



A Guide to Best Management Practices for Forest Operations in Northern Ontario and Manitoba

For Private Landowners & Logging Contractors



CENTRAL CANADA
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SFI Program Participants

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EACOM Timber Corporation
GP North Woods

Louisiana-Pacific Canada Ltd.
Miisun Integrated Resource Management Inc.
Nipissing Forest Resource Management Inc.
Norbord Inc.

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Wagner Ontario Forest Management Ltd.
Rainy Lake Tribal Resource Management Inc.
Resolute FP Canada Inc.
Spruce Products Ltd.
The Forestland Group
Timiskaming Forest Alliance Inc.
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NORCAT

Ontario Forest Industries Association
Ontario Ministry of Natural Resources and Forestry
Ontario Woodlot Association
Workplace Safety North
Whitefeather Forest

For current Participants and Supporters go to:
<http://www.sficentralcanada.org/about.html>

All photos included in this guide are courtesy
of CCSIC members and participants.



1. Introduction

The Central Canada Sustainable Forestry Initiative Implementation Committee (CCSIC) prepared this document to provide private landowners and logging contractors in Northern Ontario and Manitoba with a guide to Best Management Practices (BMPs) for conducting sustainable forest operations on private land.



The Sustainable Forestry Initiative® (SFI) standards (the 2015-2019 Forest Management Standard and the 2015-2019 Fiber Sourcing Standard) are internationally recognized performance standards designed to promote and achieve sustainable forest management on all forestlands. The program is comprised of principles, objectives, performance objectives and indicators that were developed cooperatively by foresters, conservationists, and scientists. Participants in the SFI program practice and promote sustainable forestry by training loggers, landowners, and foresters in best management practices. Participants must verify that all procured wood comes from legal and well-managed sources.

Inconsistent Practices

Inconsistent practices are activities conducted by SFI program participants that are not consistent with the SFI Standard objectives and principles. If you believe that a company, who is SFI certified, is operating outside of the approved standard, you can voice your concern by calling or sending a written account of the non-conformance to the CCSIC Inconsistent Practices Coordinator (contact information found at www.sficentralcanada.org).

How to Use this Guide

The guide is divided into 12 sections with each section highlighting legal requirements, BMPs and special notes associated with every step of the timber *harvesting* and *reforestation* process. BMPs are recommended procedures that when followed will prevent or minimize potential environmental damage over the course of the operation.

Throughout the guide, you will find symbols to alert you to these key topics.

Legal requirements will be identified with a  symbol.

BMPs will be identified with a  symbol.

Topics of special note will be identified with a  symbol.

Terms typed in *italics* are defined in the glossary in Appendix 2.

2. Legislation



As a landowner or logging contractor operating on private land, it is your responsibility to be aware of and adhere to municipal, provincial, and federal legislation.

Some of the key legislation is listed below. A full list of federal and provincial laws can be found using the links at the bottom of the page.

Federal

- ▶ Canadian Environmental Protection Act
- ▶ Fisheries Act
- ▶ Migratory Birds Convention Act
- ▶ Navigable Waters Protection Act
- ▶ Species at Risk Act
- ▶ Transportation of Dangerous Goods Act

Provincial (Ontario)

- ▶ Conservation Authorities Act
- ▶ Endangered Species Act
- ▶ Environmental Protection Act
- ▶ First Aid Regulation 1101 - WSIB
- ▶ Forest Fire Prevention Act
- ▶ Lakes and Rivers Improvement Act
- ▶ Liquid Fuels Handling Code
- ▶ Municipal Act
- ▶ Occupational Health and Safety Act & Applicable Regulations, e.g. Industrial Establishments Reg. 851, First Aid Requirements Reg. 1101, WHMIS Reg. 860
- ▶ Trespass to Property Act

Provincial (Manitoba)

- ▶ Forest Act
- ▶ Environment Act

Contact your municipality for by-laws that regulate forest operations in your area. For an up to date list of provincial and federal legislation go to the following websites.

<http://www.e-laws.gov.on.ca/index.html> (Ontario-provincial)
<http://web2.gov.mb.ca/laws/index.php> (Manitoba-provincial)
<http://laws.justice.gc.ca/en> (Federal)

3. Pre-Harvest Planning

a. Forest Management Plans

The landowner and logging contractor should ensure they have a forest management plan in place that outlines the goals, timelines, and methods for accessing, *harvesting* and regenerating the woodlot prior to undertaking any forest operations. The first step in preparing a management plan is to become familiar with the property by studying maps, aerial photos and walking the land. In Ontario, aerial photos and maps can be obtained from the Ministry of Natural Resources and Forestry at:

https://www.ontario.ca/search/search-results?external_tag=Natural%20resources%20maps

High quality aerial imagery is also available online for most areas for free.

