

The Handbook of  
Best Management  
Practices for  
Private Forest Land  
in British Columbia





## Mission

*To promote responsible forest stewardship  
on British Columbia's private forest lands;*

*to promote government policy which is fair,  
environmentally sound and fiscally responsible;*

*to protect the rights of private property owners  
and seek compensation if landowners' rights  
to manage are constrained by  
government policy;*

*to promote government policy that  
encourages investment on private forest lands,  
including incentives to grow trees.*



## Acknowledgements

This handbook was developed by the Private Forest Landowners Association (PFLA). In addition to reviewing technical information in British Columbia, a search of existing Best Management Practices initiatives throughout the world proved to be very rewarding. The PFLA would like to recognize the excellent work of these jurisdictions.

Since its inception, the PFLA has worked collaboratively with government agencies to improve resource management. This handbook is a product of the ongoing cooperation between landowners and government. We wish to express our gratitude to the Department of Fisheries and Oceans Canada, the Land Reserve Commission and the Ministry of Water, Land and Air Protection for their help.

Good forest management for multiple objectives requires a healthy partnership between forest owners, forest workers, suppliers, forest product buyers and neighbours. The PFLA salutes our forestry community partners and commits to developing and maintaining these partnerships into the future.

Copyright © 2001, Private Forest Landowners Association

Earlier edition © copyright 1997 Private Forest Landowners Association

ISBN 0-9689427-0-9

All rights reserved. No part of this handbook may be reproduced without written permission from the PFLA.

For questions or comments concerning the PFLA Best Management Practices Program or Handbook, please contact:

Private Forest Landowners Association  
 556 Herald Street, Victoria, BC V8W 1S6 Canada  
 Phone: (250) 381-7565  
 Fax: (250) 381-7409  
 Website: [www.pfla.bc.ca](http://www.pfla.bc.ca)  
 Email: [info@pfla.bc.ca](mailto:info@pfla.bc.ca)



## Table of Contents

Introduction .....	1
Environmental Policy .....	4
Key Public Values & Regulatory Requirements .....	5
Planning & Risk Assessment .....	6
Assessing Private & Public Values .....	6
Fish  .....	11
Licensed Water Supply Areas & Intakes  .....	14
Wildlife  .....	16
Forest Establishment  .....	17
Effective Management of Key Public Environmental Values .....	18
Best Management Practices .....	20
Roads, Stream Crossings & Water Management  .....	21
Timber Harvesting  .....	31
Hazardous Substances  .....	39
Site Rehabilitation & Preparation  .....	40
Reforestation  .....	42
Fire Prevention & Management  .....	44
Monitoring & Auditing .....	47
Performance Assurance & the PFLA .....	49
Glossary .....	53
Further Reading .....	58
Appendix .....	



# Introduction

## Private Forest Land

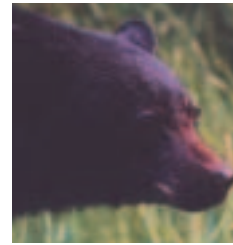
Private forest land covers over 2 million hectares of British Columbia (B.C.) and provides its owners and the public with many economic, social and environmental benefits. It sustains forest resource employment, fibre supply, tax revenues, recreation, water, fish and wildlife. There are an estimated 20,000 private forest owners in British Columbia. More than 9,000 employees work directly in B.C.'s private forest land sector. 18,000 jobs are created in spin-off activities. The harvest from B.C.'s private forest lands averages about 10 percent of the total volume of timber harvested in the province each year.

## Private Forest Landowners Association

The Private Forest Landowners Association (PFLA) represents the owners of approximately 860,000 hectares of B.C.'s private Managed Forest land. Owners of Managed Forests have demonstrated a long-term commitment to their private forest land through investment and innovative practices. PFLA members commit to protecting the key public environmental values of Fish Habitat, Water Quality, Critical Wildlife Habitat, Soil Conservation and Reforestation on their Managed Forest land. The PFLA supports the equal protection of these key public environmental values on all private land, including the over 1 million hectares of private forest land in B.C. currently not managed for long-term forestry. The PFLA advocates government policy that will attract and encourage the investment in, and management of, B.C.'s private forest lands.

## PFLA Best Management Practices Program

Best Management Practices (BMPs) are recommended practices for private forest landowners and forest resource managers to follow in pursuing responsible forest stewardship. The PFLA BMP Handbook is not exclusive, but is intended to guide owners through regulatory requirements and best management practices to manage for key public environmental values. This is the first such document in B.C. written with a results-oriented approach and purpose.



This handbook is an integral part of the education system developed by the PFLA for use on private forest land in B.C.. This program includes formal training workshops, field monitoring and auditing, forestry manager extension services and active communication amongst landowners, and between landowners and the public. BMPs serve as a base for continuous improvement of forest management - optimizing forest productivity, financial return to landowners and conservation of natural resources. The healthier the private land business, the more owners are able to spend on environmental protection and forest renewal – the foundation of our land, forests and business.

### Caution

It is incumbent upon PFLA members to be aware of the standards set out in this handbook. However, readers are advised that whilst every reasonable effort was taken during the development of this handbook to outline an effective approach to protecting the key public environmental values of water quality, fish habitat, soil conservation and critical wildlife habitat, the Landowner has sole responsibility to ensure the regulatory compliance of activities on their land, and should seek professional advice, where necessary.



## Environmental Policy

---

Private Forest Landowners Association members make the following commitments for forest operations on their private land:

- Ensure that the safety of forest workers and the public is always the primary concern in any forest practice.
- Understand that conservation of natural resources benefits society as a whole.
- Meet all applicable laws governing environmental performance.
- Conduct forest harvesting and silviculture operations in a manner which protects key public environmental values of water quality, fish habitat, soil conservation and critical wildlife habitat.
- Ensure that downstream users of water will not be significantly impacted from forest management activities.
- Seek expert advice where proposed operations pose a potential risk to the environmental values to be protected, and consider such advice in the development of operational plans.
- Cease operations should their continuance pose a significant threat to the environmental values being protected, and immediately undertake appropriate remediation actions to minimize undesirable impacts.
- Apply Best Management Practices in the planning and implementation of forest land management operations.

*Approved and endorsed by  
the PFLA Board of Directors – June 2001*

# Key Public Values & Regulatory Requirements

All private forest owners in B.C. are subject to legislations that require protection of many public values. This includes legislation such as the *Water Act*, *Fisheries Act* and *Wildlife Act*.

Enacted April 1, 2000, the *Private Land Forest Practices Regulation* is a results-oriented regulatory approach focusing on results, not process. It is designed to keep Managed Forest owners working in the forest where they can make the right decisions to protect key public environmental values. This regulation applies to all land within the Forest Land Reserve (FLR) that is not within a Tree Farm Licence or Woodlot Licence, and Managed Forest land within the Agricultural Land Reserve. It does not apply to other forest land.

The *Private Land Forest Practices Regulation* addresses these key public environmental values.

- Protect water quality and fish habitat;
- Conserve soil;
- Recognize and, through agreement with the provincial government, protect critical wildlife habitat where it cannot be supplied on Crown lands alone;
- Grow and harvest trees.

The PFLA promotes the equal protection of these values on all private forest land in B.C. The PFLA BMP Handbook outlines planning considerations and effective practices to help landowners achieve these results.



KEY PUBLIC ENVIRONMENTAL VALUE	APPROACH
PROTECT WATER QUALITY AND FISH HABITAT	<ul style="list-style-type: none"> <li>¥ Establish &amp; maintain riparian zones (RZs);</li> <li>¥ Build &amp; maintain secure and stable roads with appropriate drainage structures;</li> <li>¥ Protect natural surface drainage patterns;</li> <li>¥ Comply with applicable legislation.</li> </ul>
PROTECT WILDLIFE	<ul style="list-style-type: none"> <li>¥ Consider provisions of applicable legislation;</li> <li>¥ Consult appropriate government agencies to locate Critical Wildlife Areas and as needed, enter into a Habitat Protection Agreement with government.</li> </ul>
GROW TREES	<ul style="list-style-type: none"> <li>¥ Ensure timely re-establishment of forest cover following harvesting, or if natural events cause removal of trees.</li> </ul>
CONSERVE SOIL, ESPECIALLY IN SENSITIVE TERRAIN	<ul style="list-style-type: none"> <li>¥ Identify unstable slopes and soils that are prone to serious erosion, and direct all harvesting or road building accordingly.</li> </ul>

### Liability Waiver

The regulatory requirements and suggested practices presented in this PFLA handbook are not exclusive and may be subject to change. Readers are advised that the landowner alone has sole responsibility to ensure the regulatory compliance of activities conducted on their land. By publishing this handbook, the PFLA does not assume this responsibility.

If unsure about regulatory obligations, readers are advised to consult relevant Acts and Regulations, or seek expert advice from an experienced, qualified professional, before proceeding with any activities.

*Key Acts and Regulations are listed in the Appendix.*

Planning & Risk Assessment

## Planning & Risk Assessment

### Assessing Private & Public Values

Planning and due diligence is a key factor in responsible forest stewardship. The following planning considerations are important for most forest management activities.

