

1 ABOUT THIS GUIDE

Drainage Management Planning

Important !

This guidebook provides information and guidance on conducting maintenance works in **constructed ditches**.

For works in channelized and natural streams, contact with DFO and WLAP is generally required. See Appendix B

Why is the Guide Needed?

This guidebook provides information on how to develop and implement an Agricultural Drainage Management Plan. Once developed the plan should provide guidance on the methods, timing, and agency contacts that are required to conduct maintenance works in watercourses around the farm. Determining the type of watercourses that are on your farm is an important first step. The process allows for maintenance works on constructed ditches to proceed with minimal agency contact providing that the timing windows and guidelines that are outlined in the management guide are followed. This process significantly reduces the need for approvals for maintenance of **Constructed Ditches** on farmland. The watercourse classification is based on channel structure and drainage. This makes it possible to determine the risk to fish and fish habitat and whether there's a need to contact Fisheries and Oceans Canada (DFO) before doing maintenance.

While the guidebook is primarily meant for agricultural producers, local governments involved in the maintenance of ditches (e.g., ARDSA channels in the Fraser Valley) may find the information useful for developing stewardship agreements with DFO for channel maintenance.

Good drainage improves the productivity of agricultural soils. Constructed ditches allow fields to be planted earlier in the spring, remove excess water that might retard the growth of crops, and dry up fields that normally would be too wet to support the weight of heavy farm machinery. In drier regions such as the BC Interior, agricultural producers may use constructed ditches to tap into streams or other natural water sources for irrigation.

Agricultural channels often need maintenance and repair due to excessive vegetation or sediment in the channel, sloughing of banks or the introduction of debris. Maintenance can extend the life of the ditch by restoring the ditch to its original profile or deepening or widening the original profile. However proper construction practices and protection of the riparian area of a these channels can go often prevent the need for regular maintenance.

Ditch maintenance can affect fisheries values. This guidebook provides the information you need to protect them. Effective stewardship of fisheries resources is everyone's responsibility and can only be achieved through co-operation and good communication.

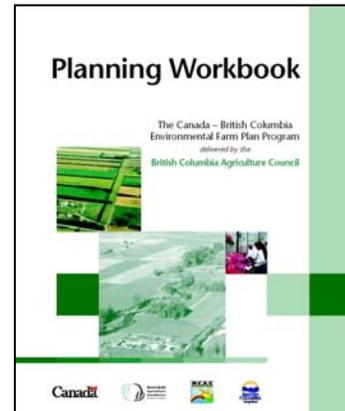
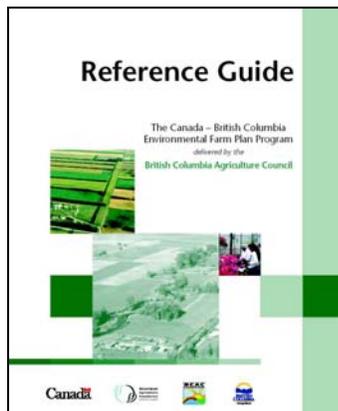
The guidebook applies to all of BC and recognizes that hydrology and drainage needs may vary considerably between the coast and interior. The timing of seasonal high flows differs between the north and south coast and between the coast and the interior. So does the timing of fish migrations. The guidebook takes these differences into account.

HOW DOES IT FIT WITH MY ENVIRONMENTAL FARM PLAN?

The **Environmental Farm Plan (EFP)** is a voluntary process to help producers identify areas where environmental improvements should occur on the farm. The **Canada - British Columbia Environmental Farm Plan: Reference Guide** provides information on various environmental laws and makes suggestions for environmentally sound practices. It is the primary reference for completing the worksheets in the **Canada - British Columbia Environmental Farm Plan: Planning Workbook**.

The EFP Planning Workbook asks some basic questions regarding drainage water quality and the maintenance of surface and subsurface drainage systems on your farm. If you have already completed an Environmental Farm Plan you may have identified action item or areas of improvement for your drainage systems. Developing a drainage management plan may improve the management and performance of the drainage systems on your farm.

This **Drainage Management Guide** is a companion document to the Environmental Farm Plan Reference Guide and Planning Workbook shown below. This guide can be used to develop the **Drainage Management Plan** identified in the EFP.



The steps outlined in this guide provide a process for determining contact and approval requirements for conducting maintenance work in and about watercourses on your farm. Municipalities and other drainage utilities can also use the steps outlined as part of preparing protocol agreements with agencies for maintenance of channels in agricultural areas.

SUPPORTING FACTSHEETS

The following factsheets are included in this guide and provide information on the process and the conditions and guidelines that should be followed when performing drainage maintenance and other works on **constructed ditches**. Factsheets 1- 4 provide guidance on the approval processes that must be followed depending on the type of channel and work to be done. Factsheets 5 – 18 provide information on the best management practices that must be followed. These factsheets provide useful information in the preparation of a Farm Drainage Management Plan. (If obtaining the factsheets separately the MAFF order number provided can be used.)

The factsheet in Appendix B is provided as reference only. It can be used to determine agency contact requirements for channelized and natural streams.

Appendix A Drainage Management Guide Factsheet Series

Factsheet	1	527.100-1	Federal Fisheries Act and Watercourse Maintenance
Factsheet	2	533.500-1	Agricultural Watercourse Classification
Factsheet	3	543.100-1	Agency Contact Requirements for Constructed Ditch Maintenance
Factsheet	4	543.000-2	Fishery Timing Windows for Maintenance Work in Constructed Ditches
Factsheet	5	543.100-2	Constructed Ditch Maintenance
Factsheet	6	533.530-1	New Ditch Construction
Factsheet	7	533.530-2	Filling in Constructed Ditches
Factsheet	8	641.300-1	Sediment Control
Factsheet	9	641.310-1	Sediment Traps
Factsheet	10	533.430-1	Ditch Bank Stabilization Techniques
Factsheet	11	533.440-1	Bank Re-vegetation for Agricultural Land
Factsheet	12	533.410-1	Rock Revetments for Constructed Ditches
Factsheet	13	533.431-1	Bio-Engineering Techniques
Factsheet	14	373.020-1	Bridge Construction
Factsheet	15	542.140-1	Culvert Installation in Constructed Ditches
Factsheet	16	543.110-1	Beaver Dam Management
Factsheet	17	527.110-1	Fish Salvage
Factsheet	18	527.200-1	Drainage Water Quality
Factsheet	19	060.000-1	Agency Contacts for Environmental Issues

Appendix B

Factsheet	20	543.000-1	Agency Contact Requirements for Channelized and Natural Streams
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Notification for Proposed Works and Changes In and About a Stream under Part 7 Regulation of the Water Act.

Fisheries and Oceans Canada – Project Review Information Requirements for Works Affecting Fish Habitat

Note:

The factsheets contained in this guide provide information and guidance for work on **Constructed Ditches** only. Best management practices and other information for channelized and natural streams must be obtained from DFO or LWBC or WLAP.

2 DRAINAGE ENVIRONMENTAL CONCERNS

The environmental concerns with respect to drainage are nutrient leaching, operation and maintenance of drainage systems, and drainage water quality.

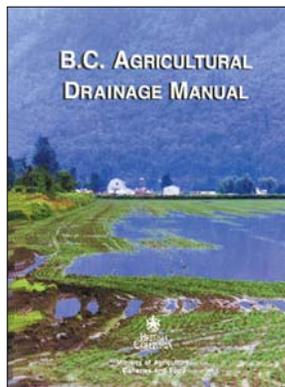
NUTRIENT LEACHING

Leaching of nutrients from the soil through the drainage system is a concern on some systems. Nutrient leaching can be reduced by installing a well designed system and operating it properly.