<http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html>

The plan should include:

- ▶ a map and/or aerial photos of your land
- ▶ accurate property boundaries
- ▶ a legal description of the property
- ▶ an *inventory* of the property (including trees and wildlife, important wildlife uses, physical features, etc)
- ▶ a confirmed right to harvest pine (check the deed)
- ▶ water features, wetlands, or other areas of environmental concern that are on the property
- ▶ your objectives
- ▶ a schedule of activities that you will carry out to achieve those objectives.

Proper planning makes good business sense, avoids costly mistakes, and improves efficiency. It also helps to ensure that forest operations are carried out in an environmentally responsible manner.

The Ontario and Manitoba governments both have numerous forest management guidelines covering operations on crown land that may be helpful for the private landowner as well:

<https://www.ontario.ca/page/forest-management-guides>

<http://www.gov.mb.ca/conservation/forestry/practices/guidelines.html>



Aerial photo noting important features.

The Ontario government has incentive programs in place to increase landowner awareness about forest stewardship and assist in private land management. The Managed Forest Tax Incentive Program (MFTIP) provides a reduction in property taxes to landowners who have an approved managed forest plan and agree to be good stewards of their property. For more information regarding this program, please visit the website listed below.

<https://www.ontario.ca/page/managed-forest-tax-incentive-program>

The **Manitoba Forestry Association**'s Private Land Resource Planning program offers services promoting sustainable woodlot management for environmental, economic, and social benefits through the delivery of resource management plans, skills development training, and forestry services. For more information please visit their website at www.thinktrees.org.

-  **Prepare a proper forest management plan.**
-  **Walk the property to identify property boundaries, streams, wetlands, sensitive areas, critical wildlife *habitat*, etc. Make plans to avoid or minimize disturbance to these areas. Be aware that seasonal streams or even wetlands may be dry at certain times of year.**

b. Property Lines, Boundary Marking and Utilities

Survey and deed documents for your property will include a legal description of the property boundaries. This description should be used to locate benchmarks, such as iron pins and roads, or natural features such as ravines used to express property boundaries. These documents can be found at the local Land Registry Office.

i Operating outside the legal boundary is one of the most common and serious legal mistakes than can happen on a forest operation.

- !** Careful identification and marking of property boundaries is critical to avoid legal troubles. (Trespass to Property Act R.S.O. 1990, c. T.21, Forestry Act R.S.O. 1990, c.F.26)
- !** Property lines should only be *blazed* by a surveyor or when the exact location is known. (Surveys Act R.S.O. 1990, c. S.30)
- !** Under the Mining Act, it is illegal to deface, alter, remove or disturb any lawfully placed mining claim marker. (Mining Act R.S.O. 1990, c.M.14)
- !** Contact utility agencies (e.g. hydro, pipelines, water) if your operations will cross any of their right-of-ways.



Mining claim marker.



Example of a survey pin (left) and a blaze (right).

- 🌲 Obtain survey and deed documents from the local Land Registry Office to identify corner posts and survey lines. If you have any questions regarding the boundaries of your land, seek professional advice from a surveyor or lawyer.
- 🌲 Make sure property and harvest boundaries are clearly marked with flagging tape; such that flags can clearly be seen from each other and everyone on site is aware of them.
- 🌲 Set up *buffers* around bodies of water and marshlands to minimize impacts on these areas during operations.
- 🌲 Leave a non-harvest *buffer* at the property line for your neighbour's aesthetics.
- 🌲 Obtain a written agreement to the boundary with the adjacent landowner.
- 🌲 Utilize different flagging colours to avoid confusion between planned road lines and harvest boundaries.

c. Harvesting Prescriptions and Equipment

A *harvesting prescription* is a detailed plan on how, when, and where timber will be harvested from an area. The type of equipment and harvest systems utilized can have a significant impact on soil conditions and forest renewal so it is important to choose wisely. There are several *harvesting prescriptions* to choose from.

- ▶ Full tree *harvesting*
- ▶ Cut-to-length
- ▶ Cut & Skid
- ▶ Careful Logging Around Advanced Growth (CLAAG)
- ▶ Seed Tree & Strip Cuts
- ▶ Commercial *Thinning*

Details regarding each system are described in Section 8 Harvesting Operations.