### Regulatory and Legal Requirements

- Review relevant legislation that must be complied with, such as the *Water Act*, *Fisheries Act*, *Forest Land Reserve Act* and the *Private Land Forest Practices Regulation*;
- Review applicable BMPs;
- Ensure licenced water supply area and intake, fish and critical wildlife habitat values have been adequately assessed, including activities upstream from the planned operation that may affect water quality or fish habitat;
- If in doubt, particularly about regulatory requirements, participate in training or consider seeking advice from experienced, qualified persons.

### Forest Level Activity

- Develop a Working Forest Plan or Map for reference during detailed planning and before work starts;
- Develop a contingency plan to manage risks during unplanned events or changes in weather;
- Conduct a review of risks associated with your operation and planned activities;
- Ensure people have adequate levels of training, experience and supervision to make the project successful.

### Working Forest Plans and Maps

Support resource management decisions by highlighting:

- Licenced water supply areas and intakes
- Fish habitat values
- Critical wildlife habitat values
- Property boundaries
- Permanent structures
- Permitted access routes on neighbouring land
- Public access routes
- Timber resource values
- Existing and proposed infrastructure
- Existing and proposed timber harvesting management unit boundaries
- Long-term forest access requirements
- Heritage sites



## Risk Assessment & Management

Risk assessment is essentially about common sense and awareness. The objective of risk assessment is to evaluate the potential for activities to negatively impact key public environmental values. Risk assessment enables informed planning, and identifies where higher levels of care may be justified, and where ongoing maintenance or monitoring efforts should be focused.

For example, a risk assessment to determine potential Hazards and Consequences related to forest roads may consider the following:

### HAZARD

#### Higher Hazard

- Road sections featuring easily erodible sediment sources
- Poorly constructed roads with ineffective water management
- High rainfall areas
- Exposed sediment sources
- Unstable terrain

#### Lower Hazard

- Low rainfall areas
- Coarse textured or non-erodible materials
- Well-constructed roads with effective water management
- Vegetated soils
- Stable terrain

### CONSEQUENCE

#### Higher Consequence

- Fish Streams, OR
- Streams within Licenced Water Supply Areas
- Sedimentation highly likely to impact fish or water quality values

#### Moderate Consequence

- Areas hydraulically connected to downstream fish habitat and Licenced Water Supply Intakes
- Minor potential to transport sufficient sediment to impact these values

#### Lower Consequence

- No streams present
- Small seasonal streams without Licenced Water Supply Area or fish values
- Areas hydraulically isolated from fish habitat and Licenced Water Supply Intakes
- Streams incapable of transporting sediment to impact downstream values

## Onsite Pre-Work Meeting

Before work begins, consider the value of an onsite pre-work meeting to review the area and emphasize ongoing communication with the people responsible for making the planned operation successful.

An onsite pre-work meeting is an opportunity to review project objectives and the work plan, discuss suitable options, and raise awareness of other site-level considerations such as:

- Key public environmental values;
- Identification, location and establishment of treatment area boundaries;
- Personal health and safety or property hazards such as utility power lines or pipelines;
- Public health and safety hazards such as trees falling near roads, log hauling and use of pesticides;
- Localized site treatment requirements according to variations in site soil type, natural vegetation, planned forest regeneration method etc.;
- Work contract quality standards, contract conditions, expectations and documentation;
- Operation shut-down criteria, e.g. following heavy rain, during high fire risk conditions or during critical pest flight time periods.



## Fish



Landowners are obliged to carry out activities in a manner that protects fish and fish habitat according to relevant legislation. **Note:** Minimum requirements in a particular regulation may not necessarily be adequate to comply with all legislation.

Establishment of fish presence or absence through fish inventory and stream classification clarifies management options. **Always determine the fish-bearing status of streams before work begins.**



- Consult relevant legislation for exact regulatory definitions of streams and determination of fish status;
- Consult appropriate government agency staff;
- Identify and map all streams adjacent to or potentially affected by planned operations (including those that may be dry during part of the year);

- Determine fisheries value of streams;
- If field surveys for fish stream identification are required, survey methodology must be well designed and conducted by qualified and experienced personnel who have the necessary expertise, or have received appropriate training in fish sampling techniques and fish species identification-survey methodology must be approved by relevant government agencies;
- Ensure streams and other water bodies are clearly illustrated on working maps, and that planners, engineers, layout personnel and field operators are aware of stream values and what measures need to be taken to manage them;
- If in doubt about fisheries values and landowner responsibilities, participate in training or seek qualified advice. If there is any doubt about the fisheries value of a stream and a planned operation has potential to negatively impact fish resources, treat the stream as fish bearing, and manage accordingly.

### Assessing Fisheries Values

Persons trained to the necessary level of expertise for fish surveys include biologists, biological technicians and environmental technicians. Assessment objectives may be limited to determining fish presence or absence, though some owners may wish to expand this work to identify opportunities to enhance fish habitat on private land. It is important that the objectives of the assessment are clearly established by the landowner. Studies may also be conducted to assess the relative values of confirmed fish habitat, and provide advice to landowners for the protection of fish habitat. The PFLA can advise on acceptable fish stream inventory methodology.



*Although certain independent studies can initially seem burdensome, this survey work may be critical in establishing the presence or absence of fish.*

### If stream is fish-bearing:

- Owners should refer queries related to any works below the high water mark in and around streams that can negatively impact fish and /or fish habitat to the appropriate government agencies;
- Ensure In-stream Reduced Risk Work Windows guidelines are followed, if required by government agencies;
- Design appropriate fish and fish habitat protection measures.





**Caution:** Some steep streams contain fish, especially where the stream contains pools, and historic data may not always be reliable.

- If there is any doubt about the fisheries value of a stream, and a planned operation has potential to negatively impact fish resources, treat the stream as fish-bearing and manage accordingly.
  - Manage the stream and install a structures that will protect suspected fish habitat, OR
  - Conduct a fish habitat inventory to an acceptable standard to clearly establish your management options.

#### Do Not:

- Allow deleterious impacts to fish or to habitat.

## Licensed Water Supply Areas & Intakes



Private forest landowners play an important role in providing quality domestic water supplies to individual residences and communities at no cost to the consumer. Studies have demonstrated that historically forestry has had lower impacts on water quality than alternative or downstream land uses such as agriculture and residential development. The PFLA supports and promotes appropriate protection of water quality on all lands. The BMP approach is intended to be applicable to all land uses by raising awareness of key public values, and suggesting appropriate steps to effectively protect those values.

Landowners are obliged to protect water quality for Licensed Water Supply Areas and Intakes for drinking water as defined by the *Water Act* and the *Private Land Forest Practices Regulation*. **Always determine the water supply values of areas before work begins.**

Due diligence requires that landowners establish presence of Licensed Water Supply Areas and Intakes, as well as downstream value of streams.

- Contact the appropriate government agency and review other available sources to confirm whether streams are in a Licensed Water Supply Area – where such information is not available, ensure an adequate inventory of adjacent or potentially affected streams has been conducted to identify Licensed Water Supply Areas;
- If stream flows into a Licensed Water Supply Area or Intake:
  - Research, evaluate and classify stream and riparian values; especially slope stability and susceptibility to erosion;
  - Communicate with downstream water users to ensure all available information is captured and made available in subsequent plans;
  - Ensure resource values are clearly illustrated on working maps, and planners, engineers, layout personnel and field operators are aware of what measures need to be taken to protect them;
  - Ensure In-stream Reduced Risk Work Windows guidelines are followed, if required by government agencies.



## Wildlife

- Ensure impacts to water quality and stream integrity caused by factors beyond the landowner's direct control such as other commercial activities, wildlife, other owners, livestock or recreational user activities, are documented;
- If duration of activity and size of crew justify, consider provision of portable washroom facilities for operational personnel;
- If in doubt about water supply values and landowner responsibilities, participate in training or seek qualified advice.

### Do Not:

- Allow deleterious impacts to water quality in Licenced Water Supply Areas and Intakes.

Private land provides substantial wildlife habitat benefit, either incidentally, or because of actions taken by the owner. Habitat management activities conducted by private landowners to preserve or enhance wildlife habitat values include stream rehabilitation, habitat and wildlife tree retention, nesting box installation and establishment of conservation covenants. These efforts are often undertaken voluntarily, either by the owner acting alone, or in partnership with conservation groups or government.

A key management objective for Managed Forest owners is to generate a reasonable return on the investments made by the owner throughout the life of the forest to support themselves and pay taxes. Although alternative income from non-timber forest products and activities may also be actively pursued, the most common and effective way to generate income on private Managed Forest in B.C. is to grow and harvest trees. Income from log sales supports private forest management and generates public benefits without public costs.

Where critical wildlife habitat that is essential to the continued existence of a species cannot be supplied on Crown lands alone, a forest landowner and government may enter into an agreement to restrict activities for the protection of such habitat where it occurs on private land. The agreement will set out the extent of the habitat to be protected and provide to the landowner fair and timely compensation for the loss of timber and land values encompassed by the protected area. This legal mechanism is provided under the *Private Land Forest Practices Regulation*.