Plants with good drainage are better able to take up nutrients from the soil and water, reducing leaching of nutrients. A drainage system may consist of a combination of land grading improvements such as ditches and other watercourses, subsurface drainpipes and pumping systems. A well-designed system will improve the trafficability of soils, reduce the delay time for re-entry to fields after rainfall, and increase the growing season. A site-specific design produced by a qualified soil and drainage specialist is highly recommended to ensure that subsurface systems are matched to specific soil conditions and plant rooting requirements.

To improve drainage performance of farm ditches implement the following practices:

- design subsurface drainage systems for the specific soil conditions and plant rooting requirements
- grade cropped fields to eliminate low areas where water can pond (done in a manner that prevents soil degradation)
- install interceptor drains to reduce concentrated overland flow
- install permanent drop structures in ditches to allow water to flow gently without causing erosion
- do not use woodwaste as porous backfill around subsurface drains to prevent any potential for leachate to contaminate drainage discharge water
- follow the beneficial management practices outlined in the nutrient management section of the Environmental Farm Planning Program



- 📖 **B.C. Agricultural Drainage Manual**
- 📖 **Agriculture Drainage Criteria**

OPERATION AND MAINTENANCE OF DRAINAGE SYSTEMS

Watercourse Maintenance and Fish Habitat Protection

Using heavy equipment (often a necessity) for in-water work can kill fish and fish eggs as well as their food sources. Both in-water work and bank maintenance (e.g., removing sediments or cutting vegetation) can affect fish habitat by:

Removing habitat features.

Riparian and aquatic vegetation, bottom materials, and channel features such as pools and riffles all contribute to one or more habitat requirements of juvenile and adult fish that may inhabit constructed ditches. Grasses and shrubs along channel banks provide shade and nutrients for aquatic life. Removing these features can damage fish habitat.

Altering the channel.

Straightening, widening or smoothing out the bottom of a channel can reduce the quantity, quality and diversity of available habitat. Widening the channel can change water depth, may allow higher flows to pass downstream that can wash fish out of the system, disrupt pool formations, and increase bank erosion. Channel features such as riffles provide important habitats for aquatic insects on which fish feed. Although some aquatic insects and fish species can re-establish following channel alteration, the resulting community is rarely as diverse or robust as the community that existed before.

Reducing water quality.

Increased concentration of suspended sediment changes fish behaviour and their ability to find food, clogs their gills and affects their ability to resist parasites and disease. Increased sediment in the water column can be lethal to fish. Sediment released during maintenance activities can disrupt habitat by clogging gravels and infilling pools, side channels and riffle areas that are necessary for spawning and the development of juvenile fish. Water quality can be degraded in other ways, including the introduction of other deleterious substances such as petroleum products from machinery, excess nutrients from channel vegetation activities and adjacent runoff and bank sloughing during maintenance activities. Changes in water quality upstream can affect fish and fish habitat far downstream in other watercourses.

Removing vegetation.

Overhanging and bankside vegetation help keep the water cool in summer by blocking sunlight while insulating water from extreme temperatures during winter. Higher water temperatures are stressful to most fish, particularly salmon and trout, which prefer cold water. Fish also feed on terrestrial insects that drop into the water from vegetation along channel banks. Removing this vegetation can reduce or eliminate an important source of food for fish.

Fish habitat destroyed during maintenance work may take many years to recover. You can avoid or minimize damage by using the Fact Sheets in Part III, adhering to other BMP's noted within this document, and by timing the work so it doesn't coincide with crucial stages in fish life-cycles. Usually that means doing the work in the driest part of summer.

 **Fishery Timing Windows for Maintenance Work**

Subsurface Drainage Systems

Maintenance of subsurface drains and outlets is important for the benefits of drainage. If relying on a subsurface drain system to improve drainage and reduce surface flow as quickly as possible, any clogging of drains or obstruction of outlets will increase the potential for surface flows that could cause erosion or other environmental problems.

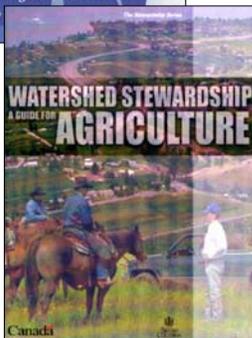
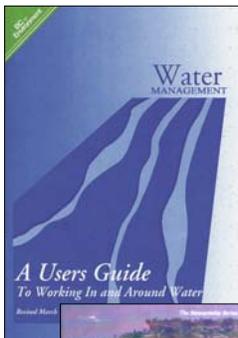
Discharge water quality is a concern with subsurface farm drainage systems. Where water quality is a concern, controlling the subsurface drainage discharge outlet allows the farmer to release drainage water at times that have lower impacts to the environment. (See drainage water quality).

Subsurface drainage systems can be designed and operated to control the water table level within desired ranges. A controlled outlet allows drainage water to be held back when drainage is not required. The subsurface drainage system can then act as a subsurface irrigation system reducing water requirements and recycling nutrients that would otherwise leach out with the drain water.

 **Controlled Drainage and Subirrigation**

 **Maintenance and Checking of Performance of Subsurface Drainage Systems**

Surface Drainage Systems



Effective drainage is only possible if the drainage outlet is maintained. Eventually all farm drainage systems rely on constructed ditches and other watercourses to convey water from the farm. Low gradient watercourses often block up with silt and vegetative growth. The concern with surface drainage systems are the maintenance practices employed to keep drainage conditions at their optimum. Improper maintenance practices can cause sediments to be transported into fish bearing watercourses downstream when maintenance work is done. Exposed banks may also erode causing additional sediments to enter watercourses.

To maintain drainage within constructed ditches in a free-flowing condition, the following practices are recommended:

- keep grades shallow to reduce erosion due to water scouring
- slope banks shallow enough to prevent slumping and erosion; sandy soils require shallower slopes than clay soils
- protect banks, particularly those in sandy soils, against erosion with crushed rock, gravel or effective permanent cover crops; grasses and shrubs provide better cover than broadleaf weeds and reduce spread of weeds
- conduct maintenance according to guidelines and only as needed
- establish vegetated buffer strips to filter sediments before they reach the banks
- use riparian plantings to increase shade and reduce in water weed growth
- in low gradient reaches use vegetative bank cover to prevent erosion

 **Watershed Stewardship for Agriculture**

Numerous steps can be taken to reduce the need for maintenance of constructed ditches such as:

- Prevention of field erosion by water or wind
- Reduce nutrients entering the watercourse to reduce algae and vegetative growth in the water
- Provide shade on the streams from the south and west to reduce vegetative growth in the ditch

DRAINAGE WATER QUALITY

Quality of drainage water entering constructed ditches and other watercourses can be degraded by surface contaminants (pesticides, fertilizers and raw animal wastes) reaching the drainage discharge through preferential flow pathways to drain tiles, by overland flow to surface ditches, by woodwaste leachate used in constructing the drainage system, and by erosion at drain outlets. Poor-quality drain water can be reduced or controlled by implementing the following practices:

- slope banks shallow enough to prevent slumping and erosion (See factsheet on Bank Stabilization)
- keep contaminants from entering the drainage system by storing them in proper facilities far enough away from drainage systems
- install a controlled drainage system with the capacity of isolating and managing contaminated stormwater or runoff
- leave or plant a vegetative strip along the watercourse to filter contaminants before reaching the drainage system



Controlled Drainage and Subirrigation



Drainage Water Quality - Factsheet 18 in this Guide



Guidelines to protect fish and fish habitat from treated wood used in aquatic environments in the Pacific Region.