If in doubt, consult with a professional forester or QRP when deciding on a harvesting prescription.

For more information on professional foresters in Ontario, visit the Ontario Professional Foresters Association (OPFA) website at www.opfa.ca

d. Timing of Operations

Scheduling of operations can affect a number of business and environmental decisions.

- ▶ *Rutting* from heavy equipment on moist ground can cause site damage to soil and drainage conditions and reduce a site's ability to renew naturally
- ▶ Species, age, size & log quality all affect the market value and demand for your wood.
- ▶ Spring breakup occurs EVERY spring – plan harvest and haul accordingly so wood is not stranded on winter roads



Operations can disturb critical *habitat* and nests associated with endangered and threatened bird, plant and animal species.

e. Roads and Landings

Planning and forethought in determining the location of roads and *landings* is important to the success of any forest operation. Well-planned roads and *landings* should:

- ▶ Avoid stream crossings
- ▶ Minimize *erosion* and *sedimentation*
- ▶ Maximize safety
- ▶ Provide for longer operating periods
- ▶ Lower maintenance and operating costs

It may be possible to use existing roads on adjacent land or other locally shared roads. To prevent potential issues in the future, advise adjacent landowners and other road users about planned operations.

Ensure that all roads planned for use during the hauling of wood are classed to support the loaded weight of the haul vehicle. Some roads may have seasonal load restrictions.



Contact the local Ministry of Transportation, Local Roads Board, and/or the Municipality for any load restrictions on the haul route.

Maps and field information should be used to decide the best location for log *landings*.



Locate landings:

- On well-drained soils;
- On gently sloping ground; and
- Outside *riparian* or wetland areas.



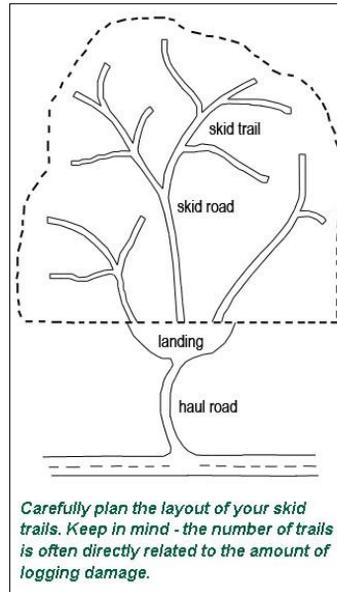
Mark landing boundaries before construction begins.



Minimize feasible landing area to maximize renewable forest land.

Refer to Section 7 Aggregates and Roads for BMPs regarding road location and construction.

Example of road layout
(Source Ontario Woodlot
Association).



f. Areas of Concern/Non-Timber Values

Areas of Concern (AOCs) are areas that should be protected due to their special characteristics or values. AOCs include:

- ▶ i. Species at risk and Invasive Species
- ▶ ii. Nesting and denning sites
- ▶ iii. Riparian areas, and
- ▶ iv. Cultural values

i. Species at Risk and Invasive Species

- ⚠ It is illegal to kill or destroy the *habitat* of species protected under the Endangered Species Act (S.O. 2007, c.6), or the Species at Risk Act (c.29).
- ⚠ Landowners and contractors are responsible for knowing the species at risk in their operating area.
- ⚠ Contact the local Ministry of Natural Resources and Forestry (MNRF) or Manitoba Conservation if you encounter any species on the list.

🌲 Contact a local SFI participant for a list of endangered and threatened and invasive species found in your area.

The status of species does change so you should refer to the following web sites for up-to-date information:

<http://www.ontario.ca/page/species-risk> (Ontario)

<http://www.species-at-risk.mb.ca/s-at-risk-list.html> (Manitoba)

<http://www.sararegistry.gc.ca> (Federal)

ii. Nests and Dens



Leave trees standing that contain bird nests or cavities.



Avoid disturbance or damage to wildlife dens.



Stick Nest

iii. Riparian areas

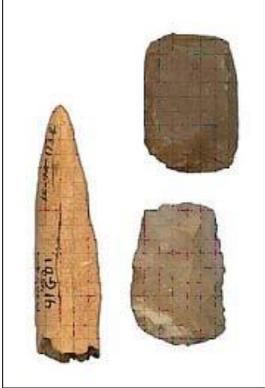
Riparian areas are the narrow strips of land that border waterways. They are important for maintaining water quality and aquatic *habitat* by preventing sediments and pollutants from entering the water body. They also provide high quality terrestrial *habitat* for animal and plant species. Federal law requires a minimum 3 m no-machinery travel zone adjacent to permanent lakes and streams, unless a permit is obtained saying otherwise (e.g. stream crossing). Check out the Ontario and Manitoba crown forestry guideline links at the start of this section for recommended practices.