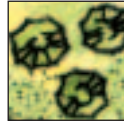
Due diligence is key to identifying and managing legally protected wildlife and wildlife habitat. Owners of forest containing legally protected wildlife habitat are required to notify the appropriate government agency prior to harvesting activity and, where necessary, enter into an agreement for the protection of the habitat.



### Do Not:

- Operate in a previously-agreed critical wildlife habitat study area without first obtaining written determination that the area is not required to meet government critical wildlife habitat requirements.

## Forest Establishment



Managed Forest owners in B.C. are required to grow and harvest trees. Unless otherwise stated in the landowner's Management Commitment, they must ensure prompt regeneration of a healthy, commercially valuable forest following harvest, or if natural events such as fire, insect attack or windthrow destroy or damage trees.

Reforestation can be accomplished naturally or artificially. Reforestation problems and associated costs are reduced by planting healthy trees soon after the site is harvested or prepared, and before establishment of competing vegetation. Reasonable steps must be taken to protect new forests from pests, animal browse and fire.



## Effective Management of Key Environmental Values

ACTIVITY	KEY PUBLIC ENVIRONMENTAL VALUE	BEST MANAGEMENT PRACTICE
PLANNING	Fish	Classify fish streams
	Licensed Water Supply Areas	Review licenced water users
	Critical Wildlife Habitat	Review specific requirements, determine study areas
	Tree Growth	Grow forest crops that meet owners' objectives
	Soil Conservation	Identify sensitive soils, minimize roads
ROAD CONSTRUCTION	Fish	Stabilize sediment sources and maintain RZ's
	Licensed Water Supply Areas	Manage activities to prevent erosion of sediment into streams
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Limit permanent site loss
	Soil Conservation	Maintain natural watercourses, use road construction methods appropriate to the sensitivity of the soil
FALLING & BUCKING	Fish	Direct trees away from RZ's
	Licensed Water Supply Areas	Locate and protect Licenced Water Supply area intakes
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Protect site productivity
	Soil Conservation	Limit soil disturbance on sensitive sites
HARVESTING	Fish	Restrict all activities near sediment sources & maintain RZ's, yard trees away from RZ's
	Licensed Water Supply Areas	Protect Licenced Water Supply Area intakes
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Restrict activities on sensitive sites
	Soil Conservation	Protect soil & minor vegetation
SITE REHABILITATION & PREPARATION	Fish	Restrict all activities near sediment sources & maintain RZ's
	Licensed Water Supply Areas	Protect Licenced Water Supply Area intakes
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Maintain & enhance forest productivity
	Soil Conservation	Restrict activities on sensitive sites
REFORESTATION	Fish	Ensure timely regeneration
	Licensed Water Supply Areas	Protect Licenced Water Supply Area intakes
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Promote successful regeneration
	Soil Conservation	Regenerate all available sites
BRUSHING	Fish	Protect RZ's and all water bodies
	Licensed Water Supply Areas	Protect Licenced Water Supply Area intakes
	Critical Wildlife Habitat	Respect study areas
	Tree Growth	Use timely treatment to enhance forest productivity
	Soil Conservation	Protect sensitive sites
PROTECTION	Fish	Monitor & protect sediment sources & RZ's
	Licensed Water Supply Areas	Monitor & protect Licenced Water Supply Area intakes
	Critical Wildlife Habitat	Monitor & protect study areas
	Tree Growth	Monitor & protect forest productivity and crops
	Soil Conservation	Monitor & protect sensitive sites

## Best Management Practices

Best Management Practices (BMPs) are not rules; they are recommendations for practices designed to help protect key public environmental values. They may require refinement based on specific site conditions and ownership goals. Natural disasters such as catastrophic storms, floods, or wildfires create extreme conditions that are beyond the scope of these BMPs. The suggestions and recommendations presented in this handbook are not exclusive. It is not intended to detail all BMP techniques and options available to a landowner to protect key public environmental values, but to raise awareness, and encourage due diligence, research and innovation.

Used in conjunction with relevant Acts and Regulations, BMPs help private forest owners practice due diligence in meeting regulatory obligations and in practicing good forest stewardship. BMPs are often recognized by the courts and regulators as standards for legal compliance. The key to the process is identifying key public environmental values and ensuring that adequate steps are taken to manage them accordingly.

The PFLA is committed to encouraging forest stewardship practices that meet landowner objectives and protect the key public environmental values of Fish Habitat, Water Quality, Critical Wildlife Habitat, Soil Conservation and Reforestation. Responsible stewardship will result from a combination of regulation, BMPs, education and training, monitoring and auditing, and a commitment to continual performance improvement.



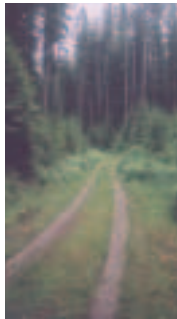
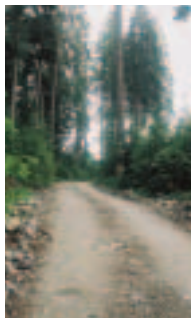
Roads, Stream Crossings  
and Water Management

## Roads, Stream Crossings & Water Management



Good roads can be an invaluable asset, poor roads are a liability. To reduce liabilities, owners should consider building good quality roads, carrying out a maintenance program, upgrading sub-standard roads, and deactivating and revegetating temporary roads after use. A useful guiding principle is that design and construction standards for all access structures should be appropriate for the intended size of vehicle, frequency and timing of use.

Permanent roads should be located, constructed and maintained in a manner that surface run-off does not degrade them. Timing of construction can reduce risk. To minimize sediment sources, BMP techniques including the revegetation of ditches or road surfaces can be used immediately after construction or during inactive (no log hauling) and deactivated stages in the life of the road.



Water flowing over exposed sediment sources may have potential to increase the risk of deleterious impacts to fish habitat or water quality. Much of the soil on our land was placed by water at some time. Poorly managed water can move it once more. Careful road and drainage construction and maintenance can help conserve soils, protect water quality and fish habitat, reduce long-term maintenance, promote forest efficiencies and save money.

### Lower Risk Streams

Road and trail construction activities may encounter unmapped minor surface and ground watercourses. A watercourse may be considered **Lower Risk** if it:

- is non-fish bearing;
- has proven upstream and downstream barriers to fish; and
- is not hydraulically connected to Licenced Water Supply Areas and intakes.

*Lower Risk streams are dealt with under Roads, Culvert and Drainage BMP's.*

### Higher Risk Streams

A watercourse may be considered **Higher Risk** if it:

- is fish-bearing;
- is connected to fish habitat; or
- is connected to Licensed Water Supply Areas and Intakes.

*Higher risk streams are dealt with under Bridges BMPs.*

**Note:** Government policy objectives include “no net loss” of fish habitat during construction or installation of any crossing structure on a fish stream. Relevant agencies may authorize a net loss of fish habitat where a mitigation or compensation agreement with the landowner can be reached.

## Planning

- Consider long term forest management objectives - Working Forest Plans and Risk Assessment Reviews can be valuable reference material for decision making;
- Identify and avoid sites sensitive to operations; minimize crossing Riparian Zones (RZs);
- All bridges and crossings must provide a level of protection appropriate to downstream fish habitat and Licensed Water Supply Area values;
- Conduct a thorough evaluation of surface water and ground water during road layout and surveying;
- Design the road system to meet long-range objectives rather than simply to access individual sites;
- Coincide an inspection of the planned road location with a high water event if possible;
- For the design and construction of bridges and culverts over 2 metres diameter, consider seeking experienced, qualified advice from a professional engineer;
- Evaluate level of risk associated with specific sections of road, stream crossings or drainage structures and plan or conduct maintenance accordingly;
- Plan ahead to ensure appropriate sizes and supplies of culvert pipes and necessary materials will be available at the time of construction;
- When ordering and allocating materials, be prepared that previously unidentified ground and surface water may be encountered during construction;
- Schedule construction and maintenance activities to avoid heavy rainfall periods and saturated soils;
- Involve field personnel in work plan development; ensure all personnel understand objectives;
- Ensure new road locations and boundaries are clearly understood by the people responsible for making the project successful.