Overland Flow

Do not release deleterious substances (i.e. substances toxic to fish and/or fish food organisms) or water containing deleterious substances into waters that fish use. The following practices are recommended:

ensure application rates for fertilizers and soil conditioners, pesticides, and other chemicals are appropriate to the site requirements and timing windows are adhered to

- apply chemicals in accordance with regulations and guidelines, and BMP's
- stop the source of contamination
- capture (or be able to stop ditch discharge) and recirculate if possible
- treat prior to discharge
- maintain a vegetated buffer strip to help capture contaminants from overland runoff

Woodwaste

Woodwaste, when exposed to water, can generate a leachate (liquid runoff) that is toxic to fish and other aquatic organisms. Drainage water containing woodwaste leachate cannot be released into a watercourse. Woodwaste piles must be properly stored, be covered to prevent leaching from rainfall and setback a minimum of 15 meters (suggested) from all watercourses. Do not use woodwaste as backfill for drain tiles. Woodwaste should not be used as a mulch for crops adjacent to a watercourse.

Drainage systems that have had woodwaste used as backfill should be monitored for leachate. If the woodwaste was recently installed determine if leachate in the drain water poses a pollution risk. If the system has been installed more than five years ago the amount of leachate may be significantly reduced.



Guidelines to protect fish and fish habitat from treated wood used in aquatic environments in the Pacific Region.

Monitoring

Monitor the water quality in drainage system outlets on a regular basis, particularly after a long dry spell and after manure or pesticides have been applied. The first flush from a rainfall after a dry spell is the best time to monitor. Monitoring should determine if contaminants such as nutrients, pesticides and pathogens are causing a pollution risk.

-  **Water Quality Evaluation of Agricultural Runoff in the Lower Fraser Valley**
-  **Drainage Water Quality - Factsheet 18 in this Guide**

Managing Drainage Water Quality

The best approach to managing the drainage water quality is to prevent drainage water from becoming contaminated in the first place. The BMP's to be followed have been explained earlier in this section.

If it is likely that drainage water leaving the farm will be contaminated with sediments, woodwaste, manure, pesticides or other deleterious substances the following steps could be considered:

For smaller amounts of water such as runoff from impervious surfaces, feeding areas or a milk house the drainage water may be diverted to a storage facility and applied to crop land when conditions are appropriate.

Constructed ditches can have a control structure and sump located at the downstream end that can block the flow if poor quality drainage water has entered the ditch. The sump can then be used to pump the water back onto the field at an appropriate time.

The sump at the end of a constructed ditch can also be used as a sediment trap and maintained as necessary.

If poor quality drainage water is entering the subsurface drainage system consider tying the drain lines into a collector pipe. A collector pipe will allow for the subsurface drainage system to be controlled with one valve. The valve can then be closed while farm operations such as manure or pesticide application are being done.

An example of a collector pipe layout is shown in Field 4, Figure 1.

3 DRAINAGE MANAGEMENT PLAN



A carefully prepared and implemented Drainage Management Plan will help alleviate environmental concerns with respect to drainage system operation and maintenance while ensuring that adequate field drainage is obtained to operate the farm. To be effective, a Drainage Management Plan should include the following information:

- a drawing that identifies the location and classification of all watercourses and wetlands
- channels that municipalities are responsible for maintaining
- a drawing that identifies the location of all drainage infrastructure such as pump locations, collector pipe outlets, drain tiles and sediment traps
- identifies groundwater spring sources of water
- location of settling ponds and other sediment control structure
- identifies channel reaches with gravel substrate
- determines what type of work needs to be done and when
- identify the equipment to be used and steps employed to prevent spills
- plans where sediment and other spoil material will be dumped or reused
- identify appropriate times for doing work
- agency contact numbers to obtain approvals

The benefit of preparing a Drainage Management Plan is that the agreed upon contact requirements in this guide will have been followed and many maintenance activities on constructed ditches can be done on the farm without contacting agencies. Without a plan, any watercourse maintenance work may require contact with DFO, WLAP or LWBC. An example drawing that should accompany the Drainage Management Plan is shown in Figure 1.

See the *Riparian Management Field Workbook* for information on riparian protection adjacent to constructed ditches

All steps outlined in Figure 2 must be completed prior to doing work.

This guide outlines a process that when followed allows a producer to do work on many constructed ditches with limited contact with the agencies. WLAP does not need to be contacted for any work on constructed ditches. The contact with DFO is reduced for constructed ditches depending on the type of work to be done, the timing for works and whether the ditch is wet or dry. The factsheets included in this guide provide information for constructed ditches that outline methods for doing works that will reduce impacts to both fish and fish habitat. See Factsheet 3 for the agency contact requirement for constructed ditches.

Some information in the factsheets may be also be useful for doing selected maintenance works in and about a channelized or natural stream but contact with agencies must be done first prior to doing any work in these channels. See Factsheet 20 for the agency contact requirements for channelized and natural streams.

The process for determining agency contact requirements for maintenance of a watercourse is outlined by following steps identified in this guide.

