED LIVESTOCK AREAS

Unconfined livestock areas are used for crop production and for seasonal feeding of livestock. Most of the feed is brought to the site and manure nutrients do not exceed crop needs.

- ☐ Locate bedding and feeding areas away from wetlands and watercourses and site them so that contaminated runoff can be directed towards croplands or collected in holding ponds.
- ☐ Locate feeding areas at least 30 m from wetlands, watercourses or the high tide watermark, unless written permission has been obtained for a closer location from the B.C. Ministry of Environment.



Provide water away from wetlands. PHOTOS: JUDITH CULLINGTON



- ☐ Use an off-stream watering system to prevent damage to riparian areas and maintain shore and bank stability. Where an off-stream watering system is not feasible use fencing to limit access to the stream and install an erosion free surface at the access point. For more details on off-stream watering see [CHAPTER 4: GRAZING](#).

#### **AVOID IMPACTS FROM SILAGE STORAGE**

Silo seepage has extremely high biological oxygen demand (BOD) values (approx 200 times raw domestic sewage). Leakage into wetlands could cause significant loss of aquatic organisms. Silage leachate also contains potential groundwater contaminants such as nitrate-nitrogen, acids, minerals, and bacteria.

- ☐ Locate silage storage areas at least 15 m away from riparian areas.
- ☐ Choose a well-drained site not subject to seasonal water flow or flooding. Locate silage storage away from yard drain inlets, ditches and wells. Divert clean surface water away from the silage site.
- ☐ Divert potentially contaminated flows away from watercourses. Flows should be directed to a liquid storage facility such as a manure pit, or onto adjacent fields if it can be shown that contamination of groundwater will not occur.

#### **USE CONSTRUCTED TREATMENT PONDS**

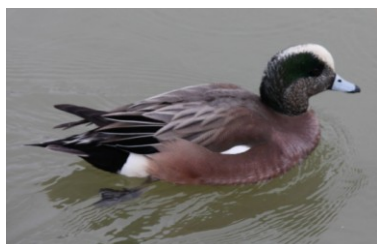


PHOTO: ROBERT COX

Treatment ponds or constructed wetlands are shallow human-made freshwater systems that can provide treatment for agriculture wastewater and runoff. They use biological, chemical and physical processes to breakdown, store or settle out contaminants. Common pollutants including suspended solids, nutrients, faecal coliforms and other pathogens as well as BOD and COD<sup>4</sup> can be reduced over 70% in a properly constructed artificial pond system.

Constructed wetlands may also provide some of the functions of natural wetlands depending on their location, inputs and management. [CHAPTER 11: ENHANCEMENT, RESTORATION AND CREATION](#) provides more details about created wetlands and wetland enhancement.

- ☐ Where practical, design the treatment pond to provide wetland features and functions including riparian vegetation. Constructed wetlands should be designed by a qualified engineer. They must be designed based on the input volume, the composition of the wastewater and the desired level of treatment. Pre-treatment settling

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<sup>4</sup> Chemical Oxygen Demand





and final discharge to a grassed waterway or final treatment pond provide best results and limit potential for pollution to 'downstream' watercourses.

- ☐ Maintain wetland vegetation and remove invasive species before they become established.

### 3.4.4. Erosion and Sedimentation

Cultivated fields may have insufficient vegetation and litter cover to reduce raindrop impact or slow runoff. When cultivation is too close to wetlands, the riparian vegetation will not be able to trap all sediments, fertilizers, pesticides, pathogens, or heavy metals before they reach the water.

#### CONTROL EROSION AND SEDIMENT

Sedimentation of wetlands can lead to a number of impacts to wetland habitats and species. Sedimentation can reduce plant growth by blocking sunlight, depress feeding rates in fish and other aquatic organisms by obscuring vision and cause species such as fish to abandon the area. Pesticide and other chemicals can cause short term distress and even death as well as longer term sub-lethal effects including reduced breeding and rearing success. These changes can lead to shifts in ecosystem functioning. Water quality for users such as livestock can also be impacted and wetland aesthetic values. Sedimentation can also affect downstream habitats, species and other water users.



Prevent erosion and sedimentation.  
PHOTO: DAVE POLSTER

- ☐ Maintain vegetated cover where possible.
- ☐ Maintain healthy, vegetated riparian areas combined with other site appropriate practices.
- ☐ Install grassed waterways. These are broad, shallow, saucer-shaped channels designed to move surface water across farmland without causing soil erosion. The vegetative cover in the waterway slows the water flow and protects the channel surface from rill and gully erosion.
- ☐ Make sure vegetated strips stay healthy and functioning. Re-seed as necessary and if using herbicides, avoid herbicide drift onto the vegetated buffer.
- ☐ Plant filter strips. These are usually grassed strips planted beside crops and situated in a location (e.g., cross slope) that helps trap fertilizers, pesticides and sediments from cultivated fields before they



can be transported into wetlands, streams or other waterways. These are often used in conjunction with grassed waterways.