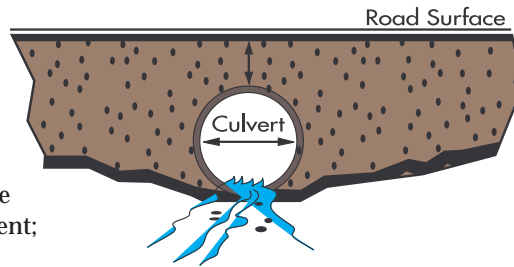
## Bridges and Higher Risk Stream Crossing BMPs

- Align road or trail approaches perpendicular to the stream;
- Elevate roads at crossings to minimize road surface and ditch run-off sediment entering the stream;
- Place bridge footings or abutments outside of stream high water mark, unless otherwise approved by government agencies;
- Design and install culverts, as specified by the appropriate government agency:
  - Long-term culverts must be appropriate for peak flows;
  - Temporary culverts to adequately accommodate flows anticipated during the life of the installation;
- Manage water quality:
  - Ensure silt or debris does not enter the stream;
  - Rip-Rap, gabion rock and any other material placed within the stream channel must be sufficiently clean to avoid negative impacts to fish habitat or drinking water quality;
  - Ensure equipment does not deposit deleterious substances into streams;
  - Conduct all work from the stream bank, unless the channel is dry;
  - Manage all excavated material to avoid contribution of sediment or debris to the stream;
  - Restore all disturbed banks of the stream to original habitat capability, with the exception of the area occupied by drainage structures;
  - Suspend work during periods of heavy rainfall, if sediment cannot be controlled;
  - Ensure adequate levels of personnel training, experience, materials and contingency planning to control sediment in the event of increased stream flow, local runoff and saturation of the work area.
- Manage water flow, as required by the appropriate agency:
  - Isolate the worksite from stream channel waterflows, or direct streamflows around the in-stream worksite;
  - Maintain natural stream flows throughout the work period.



## Road Construction BMPs

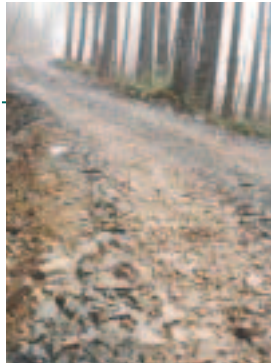
- If possible, build roads and landings far enough in advance of use to allow natural settlement;
- Use road construction methods suitable to the soil/terrain conditions encountered;
- Construct cut-and-fill slopes at stable angle of natural repose of material on site;
- Minimize sediment sources and stabilize potential sediment sources on erodible, exposed slopes by seeding with appropriate erosion control seed mixes or other suitable means;
- Engineer road surfaces appropriately to direct surface run-off into drainage structures,



*Tamp backfill material at regular intervals. Base and sidewall fill material should be compacted finer soil particles. Earth cover over pipe should be a minimum of 30cm, or half of the culvert's diameter, whichever is greater.*

### Options to manage road surface run-off:

- Inslope, outslope or crown road running surface to disperse water;
- Rolling dips and grader channels;
- Ballast running surface with non-erodible material;
- Hay bales can be used as temporary sediment filters when placed in the ditch during construction or whilst vegetation is becoming established;
- Suspend hauling operations on roads which have a risk of eroding soils into streams during prolonged spells of heavy rain, or during thaw events;
- Where risk to key public values is substantial, restrict operations to dry summer or frozen winter conditions.

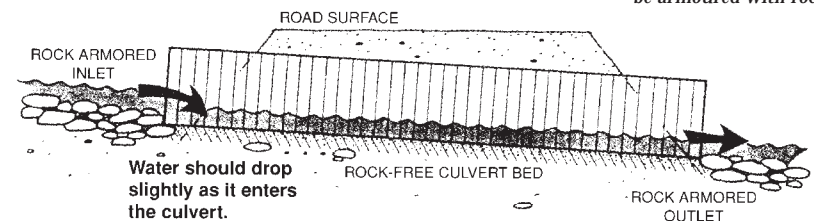


## Culvert Installation BMPs



- Place culvert on the grade of the existing stream channel where appropriate, or as otherwise required by regulatory agencies;
- Install culverts which are long enough to extend beyond the toe of the fill slopes or use alternative measures to protect the fill slope;
- Compact backfill material adequately to prevent water from seeping around the culvert;
- Cover the culvert with enough fill to prevent damage by traffic;
- If there is substantial risk that erosion could be a problem, construct a headwall on the inlet side and an apron of rip-rap at the outlet, if the outlet is placed above the toe of the fill;
- Stabilize disturbed soil with vegetation or non-erodible material if necessary to reduce potential sediment sources;
- Install non-erodible ditch blocks where necessary.

*To avoid soil erosion, both the culvert inlet and outlet should be armoured with rock.*



## Drainage Structure BMPs

- Ensure culverts, ditches, water bars, and fords are constructed appropriately;
- Employ ditch blocks in conjunction with frequent drainage culverts to empty ditch water onto the forest floor and maintain natural drainage patterns where required. Ditch blocks are a valuable BMP to:
  - Divert ditch water into culverts and filter zones;
  - Slow down and reduce ditch water energy;
  - Create sediment traps.
- If necessary, install sufficient drainage structures to enable ground water to maintain natural watercourses. Steeper grades, high incidence of ground water, and high precipitation areas will require more culverts and ditch blocks than gentler grades and dryer conditions;
- If in doubt about drainage culvert spacing, consider installing extra culverts and ditch blocks. These may also serve as a back-up structure if another culvert upstream becomes plugged. If after some time the culvert is obviously extraneous, remove it and reuse elsewhere;
- Direct road surface, culvert or ditch drainage runoff into the filtration zones such as the forest, or settlement areas (sediment traps) before it enters streams;
- Keep inlets and outlets of drainage structures clear of roadfill if there is an increased risk that the roadfill will provide a source of sediment deleterious to down stream values;
- Ensure natural debris is able to pass freely through all structures or be prevented from entering the drainage structure;
- Where appropriate, consider seeding exposed soils with appropriate erosion control vegetation mix to stabilize sediment sources and reduce mobilization of sediment.



## Road Maintenance BMPs

- Inspect roads and drainage structures regularly, and especially during spring run-off or during periods of heavy rain;
- Maintain culverts, bridges and ditches to ensure the drainage function of the structure is not compromised and road improvements are protected for the long-term or until appropriate deactivation is completed;
- Road surfacing materials and level of road use should be appropriate to operating season, sediment management measures and downstream values and risks;
- Maintain road surfaces appropriately to direct surface run-off into drainage structures, filtration zones, silt traps or onto the forest floor;
- If outsloping of the road surface is undesirable, crown the road to help prevent standing water accumulating on the running surface and developing potholes, or consider insloping the road;
- It may be valuable in some cases to restrict felling and skidding of trees onto roads in order to protect drainage structures and minimize sources of sediment;
- Clean roads and ditches following forest management activities, especially harvesting and in advance of rainy periods, to maintain adequate drainage and reduce maintenance;
- Carry a shovel to fix small problems before they become major problems;
- Ensure operator experience or supervision is appropriate to down-stream values and the level of risk involved.



## Minimizing Erosion



Erosion of soils and deposition of soils into streams can be minimized by:

### Managing Road Use

- Construct roads suitable for the intended use
- Restrict road traffic, or manage activities that might increase the risk of erosion of soils into streams during periods of high risk such as heavy rains or thaw events, such as log hauling, grading, recreational traffic

### Ditches

- Construct proper ditches
- Revegetate with suitable vegetation
- Armour ditches with non-erodible materials
- Install temporary measures such as silt fences and hay bales into ditches to reduce water velocity and trap sediment

### Water diversion and dispersal

- Direct water onto the forest floor for filtration and dispersal
- Install culverts to manage stream and drainage water
- Reduce water velocity in ditches by minimizing gradient (where appropriate), carefully using ditch blocks, culverts, vegetation, and harvesting residue, or coarse non-transportable materials