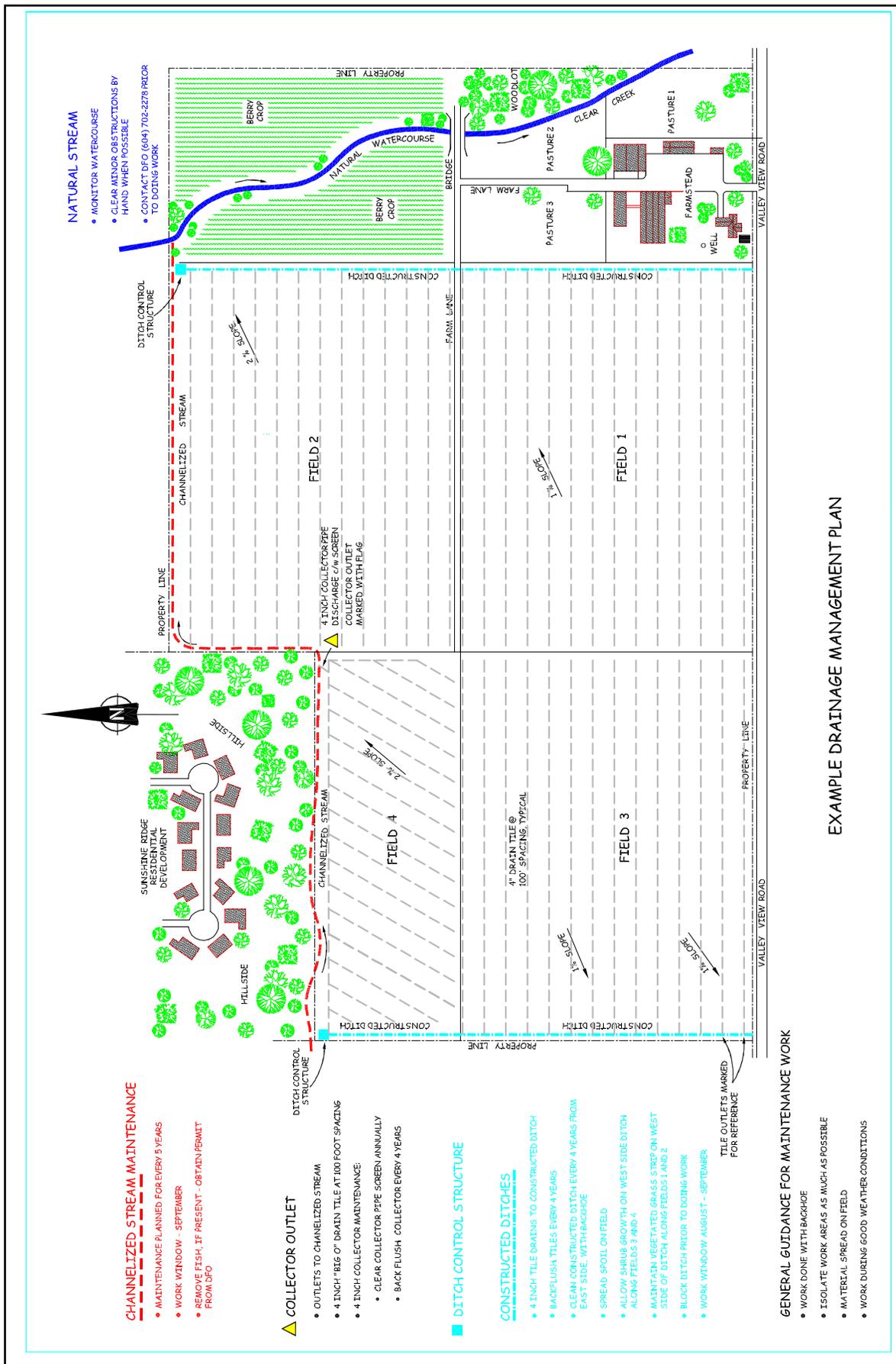
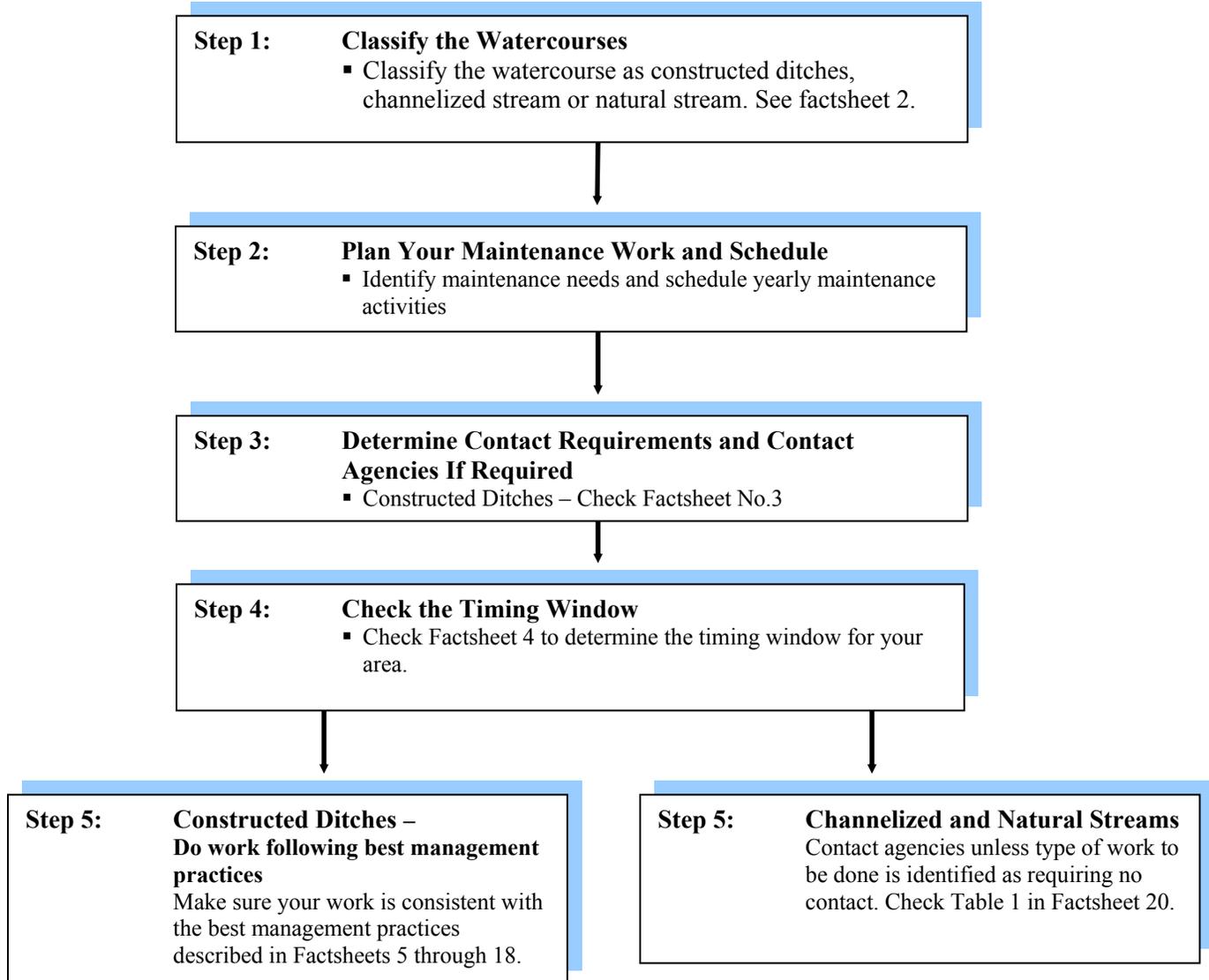


Figure 1 Example Drainage Management Plan Drawing

Steps to Developing a Drainage Management Plan



It is the responsibility of the proponent to ensure that works conducted in or about a watercourse do not:

- result in the harmful alteration, disruption or destruction of fish habitat (unless such impacts have been authorized by DFO);
- cause the deposit of a deleterious substance into waters frequented by fish; harm or kill fish;
- impede fish passage; or
- restrict flows to fish-bearing habitat downstream of the work site.

Figure 2 Steps to Preparing a Drainage Management Plan

STEP 1 CLASSIFY THE WATERCOURSES

The classification of a watercourse will help determine the risk to fish and fish habitat as well as contact requirements with agencies prior to doing any maintenance work in and about watercourses.

It is important to classify the watercourses correctly and to ensure that contact procedures are followed. Factsheet 2 in this guide provides information on the watercourse classification system. Figure 3 is a graphic representation of the watercourse classification used in agricultural areas. The same classification system is used in the Riparian Management Field Workbook and for building setback standards. The classification includes:

Natural streams: have not been significantly altered from their historical floodplain in any manner and have headwaters (usually from wetlands or springs).

Channelized streams: are permanent and/or relocated streams that may have been diverted, dredged, straightened and/or dyked.

Constructed ditches: convey drainage water from an individual farm or supply water to an individual farm property.