- ☐ Plant cover crops. These work in a similar fashion to grassed waterways or filter strips to reduce runoff, soil erosion and nutrient leaching as well as providing mulch to reduce moisture loss.
- ☐ Where practical replace annual crops with perennial hay and forage next to riparian areas where soils are prone to wind and water erosion. This may also eliminate tillage problems in wet conditions
- ☐ Reduce the amount of summer fallow next to wetland and stream riparian areas to prevent soil erosion and reduce the amount of nutrients and sediments in runoff.
- ☐ Where practical use direct seeding, minimum and zero tillage to further decrease the risk of erosion and slow down runoff.
- ☐ Adjust cutting heights and timing around wetlands to increase the amount of crops or grass stubble left during periods of expected high runoff to increase sediment and nutrient trapping.

#### USE WATER AND SEDIMENT CONTROL BASINS

Water and sediment control basins are erosion control structures commonly installed to prevent bank and gully erosion on farmland. This structure is comprised of an earthen berm, constructed across a low draw in a field, and built to a height to pond the runoff water from the upstream area. These structures control erosion due to concentrated water flows and are not effective in combating sheet erosion.

- ☐ Install water and sediment control basins to manage surface water and sediment as appropriate. Consider installation in conjunction with other control measures such as grassed waterways and filter strips.



PHOTO: JUDITH CULLINGTON




**BUILDING SETBACK BYLAWS**

The B.C. Ministry of Agriculture and Lands, with B.C. Ministry of Environment and Fisheries and Oceans Canada are currently developing guidance to local governments on establishing building setbacks in local bylaws. The document “Agriculture Building Setbacks from Watercourses in Farming Areas” should be available in summer 2009.

### 3.4.5. Building Setbacks

Buildings and other structures can impact wetland functions by eliminating or damaging, riparian vegetation and increasing sediment and other contaminant delivery.

-  Avoid the construction of new buildings in riparian areas. Determine the appropriate riparian width to maintain wetland features and functions (see [CHAPTER 2](#), Section 2.4.2).
- ☐ Establish buffers between the riparian areas and buildings. Where new buildings must be within riparian areas, ensure that there is sufficient vegetated buffer to mitigate any run-off from the structure or service areas. Do not discharge stormwater directly to wetlands or streams.

### 3.4.6. Roads and Trails


Roads and trails can focus livestock activities on sensitive riparian areas by focussing animal movement. Roads and trails are also sources of sediment delivery to wetlands and construction and maintenance can impact riparian vegetation.

For information on minimizing impacts from road and trail building, see [CHAPTER 9: ROADS AND CORRIDORS](#).

**AVOID RIPARIAN AREAS**

- ☐ Locate roads and trails outside riparian areas.

**AVOID WETLAND ROAD CROSSINGS**

-  Avoid constructing road or trail crossings through wetlands. Where trails or roads must cross wetlands, ensure that livestock are excluded from accessing the wetland at crossing points. Minimize disturbance to riparian vegetation.
- ☐ Where crossings are planned for wetland inlet or outlet areas do not constrict the channel as this may affect the hydrological cycle including flooding, scour and dewatering.



- ☐ Ensure any structures are ‘fish friendly’ where necessary. Crossings, including culverts should not impede fish passage or negatively impact fish habitat.
- ☐ Immediately re-vegetate any disturbed areas with native vegetation to prevent erosion and sedimentation.

#### OBTAIN PROPER APPROVALS

- ☐ Read additional information background information on carrying out [changes in and about a stream](#) (which includes wetlands) as well as [A Users' Guide to Working in And Around Water](#).

#### MINIMIZE IMPACTS

- ☐ Carry out works during least risk windows for fish and wildlife. Works may require authorization under Section 9 of the *Water Act*. Regional information for your area is posted on the [B.C. Ministry of Environment website](#).

### 3.4.7. Invasive Species

Invasive species are non-native or ‘exotic’ introduced species that become established outside their normal range and adversely affect the habitats they invade. Some can spread quickly and widely and can cause harm to native ecosystems by out-competing or displacing native plants and animals. Trampling, overgrazing and erosion can leave wetland riparian areas susceptible to invasive species.

For information on managing invasive species in wetlands, see [CHAPTER 2: GENERAL GUIDELINES](#).

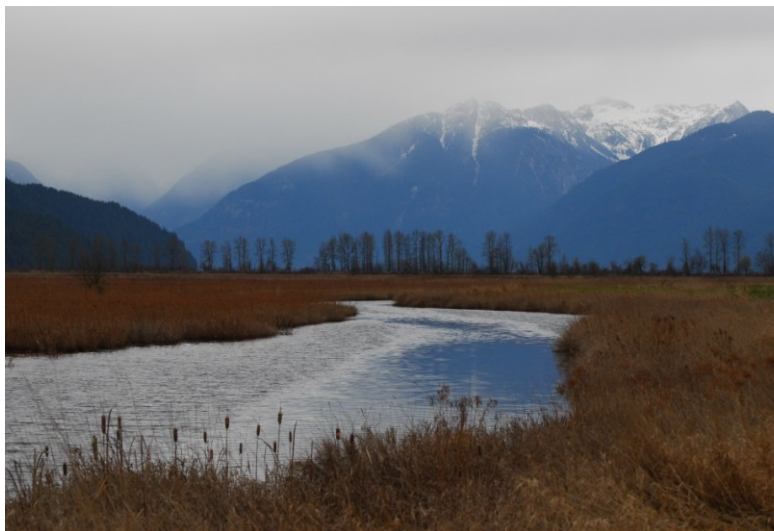


PHOTO: CLAIRE DE LA SALLE



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