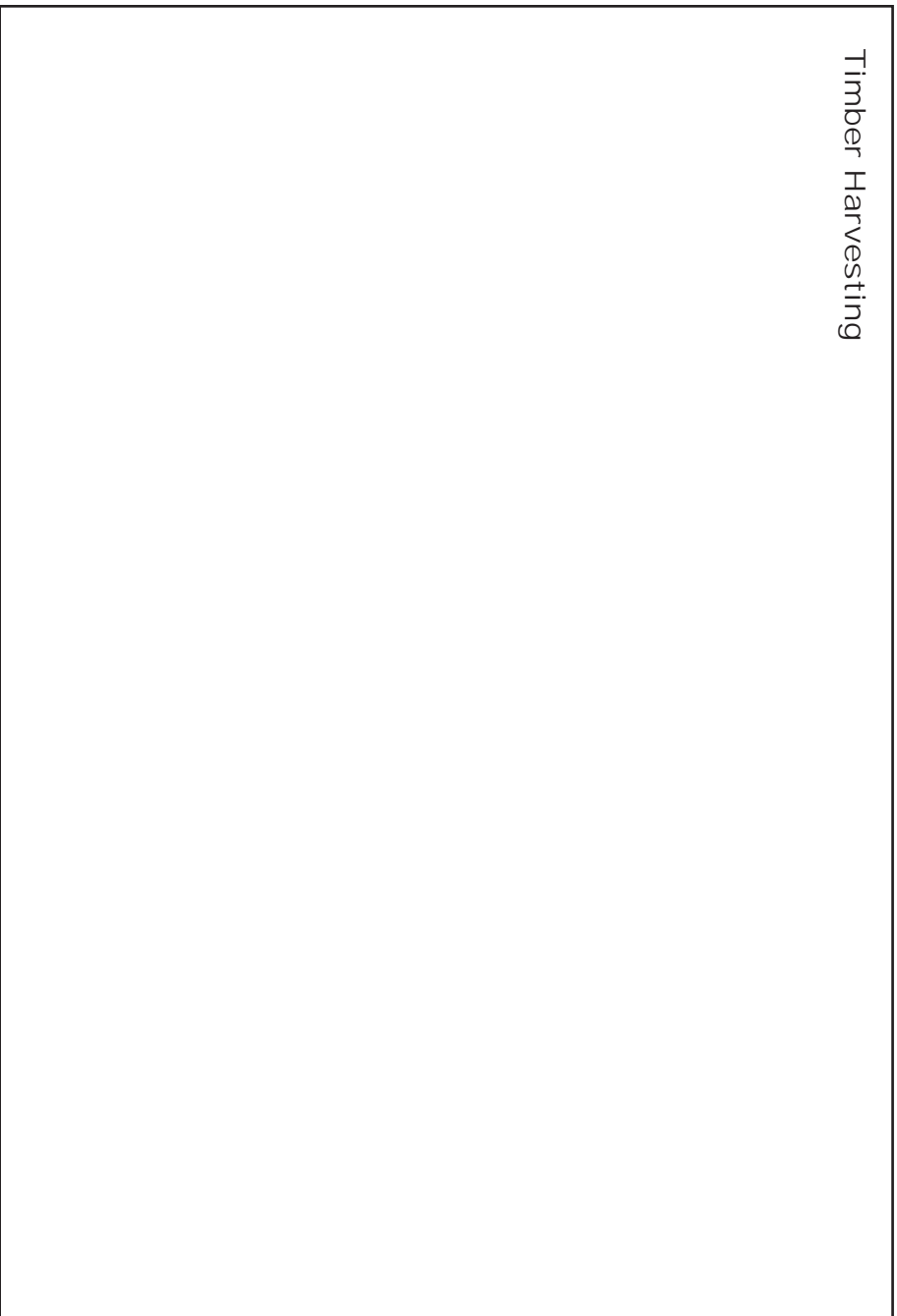
## Avoid

- Road construction inside the Riparian Zone (RZ), except where necessary to cross streams;
- Crossing areas where streams are highly active (meandering or braided channels, or alluvial fans);
- Use of acid-generating rock in construction;
- Locating roads where water tends to collect, resulting in poor drainage, such as within:
  - Ground water seepages
  - Clay strata
  - Concave slopes
  - Alluvial fans
- Building roads in unstable locations or unstable steeply dipping rock layers;
- Constructing forest access roads that are wider or longer than necessary for normal forestry activities;
- Grading roads during periods of heavy rainfall;
- Creating windows from grading that interfere with road damage.



*Road fills may be stabilized with a retaining wall. After installation, the entire fill is seeded with appropriate grass cover, planted with trees and a flume is placed under the culvert to prevent erosion.*

## Timber Harvesting



## Timber Harvesting



Harvesting trees is the first phase of forest renewal. Carefully managed harvesting operations provide conditions for vigorous regeneration. Both naturally regenerated and planted seedlings of many commercial species benefit from disturbed mineral soil and direct sunlight for successful regeneration and growth.



### Planning

Executing an environmentally responsible and economically efficient timber harvest operation, especially one near or in sensitive areas, requires a thorough understanding of the land, the trees, the capabilities of the timber harvesting equipment, and the markets for timber products.

- Identify locations for stream crossings where impacts to the stream are likely to be minimal;
- Carefully plan the harvest operation to minimize the number of crossings of lower risk streams required by machines;
- Clearly identify sensitive areas such as Riparian Zones (RZs), ephemeral streams, unstable slopes and erosive soils on operational maps; plan appropriate harvesting systems for these areas— some situations may require special harvesting equipment and/or special harvesting techniques;
- Timber harvesting contracts could specify compliance with regulations and BMPs to promote performance.

### Harvesting BMPs

- Ensure treatment area boundaries are clearly understood or marked;
- Consider cable or aerial yarding systems to protect steep, sensitive sites such as stream banks, gully walls and potentially unstable terrain. When in doubt, consult a professional engineer or professional geoscientist with adequate training and education in this field;
- Respect RZs and be especially careful if selective harvesting is planned within RZs (refer to 'Working with Streams' section);
- Employ directional falling and yarding techniques to protect RZs;
- Manage ground disturbance by ground-based machinery to meet the objectives and management requirements of relevant legislation, particularly when crossing gullies or sensitive sites;
- Take precautions to minimize excessive rutting in easily disturbed soils, consider repairing ruts with the machine before leaving the site;
- Consider using locally appropriate, alternative techniques to minimize rutting, soil compaction, and manage natural drainage patterns, such as:
  - Defer harvesting until freeze-up
  - Snowpack
  - Debris mats on skid trails
  - High flotation equipment
  - Concentrate logs in felling and forwarding operations to minimize the number of skid trails
  - Track support structures for tracked equipment machines
- Monitor streams and carefully remove inadvertently introduced harvesting waste and diverts residue from streams which adversely constricts flow of water through drainage structures;
- Protect and maintain all drainage structures concurrent with harvesting activities or as dictated by site conditions;
- Consider weather conditions when planning harvesting activities.





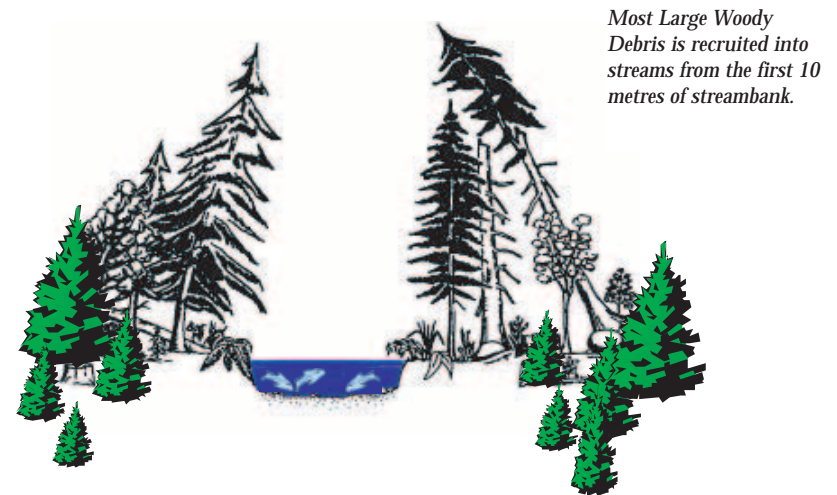
*Lower impact machinery with rubber tires can help to reduce soil disturbance*

## Working with Streams – Riparian Zones

Landowners must conduct activities in a way that protects water quality and fish habitat. Activities within Riparian Zones (RZs) must meet applicable legislation requirements. **Note:** Minimum requirements in a particular regulation may not necessarily be adequate to comply with all legislation. It may be necessary to retain streamside vegetation, including mature trees, to maintain important stream characteristics and elements of fish habitat.

### Avoid

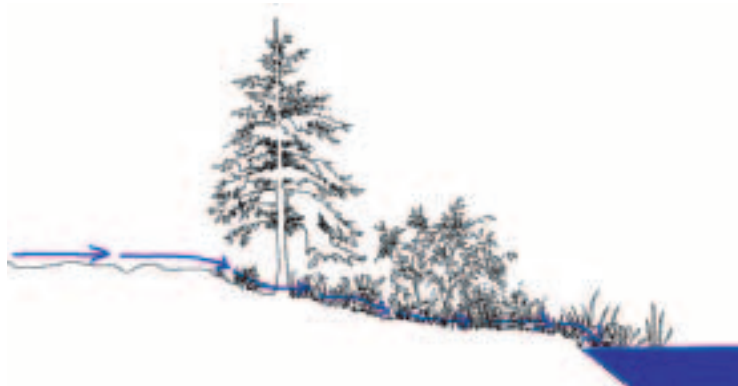
- Locating log decks in sensitive areas;
- Ground skidding on sensitive soils upslope from a stream channel;
- Skidding:
  - Straight up and down (perpendicular to the contour) on steep hillsides if mineral soil is exposed – use BMPs such as water bars, soil stabilization, etc, where this type of skidding is unavoidable;
  - Across perennial or large intermittent streams, except over an adequately designed and constructed ford, culvert, or bridge;
  - Over small intermittent or ephemeral streams during wet conditions, unless the banks (if present) have been protected by placing woody material in the water course.
- Removing culverts from stream channels following logging when the crossing will be used within ten years;
- Using soil fill, either alone or in combination with woody debris fill, for skid trail stream crossings.



Effective riparian zones contribute:

- a filter to minimize erosion of soils into streams;
- a vigorous mass of roots capable of stabilizing stream banks;
- a continual source of large woody debris for creation of pools and riffles to enhance fish habitat, regulate stream flow and contribute to stream channel stability;
- cover for fish;
- a source of nutrients to the stream;
- to a natural variation in water temperatures.

**ALL streams** must have an appropriate Riparian Zone (RZ) on both sides of the stream to protect water quality and fish habitat and meet regulatory requirements. RZs use trees, understory and herbaceous vegetation to filter runoff and act as a trap to block sediment and other debris from entering the stream.