 **Agricultural Watercourse Classification - Factsheet No. 2 in this guide**

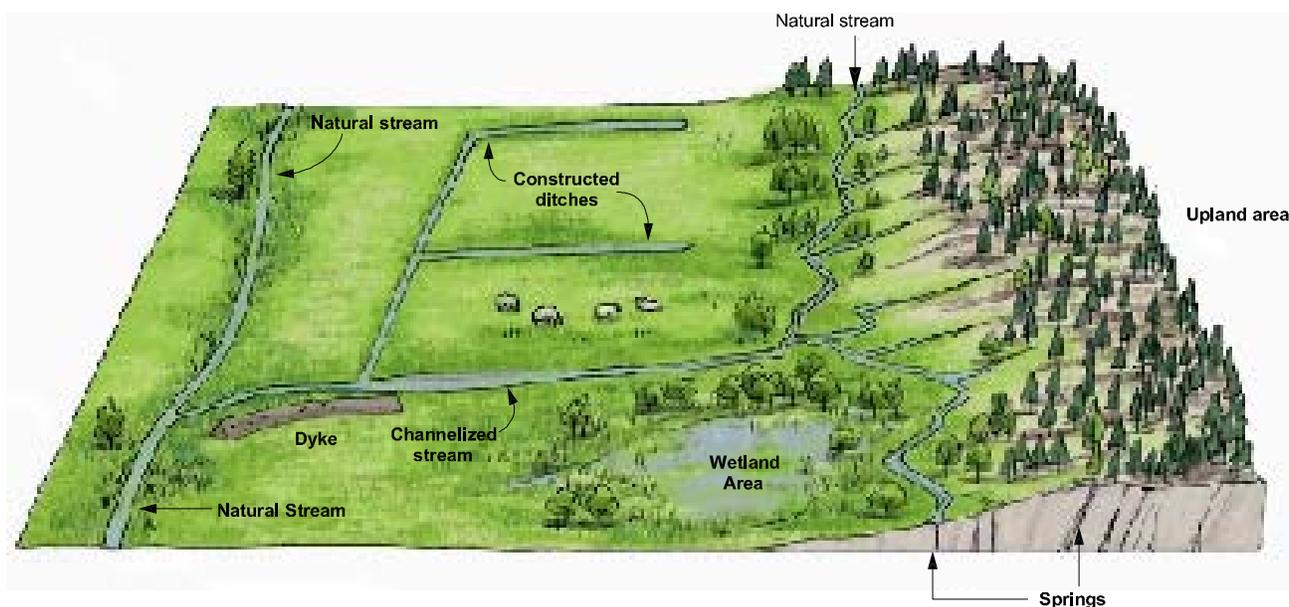


Figure 3 Watercourse Classification System

Wetlands

Wetlands should be identified and mapped on the Drainage Management Plan. Wetlands are “land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, water-tolerant vegetation, and various kinds of biological activity which are adapted to a wet environment”. (National Wetlands Working Group, 1988). Wetlands can be bogs, swamps, fens, floodplain side-channels, among others. These waterbodies are important to fish and wildlife, fulfil a number of important ecological functions and can be a benefit to farmers if used within a larger management plan for the farm. Some of the wetland functions include:

- providing habitat and refuge to fish
- storage and eventual release of surface water that may reduce flooding potential and property damage
- providing sustainable water for crops and livestock
- reducing contamination and improving water quality for fish and farm production
- retaining and filtering sediments which decrease the need for dredging and watercourse maintenance
- recharge of local and regional groundwater supplies
- reduction in peak floodwater flows
- and erosion prevention

Constructed Ditches

Constructed ditches:

- convey drainage water from an individual farm or supply irrigation water to an individual farm property
- may be permanently or intermittently wetted
- are not fed by springs
- include collector ditches that only drain other constructed ditches
- are not covered by the provincial *Water Act* but are covered by the federal *Fisheries Act*

Work on a constructed ditch when it is dry can be done at anytime providing the best management practices outlined in the factsheets are followed and discharge from the ditch is prevented from entering any other watercourse while work is being done. Care must be taken to dispose of dredged material in a manner to prevent it's entry into any watercourse.

Dry constructed ditches

A constructed ditch is classified as being dry when the bottom is dry. Constructed ditches that are dry for a portion of the year usually contain no aquatic vegetation but may contain fish during wet periods.



Constructed ditches that are normally dry can temporarily impound water for irrigation using a control structure. As long as these constructed ditches do not allow discharge to an adjoining watercourse while maintenance work is being done, and fish are not present within the ditch they can be maintained as though they are a dry ditch. If fish have access during the irrigation period, then the farmer must conduct a fish salvage program and notify DFO and WLAP for a permit prior to work being done.

Constructed ditches may also be blocked when dry to prevent fish access providing that:

- there are no fish in the constructed ditch upstream of the blockage
- there are no fish taking refuge in isolated pools
- a control gate or blockage will prevent fish from entering the ditch
- the work is done as soon as possible
- the fish barrier is removed when maintenance work has been completed and must be removed **no later than November 1st**.

Constructed ditches that have been blocked when dry to prevent fish access can:

- be maintained as though they are a dry constructed ditch even if they fill with water after being blocked
- benefit from an extended timing window to allow for maintenance work to be done later in the fall but no later than November 1st

Wet Constructed ditches

Wet constructed ditches have water in the bottom that may sustain fish and are wet all year round. In most cases fish have access to uncontrolled wet ditches. **If a constructed ditch intercepts groundwater sources (e.g a spring) then special circumstances may apply and the constructed ditch may be classified as a stream.** Groundwater provides constant cool water temperatures that provide refuge for salmonids during periods of high water temperatures. If any part of the constructed ditch is fed by groundwater, contact DFO (as per Appendix B requirements) before starting maintenance work.



Many diversion channels for irrigation in the BC interior are wet constructed ditches. If these channels end at an irrigation pump or other intake into an irrigation system they can be treated as though they are a dry ditch, providing that appropriate screening is in place to prevent fish from entering the channel. Diversion channels that contain fish must be maintained as a wet ditch. Maintenance work should be scheduled for the driest period to reduce impacts from sedimentation.

Factsheet 3 contains a table that outline what work can be done on a wet ditch without contacting agencies.

 **Agency Contact for Constructed Ditch Maintenance - Factsheet No. 3 in this Guide**

 **A Users Guide to Working in and Around Water**

New Ditch Construction

All new ditch construction should be blocked during construction to prevent fish access and to reduce downstream impacts from sedimentation.

 **New Ditch Construction - Factsheet No.6 in this Guide**

Channelized and Natural Streams



Channelized and natural streams are protected by the *BC Water Act* and the federal *Fisheries Act* protects fish and fish habitat in all watercourses, including wetlands used by fish. It is recognized that in some instances channelized and natural streams require maintenance to maintain hydraulic function and flow capacity for drainage purposes. Routine maintenance will require long term planning. Agency contact may be required for most maintenance work. **Step 3** of this guide and Factsheet No. 20 provide agency contact requirements for doing maintenance works in natural and channelized streams. Factsheet 2 provides additional characteristics and definitions of natural and channelized streams.

 **Agency Contact Requirements for Channelized and Natural Streams - Factsheet No.20 in this Guide**

 **Agricultural Watercourse Classification - Factsheet No. 2 in this guide**

Fish Presence

The agricultural watercourse classification system attempts to distinguish between watercourses in order to provide a level of risk management related to fish and fish habitat with less (constructed ditches or more (channelized and natural streams) natural or unaltered conditions). The distinction is based on physical and hydrological characteristics, not on the presence or absence of fish.

All watercourses without natural migration barriers (e.g. waterfalls) may contain fish, provide fish habitat, or flow into other watercourses that provide fish or fish habitat for all or part of the year. If you can't see fish in watercourses on or near your property, you still need to assume that fish are present. The *Fisheries Act* protects fish habitat for all species. This Guidebook provides information on how to do maintenance works that will result in the least possible disruption of fish habitat. Should more information be required, contact the local DFO Field Office for assistance.

Some fish species may be present only during certain seasons or for brief periods during the year. In addition, the *Fisheries Act* protects fish habitat not only in streams and constructed ditches but also in downstream water bodies. Fish are so sensitive to changes in water quality that their habitat can be affected miles downstream from some disturbances.

If it is determined that fish are present, fish salvage is required, as the fish must be temporarily removed and relocated from the area where you're working, in an approved manner. Appropriate persons with proper training will be required. A fish salvage permit from DFO for salmon and WLAP for other species under provincial jurisdiction is required prior to initiate maintenance work.

 **Fish Salvage - Factsheet No. 17 in this Guide**

STEP 2 PLAN YOUR MAINTENANCE WORK AND SCHEDULE

Fields prone to saturation or flooding during the growing season will have poor trafficability and most likely require improved drainage. Identifying the cause and initiating improvements to the drainage system will require an assessment of soils, crops, topography and watercourse and wetland hydrology.

 **B.C. Agricultural Drainage Manual**

Once a drainage system has been installed a maintenance schedule should be developed that takes into account:

- cropping rotation, so that maintenance work is done at a time that least impacts the crop
- fish and fish habitat values
- when fields are vulnerable to flooding and the proposed timing of works
- the amount of work to be done and the equipment required for the job
- the measures that can be taken to minimize maintenance requirements (e.g. erosion control, sediment traps, maintaining and planting vegetation buffers)
- how often the works need to be done
- measures that can be taken to reduce maintenance works
- opportunities to synchronize on farm maintenance with municipal works in your area

Maintenance needs should be reassessed each year to determine if the maintenance schedule that has been prepared is still appropriate and necessary.