For the purposes of water quality and fish habitat it may be appropriate to retain mature trees adjacent to the stream in order to enhance the protective function of the RZ. Retaining large conifers close to streams on land dedicated to forest management provides large woody debris for in-stream fish habitat and stream channel stability. Large woody debris from large conifers serve stream stability and fish habitat purposes better than smaller conifer trees and broadleaved tree species, primarily because conifers decompose at slower rate.

The results-oriented approach of the *Private Land Forest Practices Regulation* encourages owners of identified land to assess each stream reach and prescribe the specific measures required to achieve the retention and protection objectives for that specific area.

*Refer to Private Land Forest Practices Regulation and BMPs. Consider obtaining qualified advice and contacting the PFLA Forestry Manager and appropriate agency staff.*

### Planning

- Assess each stream reach and prescribe the specific measures required to achieve the stream protection and tree retention objectives and regulatory requirements for that specific area. Depending upon individual management objectives and based on knowledge and experience, the landowner should employ a results-oriented approach and consider measures appropriate to local site conditions and other resource values.



*Why protect water quality? Excessive sedimentation into streams can discolour domestic drinking water. Fish eggs laid in stream gravels must be free of suffocating sediment. Vegetation in riparian management zones will benefit fish and other terrestrial and aquatic life important to fish.*

## Riparian Zone BMPs

### CAUTION: RESTRICT ACTIVITY NEAR ALL STREAMS.

#### ALL STREAMS:

- Every reasonable effort must be taken to ensure that sufficient understory vegetation and non-commercial trees required to protect the stream are retained to the fullest extent possible;
- Machine tracks must not result in mineral soil exposure that leads to stream sedimentation except at a crossing;
- Subject to regulatory provisions, protect and maintain herbaceous vegetation;
- Fall and yard trees near or within the RZ away from the stream.

#### FISH STREAMS or STREAMS IN A LICENSED WATER SUPPLY AREA:

- Take extra precautions;
- For selective retention of trees adjacent to the stream, consider:
  - Regulatory requirements
  - Establishment of tree selection criteria for operators and supervisors
  - Managing to reduce windthrow potential
  - Field marking to clearly identify extent of the retained tree selection area, if development of an opening is planned adjacently
  - Special onsite review with fallers and machine operators
  - Close supervision of operations

#### Wind

To maintain the function of the RZ and retained trees, and to reduce the risk of adverse impacts on fish and fish habitat, consider selection of retained trees for wind-firmness and consider tree removal or pruning or topping of trees (subject to regulatory requirements regarding tree species and diameters).



#### Do Not:

##### Within Riparian Zones:

- Obstruct or divert the waterflow of natural streams;
- Allow avoidable disturbance of herbaceous vegetation;
- Drag logs across or through the water of fish streams;
- Fuel or leave equipment unattended;
- Mix, store or apply pesticides or fertilizers;
- Burn debris containing petroleum products or wood preservatives;
- Use equipment upslope of the RZ which results in widespread disturbance of erodible soil.

Hazardous Substances
----------------------



## Hazardous Substances



Improper storage and handling of oil products, fuel and chemicals (i.e. herbicides and fertilizers) can pose a water quality hazard. Spills or leaks can contaminate ground water and seep into streams.

### Planning

- A spill contingency plan should be in place to ensure due diligence in the storage, handling and cleanup procedures of any hazardous substances;
- Spill contingency plans may be more effective if reinforced by personnel training and regular inspections of containment and cleanup equipment.

### Hazardous Substances BMPs

- Isolate hazardous substance storage facilities from watercourses;
- Storage facilities must be appropriate for the application – ensure facilities meet or exceed relevant regulatory standards and provide containment structures or trays under fuel containers (if fuel containers are not double-walled);
- Ensure spill containment kits are available;
- Immediately report spills to appropriate government agency.
- Safely clean up spills immediately after discovery;
- Properly dispose of containers, cartridges, filters, used oil and other refuse;

### Do Not:

- Allow access to hazardous substances by unauthorized parties, including trespassers.





Site rehabilitation prepares soils and reduces competing vegetation and woody debris in order to enhance the productivity of the land and establish a more successfully regenerated forest. The work should be designed and performed to reduce potential negative environmental impacts.

Site preparation can take many forms. Harvested sites can be prepared for reforestation by burning, using mechanical equipment, applying herbicides, or by other methods. However, operating standards to protect water quality must be observed and these treatments should keep RZs intact, prevent sediment from entering into streams, conserve soils and maintain the productivity of the land. The main types of treatment are:

### **Mechanical Site Preparation**

Methods vary from low to high intensity. High intensity is defined as soil disturbed and exposed on more than 50% of the site; for example, disking and bedding. Chopping or slash piling are low intensity methods. Some combinations of methods, such as shear-rake-disk, are considered more intensive because they expose more soil. Higher intensity methods increase the erosion potential on sloping lands, and are most suitable on flat land and gentle slopes. Low intensity methods may be appropriate on moderate slopes.

### **Chemical Site Preparation**

Federally-approved herbicides are available for preparing forest sites. They control most undesirable vegetation and do not disturb the litter. Because they are selective, the prescription should carefully consider the vegetation to be treated. Most may be successfully applied either from the ground or aircraft. Herbicide use should be minimized whenever possible.

### **Prescribed Fire**

Prescribed fire may be used in conjunction with mechanical or chemical site preparation, or it may be used alone. Prescribed fire may be both spot or broadcast. A properly conducted broadcast prescribed burn that consumes a portion of the woody debris, without unacceptable impacts to the soil will minimize erosion potential.

## Planning

- Consider the complete site preparation process, including full regeneration of the new forest and reduction of post treatment impacts such as sediment inputs into watercourses;
- Identify sites sensitive to ground-based machinery and prescribed fire – prepare to control intensity as required;
- Limit activities to those areas which require treatment;
- Ensure compliance with the relevant regulations, and smoke management requirements of other regulatory bodies such as Regional Districts and other government agencies;
- Comply with all aspects of the *Pesticide Control Act*, in particular any restrictions near streams.

## Site Preparation BMPs

- Ensure treatment area boundaries are clearly understood;
- Herbicides, fertilizers and prescribed fire are acceptable site preparation methods on all slopes, if conducted properly;
- Consider pre-wetting riparian areas prior to prescribed broadcast burning;
- On sensitive sites or areas difficult to regenerate, use methods which leave harvesting waste and residue and other litter scattered over the site to protect soils and reforested areas;
- Minimize moving soil into windrows and piles;
- Leave vegetation and limit soil disturbance in gullies that have stabilized and are no longer eroding;
- Leave a vegetated buffer strip at least 2 metres wide on edges of drainage ditches to filter soil particles and slow runoff.

## Avoid

- Any mechanical methods where equipment will cause excessive soil disturbance due to saturated or very wet soil conditions;
- Intensive ground-based methods on sites with higher potential for soil erosion into streams (considering soil, slope, and ground cover);
- Prescribed fires that may increase erosion potential;
- Constructing windrows which will funnel surface runoff directly into streams;
- Blocking any drainage with beds, windrows, or similar structures.

## Reforestation



### Planning

- Prior to harvesting, develop a reforestation strategy and consider the values of:
  - Reforestation through natural regeneration, residual and suppressed understory trees;
  - Improved planting stock and fertilizer to improve survival and yield, reduce pest management problems and reduce seedling susceptibility to animal browse;
  - Protection of seedlings against damage from pests such as deer and rodents, including tree species choice, tree guards, fencing and repellents;
  - Developing an Integrated Pest Management strategy suitable for the size and intensity of the forestry operation.
- Obtain any necessary permits for site preparation and pest management (burning, pesticides, etc.);
- If planting, order appropriate seedlings ahead of time; inspect ordered seedlings prior to lifting and shipment.

*Intensive management is often necessary to maintain the value of the forest crop, such as the use of pheromone traps, to control insect damage to merchantable timber and seedling protectors to reduce animals foraging on young trees.*



### Reforestation BMPs

- Reforest with trees appropriate in terms of species, origin for the growing site, and management objectives;
- If planting, employ good quality seedling stock and ensure good storage and handling;
- Take reasonable steps to protect the reforested areas from damage by fire and pests;
- Employ remedial measures such as fill planting, brushing and other silviculture techniques as necessary;

- If using pesticides, herbicides or fertilizers, follow directions as stated on product labels, and according to relevant regulations.
- Isolate fertilizer from watercourses and where appropriate, limit on-site quantities to daily application requirements;
- Monitor planted areas to ensure the trees are growing properly and in sufficient density to achieve a stage where they are free of competition from other plants; monitor successfully regenerated areas for forest health.

### Good Quality Seedlings

- Healthy appearance – no pale or discoloured foliage and free of moulds
- Large, abundant dormant buds
- Plug and bare-root stock should have a vigorous, fibrous root system and good ratio of roots to shoots

### Seedling Storage and Handling

- Keep plants moist and cool
- Handle plants carefully (high seedling mortality is directly related to rough treatment)
- Avoid desiccation - keep plants out of heat or high winds



### Avoid

- Delaying reforestation, if possible; especially where there is risk of significant productivity losses or forest re-establishment problems (i.e. competing brush).

## Fire Prevention & Management



Wildfire may be a threat to landowner management objectives, depending on fuels, weather conditions and sources of ignition. Prescribed fire is a very useful silvicultural tool that may be employed from time to time as a forest management tool by the landowner for:

- Site preparation as part of a forest regeneration strategy (reduce logging debris or prepare a seedbed for seed fall);
- Managing forest fuel loads to reduce risk and hazard of wildfire;
- Encouraging development of forage for wildlife or domestic livestock.

Studies have shown that properly planned and conducted prescribed burning has no significant impact on water quality. Most problems associated with prescribed burning are a result of poor planning and changing weather conditions. Where a prescribed fire becomes too hot, the entire humus layer can be consumed, exposing the underlying mineral soil to erosion.

Prescribed burning requires an understanding of weather conditions, fuel conditions, wildfire danger, smoke management, and a host of other factors. It should only be attempted by suitably qualified personnel.

*Over 50% of forest fires are caused by human activity. Trespassing or disrespect for the forest are common problems for private landowners and their stewardship efforts.*





### Wildfire Planning

- Develop a written or verbal Fire Prevention and Management Plan, appropriate to the level of fire risk and fire hazard;
- Identify and classify areas of high and low risk;
- Inventory fire management resources:
  - Equipment (hand tools, pumps, retardants, water supplies, tanker trucks etc);
  - Skilled and experienced personnel.
- Ensure relevant regulations are observed; especially regulatory burning requirements.

### Fire Prevention and Management BMPs

- Report wildfires immediately to appropriate authorities;
- Resident forest owners may wish to consider fire suppression training to protect their property;
- Ensure operational personnel are adequately trained and equipped to conduct safe and effective fire suppression duties;
- Consider a cooperative fire management strategy with neighbours;
- Reduce fire-producing risks:
  - Manage forest fuels to reduce fire hazard;
  - Restrict public access during periods of high and extreme fire risk.

### Prescribed Fire Planning

- Contact the appropriate government agency for information regarding burn permits and regulatory requirements;
- Take precautions to manage fire; ensure the fire is adequately managed and if appropriate, enclosed by adequate fuel breaks;
- Have sufficient manpower, tools, and equipment available to control the fire; continue fire suppression until it is safe.

### Prescribed Fire BMPs

- Comply with smoke regulatory management guidelines; smoke should be monitored after the burn;
- Have fire fighting equipment readily available;
- Time prescribed fires so that the moisture level of the forest floor prevents the entire humus layer from being burned;
- Consider the value of learning the Fire Index System for fuels;
- Locate firebreaks on the contour as much as possible;
- Construct adequate water bars in firebreak lines to manage surface runoff during periods of heavy rain or snowmelt;
- Use hand tools when it is necessary to tie firebreak lines into stream channels.

### Avoid

- Burning when conditions will cause a fire to burn too hot and expose mineral soil;
- Impacting residents in smoke-sensitive residential or recreational areas;
- Allowing high intensity fire to enter filter strips or Riparian Zones (RZs);
- Constructing water bars in firebreak lines that divert surface runoff directly into streams.

## Monitoring & Auditing

In order to further assist landowners in meeting, maintaining and improving the standards prescribed in the BMPs, and requirements of the *Private Land Forest Practices Regulation*, the performance assurance process includes a program of monitoring and audits. The scope and intensity of sampling will be based on potential risk to key public environmental values. The results of the process will help to set priorities for the PFLA education and training program in order to pursue the objective of continuous improvement.



### Framework

- Informal visits and BMP implementation reviews by PFLA Forestry Manager;
- Periodic monitoring and audits by PFLA peer groups;
- Informal monitoring and public inquiry-initiated inspections from government agency staff;
- Periodic structured assessments by government agencies responsible for fish, forests and resource management;
- Independent, third-party audits to determine compliance and effectiveness of regulations, and identify opportunities for improvement. This may also be part of sustainable forest management certification programs.

### Monitoring

PFLA landowner representatives, as well as agency staff, will periodically monitor forest practices. The frequency and intensity of this monitoring will be guided by the level of risk to public values, the approach taken by the landowner to protect those values, and the level of activity on an individual ownership. A timely reporting process and individual public inquiries ensure that practices are appropriate, and the inquirer is promptly informed of inquiry inspection outcomes and measures taken by the agency and landowner to protect public values.

### Auditing

A system of independent audits will bring additional structure to the performance process. On Managed Forests, the audit process is intended to provide the public with the following information:

1. An assurance that landowners have met the environmental protection standards for private land, and
2. An assurance that the environmental standards are protecting target values, and identifying improvements in practices to better protect those values.
3. Confirmation that incentives provided to private forest landowners encourage forestry through continued investment by the landowners.

Audit results will be publicly reported.



# Performance Assurance & the PFLA

## Step 1

**Commitment to continually improve results-based approaches to protect key public environmental values as a part of overall forest management.**

## Step 2

### Education & Training

- Learn about protection of key public environmental values;
- PFLA education and training initiatives include the BMP handbook and periodic workshops.

## Step 3

### Regulatory Awareness and Co-operation with Government Agencies

- Stay aware of key public environmental values, BMPs and regulatory requirements;
- Work closely with government agency officials to recognize and protect key public environmental values and comply with regulatory obligations.



## Step 4

### Due Diligence

- Take appropriate steps to ensure proper BMP and regulatory performance during the planning and implementation of forest management activities;
- Seek expert advice as required.

## Step 5

### Monitoring, Auditing, Learning

- Review the performance process and actual results of applied forest management activities in the forest;
- Learn from Monitoring and Auditing, communicate lessons learned.



## Step 6

### Continual Improvement

Apply lessons learned to future plans and activities.

## Tools

### BMP program

The PFLA BMP Program includes BMP Handbook and a field-oriented workshop program. BMPs are the cornerstone of the PFLA Education and Training program focused on regulatory and good stewardship forest practices.



### PFLA Forestry Manager onsite visits

The goal is to visit active members on-site at least once annually and offer regulatory updates and BMP information. These are opportunities for technology, innovation and information transfer between member operations.

### Member updates

Seasonally appropriate forest management reminders, regulatory updates, upcoming events.

### Member Alerts

'Heads-up' alerting members to urgent issues that will not wait until the next regular Member Update.

### Website

- Posted Education and Training Program material;
- Notifications and registrations for PFLA Education and Training events;
- Notifications for non-PFLA Education and Training events.

### Special workshops

Targeted workshops and supplementary sessions delivered on demand basis.

Typical and ongoing special workshop topics:

- Small streams
- Windthrow management
- Culvert sizing
- Fish habitat inventory
- Road and ditch water management
- Domestic and community watershed management

### **Workshop Reference Bulletins**

Record workshop outcomes, key lessons and provide reference for participants and non-participants alike.

### **Frequently-Asked Questions Bulletins**

Regulatory interpretation and clarification reference notes.



### **Lessons Learned Bulletins**

- Process summaries of real regulatory determination case studies;
- Disseminate lessons, suggest planning and management considerations for future forest management activities.

### **Annual General Meeting**

Field trip, discussion panels, presentations, learning and forest owner networking opportunities.



# Glossary

---

The following terms are referred to in this handbook, related legislation or may be used in PFLA training sessions.

(Refer also to exact regulatory definitions, which may vary)

## **Alternative harvesting systems**

Site-specific harvesting systems using balloons, helicopters and long-line systems. These systems may protect environmental values such as fish and water quality better than conventional systems on sensitive areas.

## **Best Management Practices (BMPs)**

A practice, or combination of practices, that is determined, after problem assessment and examination of alternative practices to be the most effective, practicable means of preventing or reducing the impact of forest management and human impact activities.

## **Connected water bodies**

'Connected' water bodies such as ponds, lakes and streams are considered 'connected' for the purpose of fish habitat if there are no intervening physical barriers to fish passage. Fish experts can provide further advice, but fish barriers typically include falls, some swamps, and portions of stream where water travels underground.

## **Critical wildlife habitat**

The land requirements of those wildlife species listed as Identified Wildlife, but not including Regionally Significant Species, that is located on private land and

that is required to support these species because there is insufficient suitable land requirements available on Crown lands within that Ecoregion, as defined by the appropriate agency.

## **Crop tree**

A tree of a commercial species that is consistent with the species of trees specified in the Management Commitment for use in reforestation, and unencumbered by pathogens.

## **Crown land**

Public land that is owned by the federal or provincial/territorial government.

## **Culvert**

A metal, concrete, or plastic drain pipe or a log structure covered with soil and lying below the road surface to lead water away from or across the road.

## **Cutblock**

An area with defined boundaries intended for harvest.

## **Designated Environment Official (DEO)**

A person employed in the relevant provincial government agency who is designated by name or title for the purpose of the *Forest Land*

*Reserve Act and Private Land Forest Practices Regulation.*

## **Directional felling**

Felling trees so that they fall in a predetermined direction which will cause the least damage to the site.

## **Drainage structures**

A man-made structure designed to control the flow of water off a road surface, cut slope, and fill slope.