For large amounts of maintenance works or large projects it is always a good idea to prepare a plan. Works in and about a natural and channelized watercourses will require contact with agencies. See Step 3 and Factsheet 20 in Appendix B. In some instances some work may be done without contacting agencies. Additional detail is provided in the factsheets.

STEP 3 DETERMINE CONTACT REQUIREMENTS AND CONTACT AGENCIES IF REQUIRED

How Does the Law Affect My Work ?

The *Water Act* applies to natural watercourses and sources of water supply but not constructed ditches. (See definitions for the definition of a stream under the *BC Water Act*). This guide provides some information related to portions of the *BC Water Act* as it pertains to channelized and natural streams in Appendix B. The *Fisheries Act* covers all watercourses including constructed ditches and wetlands on which fish depend either directly or indirectly.

The federal and provincial governments have shared but somewhat different responsibilities for the protection of fish, fish habitat, and water. They cooperate with one another and with associations of agricultural producers to try to ensure that regulatory impact requirements for maintenance activities are minimized as much as possible.

Canada Fisheries Act

DFO is responsible for enforcing the *Fisheries Act* by protecting fish, fish habitat and the quality of water that fish use. The *Act* defines fish habitat as “spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes” – in other words, all parts of the environment on which fish depend throughout their life cycles, including watercourses, wetlands and riparian areas along the banks. Some salmon migrate from the ocean as far as the foothills of the Rockies to spawn, and juvenile offspring returning to the ocean may move into constructed ditches, irrigation ditches and wetlands connected to streams during all or part of the year to access rearing habitat.

Under the *Fisheries Act*, you have to make sure that works conducted in or about a watercourse do not:

- harmfully alter, disrupt or destroy fish habitat (section 35);
- deposit or permit the deposit of a deleterious substance (e.g., sediment, manure) into waters frequented by fish (that fish use) or place the substance where it may enter any such water (section 36);
- harm or kill fish (section 32);
- block fish passage (e.g., with dams or improperly installed culverts) (section 20); or
- block flows to fish-bearing habitat downstream from the work site.

In addition, intakes for irrigation ditches must be protected with a fish guard, screen or netting to prevent fish from entering (section 30).

The greater the risk of harming fish habitat, the more likely it is that you'll have to get DFO approval before starting the work. When conducting certain works or any works in certain fish habitats, an Authorization under section 35 (2) of the *Fisheries Act* may be required. If you're not sure whether proposed works will have an impact on fish habitat, contact DFO for clarification (see Appendix B for contact information).

 **Federal Fisheries Act and Watercourse Maintenance - Factsheet No. 1 in this Guide**

B.C. Water Act The *Water Act* applies only to channelized and natural streams, not to constructed ditches. The *Water Act* defines a stream as “a natural watercourse or source of water supply, whether usually containing water or not, groundwater, and a lake, river creek, spring, ravine, swamp or gulch.” This means that you can do maintenance work on a constructed ditch without notifying WLAP or LWBC.

Notification under the BC Water Act

The main purpose of the *Water Act* is to protect water supplies for licensed users such as industry and public water suppliers. Section 9 of the *Water Act* along with the Water Act Part 7 Regulation regulates changes in or about a stream and ensures that water quality, riparian habitat, and the rights of water licensed water users are not compromised. Under the *Water Act* Regulation, you can carry out specified stream works (those that do not involve any diversion of water, are completed within a short period of time, and have little impact on the environment), provided that you first notify your regional WLAP office (Factsheet 19) and follow the regulation. The *Water Act* Regulation provides a complete list of those works that may be done with notification.

To check WLAP notification or LWBC approval requirements go to www.lwbc.bc.ca

Notification means that you don't need approval although WLAP may contact you if it has any questions or concerns about the proposed project. To determine what process you need to follow refer to Factsheets 3 and 20 of this guide. For more information contact your regional WLAP offices. Table 1 in the regulation summarizes the notification requirements.

Approval Under the BC Water Act

Works in and about a stream that are not covered under the Regulation may need an approval under the BC *Water Act*. Works that require a water diversion or have a potential to harm the environment may require a formal approval from Land and Water British Columbia (LWBC). LWBC is a Crown Corporation that administers the approval process.

Contacting Agencies

Once you've classified the watercourse, you need to follow the steps outlined in Figure 2 then determine whether you need to notify WLAP or obtain approval from LWBC and/or authorization under the *Fisheries Act* from DFO, or both agencies before you begin maintenance activities. Authorization requires formal written consent from DFO and may include conditions to ensure the work minimizes the risk to fish habitat and water quality.

Information on notification from WLAP and approvals from LWBC can be found at:

 www.lwbc.bc.ca

Information on DFO authorization can be found at:

 <http://www.dfo-mpo.gc.ca>

Constructed Ditches.

Factsheet No. 3 refers to constructed ditches and provides a table that outlines the contact that is required for wet constructed ditches. There is no need to notify WLAP or obtain an approval from LWBC for work on constructed ditches. You may need to contact DFO by using a Ditch Maintenance Form (DMF) to obtain authorization from DFO for some activities. In many cases work can be done by forwarding the Ditch Maintenance Form in Factsheet 3 to DFO 14 days prior to work being done.

 **Agency Contact for Constructed Ditch Maintenance - Factsheet No.3 in this Guide**

 **Fishery Timing Windows for Maintenance Work in Constructed Ditches - Factsheet No.4 in this Guide**

 **Constructed Ditch Maintenance - Factsheet No.5 in this Guide**

Proceed to Appendix B, Factsheet 20 if you are planning work in Channelized or Natural Streams

Channelized and Natural Streams.

Factsheet No. 20, Appendix B provides contact requirements, guidance and Best Management Practice information for channelized and natural streams. There are some maintenance works that can be done with minimal contact as outlined in Table 1 Factsheet 20. The table provides guidance on when notification to WLAP, approval from LWBC or authorization from DFO is required.

Wetlands are connected to streams, are fish habitat and are therefore considered as streams by DFO and WLAP.

 **Agency Contact Requirements for Channelized and Natural Streams - Appendix B - Factsheet No.20 in this Guide**

What Work Can I Do Without Contacting Agencies?

LWBC and WLAP do not need to be contacted for works on constructed ditches. Some works in constructed ditches can be done without prior contact with DFO. Check Factsheet 3. You do not need to contact DFO when there's little or no likelihood of harm to fish or fish habitat. This means:

- Any maintenance work in dry constructed ditches;
- Maintenance work in wet constructed ditches that have been blocked off to prevent fish access;
- Some maintenance works in wet constructed ditches (see Table in Factsheet 3) within allowable timing window and while following BMP's described in this guide;
- Maintenance of in-stream structures licensed under the *Water Act*; and
- Construction of a ditch that empties into another constructed ditch.

How to proceed:

- Check the Table in Factsheet 3 to see if the work you are planning requires agency contact.
- Follow the guidelines in the relevant factsheet for the work you are doing and the BMP's outlined in step 5.

If unsure whether the proposed works will affect fish or fish habitat, contact DFO for advice (see Factsheet 20). You do not need to contact LWBC for maintenance work on constructed ditches.

How Do I Contact DFO for Work in Constructed Ditches ?

You may need to notify DFO when you're doing work in wet constructed ditches.

How to proceed

- Check Table 1 in Factsheet 3 to see if you need to notify DFO using the Ditch Maintenance Form.
- If contact is required, copy the form from Factsheet 3.
- Complete the form and fax, mail or hand-deliver it to the DFO office responsible for your area. For contact information, see Factsheet 19.
- Make sure that the form reaches DFO a minimum of **14 days** before you plan to start the work.
- If you don't hear from DFO by the end of the 14-day period, you can start the proposed work in the wet constructed ditch during the approved timing window and following the guidelines that are relevant to your activity as described in the Factsheets that are a part of this guide. Please note that if fish are present, a fish salvage will be required. See Step 5.