## **Ephemeral stream**

A watercourse generally without a well-defined channel which flows only in response to rainfall or snowmelt. Ephemeral streams flow for less than 20% of the year during normal rainfall conditions.

## **Excavated or bladed trail**

A constructed trail that has an excavated or bladed width greater than 1.5m (5ft) and a mineral soil cut-bank height greater than 30cm (1ft).

## **Filter strip**

A vegetated area of land separating a water body from forest management activities.

## **Fish habitat**

The portion of a stream required by a naturally-occurring fish population.

## **Fish stream**

(Refer to exact regulatory definitions e.g. *Federal Fisheries Act, Private Land Forest Practices Regulation*)

A fish stream is a stream that has a fish population at some time of the year. Normally if a stream is less than 20% gradient, and is connected

to fish habitat, fish presence must be assumed, unless sampling can prove otherwise.

## **Ford**

A natural or constructed stream crossing suitable for shallow streams with stable bottoms.

## **Forest practice**

An activity related to the growing, protecting, harvesting or processing of forest tree species.

## **Forest Practices Code**

Legislation on forest management and practices (including the *Forest Practices Code of British Columbia Act* and associated Regulations, Standards and Field Guides) which was enacted in June 1995 on Crown land in B.C. Applies to Crown Forest land and Schedule 'A' private land within a crown woodlot licence.

## **Groundwater**

Water suspended or flowing in the soil below the ground surface.

## **Harvesting**

The removal of merchantable trees from an area. Activities include falling, bucking, yarding, loading and hauling of trees.

## **Herbaceous vegetation**

Plants which contribute to stream bank stability along with selected trees. Herbaceous vegetation also acts as a sediment filter.

## **Herbicide**

A federally registered pesticide used to prevent the growth, or to promote the removal, of targeted trees, shrubs, and /or herbaceous vegetation.

**Inadvertently-introduced materials**

Woody, non-woody debris, sediment or other materials resulting from activities which may adversely impact water quality or fish habitat.

**Integrated Pest Management (IPM)**

Integrated Pest Management is an approach to managing pests such as insects, diseases, weeds and animals by integrating appropriate physical, biological and chemical tactics that are safe, profitable and environmentally compatible.

The IPM approach to managing pests combines biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks.

**In-stream reduced risk work windows**

A time period established by government agencies, when for reasons of seasonal requirements of different fish species, in-stream works pose a reduced risk to fish values.

**Intermittent stream**

A watercourse that flows in a well-defined channel for 20-90% of the year during normal rainfall conditions.

**Land Reserve Commission (LRC)**

A government agency that regulates Land Reserves in B.C., including forest land within the Forest Land Reserve in B.C. The LRC also administers the *Private Land Forest Practices Regulation*.

**Licensed water supply intake**

A water intake that is:  
(a) within

- (i) a water supply area, or
- (ii) a community watershed contiguous to a water supply area,

(b) to provide water for human consumption, and

(c) licensed under the Water Act for a waterworks purpose, or a domestic purpose, if the license is held by or is subject to the control of a water user community incorporated under the *Water Act*.

**Managed Forest land**

BC Assessment's Managed Forest Land Class refers to privately owned forest land property for which an acceptable forest management commitment has been made to the Land Reserve Commission. To be eligible, the owner must first successfully apply to have the land put into the Forest Land Reserve. This reserve is administered by the Land Reserve Commission. The exception is land in the Agricultural Land Reserve, which does not have to go into the Forest Land Reserve. Owners of Managed Forest land must make a written commitment to follow good forest land resource management practices.

Managed Forests accounts for half of the private forest land base in British Columbia. The Managed Forest assessment class was established in 1987 by the provincial government to encourage private landowners to manage for long term forest production.

**Material Safety Data Sheet (MSDS)**

The basic hazard communication tool that gives details on chemical and physical dangers, safety

procedures, and emergency responses for chemicals.

**Mechanical site preparation**

The preparation by mechanical means of an area for the establishment of a future forest. May include cutting of standing material or harvesting residue with blades or choppers, disking, bedding, raking and piling and /or windrowing.

**Natural channel**

A watercourse created by the erosive forces of water moving over land. Drainage ditches are not considered natural channels.

**Natural surface drainage patterns**

Stream channels and gullies within which water historically travels.

**Perennial stream**

A watercourse that flows continuously (at least 90% of the year) in a well-defined channel.

**Permanent main access road (Main Line)**

A two-lane industrial road accessing a large operating area.

**Pesticide Control Act**

Provincial legislation which regulates the application, storage, transportation and possession of organisms or materials used to prevent, destroy, repel or mitigate a troublesome living organism.

**Private forest land**

Consists of all Managed Forest and Unmanaged Forest land in B.C. as defined under the B.C. Assessment Act.

**Private Land Forest Practices Regulation (PLFPR)**

Enacted April 1, 2000. Applies to land within the Forest Land Reserve and Managed Forest land within the Agricultural Land Reserve. It does not apply to any other private forest land in B.C.

**Regeneration**

The renewal of a forest stand. Natural regeneration can occur through seed fall from adjacent stands or with seeds brought in by wind, birds or animals or by released residual trees. Artificial regeneration involves planting or seeding.

**Remedial measures**

Action taken to repair accidental environmental damage.

**Representative tree**

Trees of representative size and species to be left in the riparian zone.

**Riparian Zone (RZ)**

An area adjacent to the bank of a stream where extra precaution is necessary to carry out forest practices in order to protect streambank stability and water quality.

**Road**

A constructed surface used for transportation. Roads include ditches, other drainage structures and non-productive cut and fillslopes.

**Sensitive terrain**

An area where there is a moderate to high likelihood of landslides.

### **Silviculture**

The art and science of controlling the establishment, growth, composition, health and quality of forests.

### **Site productivity**

An expression of an area's natural fertility or capacity to grow vegetation, especially trees.

### **Skid trail**

(may or may not be an excavated or bladed trail, see excavated trail definition) A path (most frequently traveled by harvesting equipment, normally leading to landings) that may have been intentionally cleared down to the soil layer by a machine.

### **Soil disturbance**

Disturbance to soil which can be caused by a forest practice, such as the use of heavy equipment.

### **Soil types**

The classification of soils based on stability and erodibility.

### **Stream**

For the purpose of the *Water Act* : A 'Stream' is defined as "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".

A 'Stream channel' is "The bed of a stream and the banks of a stream, whether above or below the natural boundary and whether usually containing water or not, including all side channels.

'Change in an about a stream' means any modification to the nature of the stream including the land, vegetation, natural environment or flow of water within a

stream, or any activity or construction within the stream channel that has or may have an impact on the stream;

For the purpose of the *Private Land Forest Practices Regulation*:

A 'Stream' means a watercourse flowing perennially or seasonally in a continuous channel or bed that may be locally obscured by overhanging or bridging vegetation or soil mats, and that

- (a) has been scoured by water, or
- (b) contains any mineral alluvium.

A 'stream channel' means the area between the outermost opposing streambanks measured at the point where rooted terrestrial vegetation begins.

### **Successfully Regenerated**

Healthy trees of a commercially valuable species, whose growth is not impeded by competition from plants, shrubs or other trees.

### **Tree**

A living, woody perennial plant, typically large and with a single well-defined stem supporting a crown.

### **Unstable slopes**

Steep terrain which is sensitive to road building and harvesting activities and may result in significant slope failure.

### **Water Act**

Provincial legislation regulating the protection of water.

### **Wildlife**

Animals and plants that form part of the natural habitat.

## Further Reading

---

The following may assist the landowner in forest management decision making:

*A Guide for Management of Landslide Prone Terrain in the Pacific Northwest*, S.C. Chatwin, D.E. Howes, J.W. Shwab, and D.N. Swanston

*Armtec Construction Products Reference Binder*, Armtec Construction

*Handbook for Roads and Transportation, Volumes #1 & #2* B.C.I.T.

*Coastal Fishes of British Columbia*, Phil Edgell and Andy Lamb

*Common Tree Diseases of British Columbia*, R.E. Foster and G.W. Wallis

*Field Identification of Coastal Juvenile Salmonids*, W.R. Pollard, G. Hartman, Groot and Edgell

*Forest Pathology*, John Shaw Boyce

*Forestry Handbook*, University of British Columbia

*Handbook of Steel Drainages & Highway Construction Products*, Armtec Construction

*Indicator Plants of Coastal British Columbia*, K. Klinka, V.J. Krajina, A. Ceska and A.M. Scagel

*Plants and Animals of Pacific Northwest*, Eugene Kozloff

*Plants of Coastal British Columbia*, Pojar and MacKinnon

*Plants of Northern British Columbia*, MacKinnon, Pojar, Coupé

*Plants of Southern British Columbia*, Parish Coupé and Lloyd

*Principles of Silviculture*, Daniel, Helms and Baker

*Regenerating British Columbia's Forests*, Lavender, Parish, Johnson, Montgomery, Vyse, Willis, and Winston

*The Tree Rusts of Western Canada*, Wolf G. Ziller