Depending on the type of constructed ditch, the watercourse into which it empties, fish species present, length of the ditch to be cleaned, etc., DFO may have some concerns. DFO staff will then contact you within the 14-day period and provide advice on how to proceed.

How do I Obtain DFO Authorization When Required ?

You need DFO authorization for most works in channelized and natural streams, some works identified in Table 1 - Factsheet 3, and works in constructed ditches outside the Timing Window. Where work will result in the harmful alteration, disruption or destruction (HADD) of fish habitat, DFO authorization under the Fisheries Act is required and authorizes specific impacts on fish habitat and describes what you need to do to minimize the impact.

The harmful alteration, disruption or destruction of fish habitat is likely to occur when any of the following work is done:

- Removal of riparian vegetation, which provides an important source of insects for fish diets, woody debris for protection from predators, and shading to maintain suitable water temperature.
- Increased flow or introduction of sediment (a deleterious substance under the Act), which can impact fish directly or indirectly, and can smother fish spawning gravels (and incubating eggs or developing juvenile fish) and invertebrates that provide a food source for fish.
- Removal of in-stream vegetation, which provides fish shelter and food.
- Infilling of stream channel with debris or culverts, causing a loss of spawning substrates, living space and potential food supply.

How to proceed:

Check the Table in **Factsheet 3** for works in and about **constructed ditches**, to see whether you need to contact DFO prior to starting your project.

For works in and about channelized or natural streams proceed to Appendix B and refer to Factsheet 20.

 **Agency Contact Requirements for Channelized and Natural Streams - Appendix B - Factsheet No.20 in this Guide**

To obtain DFO project review and authorization, if required, you must submit a written proposal that provides the following information:

- proponent information
- project title
- location of works
- agent name
- environmental monitor
- proposed start and finish dates
- notification to WLAP?
- tenure of the land and any restrictive covenants
- written project rationale
- description of proposed activities
- description of fish and fish habitat
- fish habitat impact assessment
- mitigation proposed
- habitat compensation plans
- maps
- photographs
- signature and date

 **Project Review Information Requirements for Works Affecting Fish Habitat - Appendix B**

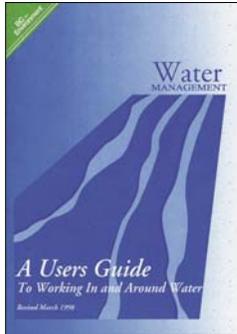
If you need assistance filling in the details, consider hiring an environmental consultant to help develop your project proposal, determine the fish and species present and conduct fish salvage if fish are present. A provincial permit is required to salvage fish in freshwater. (Environmental consultants are usually listed in the Yellow Pages of the phone book).

To allow DFO adequate time to process the application (including conducting a site visit to assess the proposed works, if necessary) prior to the Timing Window, you should submit the proposal well in advance of the planned work, and preferably by May 1 of the year you plan to do it. One of the advantages of a protocol agreement or long-term plan is that you may be able to obtain multi-year approvals for longer terms so you don't need to apply every year.

If DFO concludes that the risk of harm to fish or their habitat is too great or unknown, it may withhold approval until more information is obtained or more consultation is done to ensure the proposed works minimize the risk to fish habitat and water quality.

 **Project Review Information Requirements for Works Affecting Fish Habitat**

When Do I Need to Notify WLAP or Obtain Approval from LWBC ?



The *Water Act* regulations allow for written **notification** to the Ministry of Water Land and Air Protection (WLAP) for some works in and about channelized and natural streams where:

- diversion of water is not required;
- the work may be completed within a short period of time; and
- the work has little impact on the environment.

With notification to WLAP, some of the works allowed to be done under the Regulation includes:

- Installation, maintenance or removal of stream culverts, clear span bridges, fences, or pipeline crossings
- Removal of beaver dams
- Repair or maintenance of dykes and of vegetation by annual cutting.

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LWBC **approval** is required for all activities on channelized and natural streams that are not listed in the *Water Act* regulations.

How to proceed:

- Check the Table in Factsheet 20 to see if you need to notify WLAP or obtain approval from LWBC about the proposed project.
- If so, notify your regional WLAP office (See Factsheet 20) at least 45 days before the start of the proposed activity.
- If required obtain an approval form from regional LWBC offices or check Appendix B. Completed applications should be submitted by May 1 so they can be processed well in advance of the timing window for work to be done.
- If there are fish in the stream, obtain fish salvage permit from DFO and WLAP before beginning work and then conduct salvage operations.

The WLAP habitat officer will review the notification form and may set conditions which must be followed in carrying out the work. If you haven't heard back from them within 45 days, you can proceed with the work.

LWBC staff will do a technical review of your approval application and forward a set of conditions for the works if approval is to be granted. The works cannot proceed until an Approval document has been issued.

How Far in Advance Should I Contact DFO LWBC or WLAP ?

If you need to contact DFO, LWBC or WLAP, do so as early as possible before your planned dates of work in order to avoid delays. For work in Timing Windows outlined in this guide make sure the agency gets the information it needs *at least*:

- 14 days in advance for DFO notification using a Ditch Maintenance Form
- 45 days in advance for WLAP notification
- by May 1 for LWBC approval
- by May 1 for DFO authorization
- 14 days in advance for a DFO fish salvage permit

STEP 4 CHECK THE TIMING WINDOW

The sensitivity of fish to habitat disturbance varies according to different stages in their life-cycles. For salmonids (salmon and trout), for instance, the most sensitive stages are during up-stream migration, spawning, and rearing of juveniles. The time of year when fish are most sensitive to disturbance may vary by watershed and region.

To ensure that the impact of ditch maintenance on fisheries values is minimized DFO and WLAP have developed Timing Windows for various regions of the province. See Factsheet 4, *Fishery Timing Windows for Maintenance Work*. If you need additional information, contact DFO or WLAP (see contact information in Factsheet 19).

If you are unable to complete ditch maintenance work during the Timing Window, DFO will consider granting an extension depending on weather conditions, habitat type or function and fish use, including migration timing of adult salmonids.

 **Timing Windows for Agricultural Watercourse Maintenance - Factsheet No.4 in this Guide**

STEP 5 USE BEST MANAGEMENT PRACTICES

For constructed ditches, this Drainage Management Guide provides the information on best practices that can be used. Work must be consistent with the guidelines provided in the Factsheets included in this Drainage Management Guide. The Factsheets describe ways to prevent and reduce impacts on fish and fish habitat. It is everyone's responsibility to avoid damage to fish habitat or water. Anyone doing maintenance work is responsible for assessing each situation and ensuring compliance with *Fisheries Act* requirements.

The Ministry of Water, Land and Air Protection has prepared a guide ***Standards and Best Practices for Instream Work*** that provides information to ensure that proposed works in and around natural and channelized streams are carried out in compliance with various legislation, regulations and policies. The guide provides advice on best management practices to minimize environmental impacts of instream work. The guide can be found on the web site. See the references section on the next page.

Factsheets in this series that provide information on conditions and guidelines for doing maintenance work and other activities in and about watercourses are shown below.

Best Management Practices Information

Drainage Management Guide Factsheet Series	Title
Factsheet 5	Constructed Ditch Maintenance
Factsheet 6	New Ditch Construction
Factsheet 7	Filling in Constructed Ditches
Factsheet 8	Sediment Control
Factsheet 9	Sediment Traps
Factsheet 10	Ditch Bank Stabilization Techniques
Factsheet 11	Bank Re-vegetation for Agricultural Land
Factsheet 12	Rock Revetments for Constructed Ditches
Factsheet 13	Bio-Engineering Techniques
Factsheet 14	Bridge Construction
Factsheet 15	Culvert Installation in Constructed Ditches
Factsheet 16	Beaver Dam Management
Factsheet 17	Fish Salvage
Factsheet 18	Drainage Water Quality

4 DEFINITIONS AND REFERENCES

Definitions

BC Water Act Definition of Stream – “stream” includes a natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.

BMP – best management practices or guidelines

Controlled Drainage System - a drainage system where the outflow is controlled by a device that controls the effective depth of the system or prevents discharge of the drainage system to downstream watercourses.

Fisheries Act Section 34 (1) - "fish habitat" means spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Pool – A portion of a stream with reduced current velocity, often with water deeper than surrounding areas. A smooth relatively undisturbed surface that is frequently usable by fish for resting and cover. A pool can also be a small body of standing water.

Riffle – a shallow rapid where water flows swiftly over completely or partially submerged obstructions to produce surface disturbances, but where standing waves are absent.

Trafficability – a term used to describe sufficient soil strength to support traffic from machinery and/or livestock without compacting the soil beyond the point where water and roots have difficulty penetrating surface layers.

Watercourses – For the purposes of this guide watercourses refers to natural channels, channelized streams and constructed ditches.

References

The following references have been cited a number of times throughout the guide. The table provides web links to the information.

Title	Publisher	Material	Cost	Location
Agriculture Drainage Criteria	MAFF	Factsheet	-	http://www.agf.gov.bc.ca/resmgmt/publ ist/Water.htm
A Users Guide to Working in and Around Water	MWLAP			http://www.lwbc.bc.ca/03water/licencin g/docs/working_around_water.pdf
BC Agricultural Drainage Manual	MAFF	Publication	\$10.00	Irrigation Industry Association of BC www.irrigationbc.com
Controlled Drainage and Subirrigation	MAFF	Factsheet	-	http://www.agf.gov.bc.ca/resmgmt/publ ist/Water.htm
Fisheries and Habitat Policy Information				http://www.dfo-mpo.gc.ca/canwaters- eauxcan/inforcentre/legislation- lois/policies/fhm-policy/index_e.asp
Guidelines to Protect Fish and Fish Habitat from Treated Wood Used in Aquatic Environments in the Pacific Region	DFO	Factsheet		http://www-heb.pac.dfo- mpo.gc.ca/publications/publications_e. htm
Maintenance Checking of Performance of Subsurface Drainage Systems	MAFF	Factsheet	-	http://www.agf.gov.bc.ca/resmgmt/publ ist/Water.htm
Standards and Best Practices for Instream Works	MWLAP	Guide		http://wlapwww.gov.bc.ca/sry/interim_i sw_standards_&_best_practices_march 03.pdf
Project Review Information Requirements for Works Affecting Fish Habitat	DFO			http://www-heb.pac.dfo- mpo.gc.ca/publications/publications_e. htm
Watershed Stewardship For Agriculture	DFO			http://www-heb.pac.dfo- mpo.gc.ca/publications/publications_e.h tm

Literature Cited

The following list provides related information that may be useful.

A User's Guide to Working In and Around Water: Understanding the Regulation under the British Columbia's Water Act. 2004.

- Text and glossary contains definitions of watercourses, streams and wetlands etc.

Land Development Guidelines for the Protection of Aquatic Habitat. 1992. Province of British Columbia and Department of Fisheries and Oceans.

- <http://www-heb.pac.dfo-mpo.gc.ca/publications/pdf/165353.pdf>
- This document is primarily directed towards urban and commercial developments, however, several of the definitions and guidelines can be applied to agricultural lands. Section 1 (pages 9-11) defines fish habitat and Section 2 (pages 15-22) recommends riparian area setbacks for various stream types.

Reference Guide: The Canada British Columbia Environmental Farm Plan Program. 2004. BC Ministry of Agriculture, Food and Fisheries Resource Management Branch.

- http://www.bcac.bc.ca/efp_documents.htm
- Chapter 7 (pages 143-156) defines and contains information on buffer and riparian area legislation and beneficial management practices.

Caring for the Green Zone: Riparian Areas and Grazing Management - 3rd Edition. 2003 Alberta: Cows and Fish Program.

- <http://www.cowsandfish.org/pdfs/greenzone3rd/greenzone3rd.pdf>
- Page 3 describes how to loosely delineate a riparian area, page 19 describes well-managed and poorly-managed riparian areas and page 20 describes the relationship between fish and riparian areas.

Establishing Fisheries Management and Reserve Zones in Settlement Areas of Coastal British Columbia. 1997. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2351.

- <http://www.dfo-mpo.gc.ca/Library/213234.pdf>
- This document describes how scientifically derived setbacks can be established by matching specific riparian habitat values with knowledge of fish use, species habitat requirements, local features and geomorphic and fluvial processes. Section 3 (pages 26-47) describes how to delineate a Fisheries Management Zone (FMZ).

Freshwater Intake End-of-Pipe Fish Screen Guideline. 1995 Fisheries and Oceans Canada.

- <http://www.dfo-mpo.gc.ca/Library/223669.pdf>
- Or see http://www-heb.pac.dfo-mpo.gc.ca/publications/publications_e.htm

Standards and Best Practices for Instream Works. 2004. BC Ministry of Water, Land and Air Protection.

- <http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf>
- Page 3 describes fish habitat.
- This document provides best management practices for various types of work that would be relevant in an agricultural setting, including stream crossings (pg. 40-51), stream channel maintenance (pg. 52-60), stream bank stabilization (pg. 61-71) and habitat enhancement and restoration (pg. 83-92).

Guidelines on Storage, Use & Disposal of Wood Residue for the Protection of Fish & Fish habitat in British Columbia. 1995. DOE/DFO FRAP Report 95-18 prepared by S. D. Liu, M. D. Nassichuk, and S. C. Samis. <http://www.rem.sfu.ca/FRAP/9518.pdf>

The Stewardship Series, available at: http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp

Stream Stewardship: A Guide for Planners and Developers. 1994. Province of British Columbia and Department of Fisheries and Oceans.

- Page 3 describes freshwater habitat requirements for fish production
- Pages 26-27 describes the approval process for projects affecting fish habitat.
- Page 29 describes leave areas and their importance to fish habitat.

Watershed Stewardship: A Guide for Agriculture. 1997. Province of British Columbia and Department of Fisheries and Oceans.

- This document introduces general stewardship practices for farms and is a general guide for all agricultural producers on how to identify watershed features and functions.

Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management. 1996. Province of British Columbia and Department of Fisheries and Oceans.

- This document defines aquatic environmentally sensitive areas (ESA) and describes the ecological principles that should be addressed when designing access plans near ESA's.
- This document is mainly targeted towards recreational access near aquatic areas; however, principles in this document can be extrapolated to include agricultural purposes.

Environmental Best Management Practices for Urban and Rural Land Development in British Columbia. 2004 Ministry of Water, Land and Air Protection.

<http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html>

Fish-stream Crossing Guidebook. March 2002 BC Ministry of Forests Province of British Columbia. Forest practices Code of BC Guidebook.

- Provides technical and process guidance, guidelines and BMPs for proper stream crossing design and installation on fish bearing streams. Developed by Province of BC, DFO, and Forest Industry.
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm>

Mapping Resources:

Various mapping resources prepared by federal, provincial, local and regional districts exist for many areas. These maps include information on streams, wetlands, habitat features, fish presence etc. A few of the mapping resources available include:

- Surrey Watercourse Classification Maps
- Langley Watercourse Classification Maps
- Delta Watersheds
- Fraser Valley Regional District Watercourse Mapping
- City of Chilliwack SHIM Survey
- Comox Valley Project Watershed
- Community Mapping Network