Shoreline riparian buffer.

 Establish **buffers** around bodies of water and marshlands to minimize impacts on these areas during management activities

iv. Cultural values



In Ontario, the Ministry of Culture is responsible for preserving archaeological sites. An archaeological site is any property that contains an artifact or other physical evidence of past human use of cultural heritage value. An artifact can be any object that is made or used by humans and is of cultural interest.

Examples of significant archaeological items.

 **The Cemeteries Act prohibits anyone from disturbing or ordering the disturbance of a burial site or artifacts associated with the human remains. (R.S.O. 1990, c. C.4)**

 **If an unidentified value is encountered, halt work until the best course of action to protect the value is determined. Contact your local SFI participant for help.**

v. Aesthetic Values

Protecting aesthetic values is not necessarily only about leaving large *buffer strips*. Aesthetics are linked closely to *reforestation* efforts and green up of the harvest area. Prompt and successful *reforestation*, through *natural* or *artificial regeneration* is key. Discuss with the landowner prior to operations. Some other options include:

- ▶ Leave *seed trees* throughout the harvest area – maintains *stand* genetics and provides *habitat* for forest wildlife.
- ▶ Leave “clumps” of *advanced regeneration* undisturbed with several snag / *seed trees* where possible
- ▶ Groups of snags; are wind firm, have less logging related damage and provide better wildlife *habitat* than single trees



g. Qualified Logging/Resource Professionals

The SFI® standard requires that Program Participants have written agreements for the use of Qualified Logging Professionals that meet the training criteria defined by CCSIC. Accordingly, the CCSIC has established training criteria & delivery mechanisms for Qualified Logging Professionals that conduct logging operations in Central Canada. A Qualified Logging Professional (QLP) has fulfilled the following training requirements applicable to their job responsibilities: (1) Legal Requirements, (2) SFI Awareness & Best Practices, and (3) Continuing Education. The following list provides some examples of SFI QLP training elements and some common legislative requirements applicable to logging professionals:

Legal Training Requirements

- ▶ Workplace Hazardous Materials Information System (WHMIS) or Global Harmonized System (GHS)
- ▶ First Aid/CPR
- ▶ Mechanical Harvesting Equipment Operator
- ▶ Transportation of Dangerous Goods (TDG)
- ▶ Cutter-Skidder Certification Program

SFI Awareness and Best Practices

- ▶ SFI Principles
- ▶ Species at Risk and Wildlife Protection
- ▶ Water Quality and Riparian Areas
- ▶ Reforestation
- ▶ Visual Aesthetics

Continuing Education

- ▶ CCSIC Continuing Education Training Modules & Tools
- ▶ Tailgate lessons

A QRP is a person who by training and experience can make forest management recommendations (e.g. Pre-harvest assessments, operational prescriptions, MFTIP's, etc.), such as a registered professional forester in Ontario (see the OPFA website at www.opfa.ca for more information).

Contact your SFI Certified CCSIC participant or refer to the following CCSIC website for more details regarding the QLP and QRP program:

<http://www.sficentralcanada.org/qlp.html>

As a landowner you should:

- ▶ **Preference the use of Qualified Logging Professionals**
- ▶ **Ask for references and inspect previous logging operations**
- ▶ **Request a current copy of the contractor's Workers Safety and Insurance Board (WSIB) Clearance Certificate.**
- ▶ **Prepare a contract.**

As a logging contractor, you should:



Hire Qualified Logging Professionals

Accept environmental responsibility on all your operations

Maintain a list of references from previous jobs

h. Developing a Contract

A formal contract should be prepared that addresses issues such as:

- ▶ The use of Qualified Logging Professionals
- ▶ An agreed upon price and wood measuring methodology
- ▶ Which trees are to be cut and wood utilization standards
- ▶ Timing of harvest
- ▶ How the boundary has been marked
- ▶ Responsibility for clean-up, *slash gathering*, trail/road repair, and possible damage to the bark of remaining trees
- ▶ Liability insurance and an arbitration method
- ▶ A strict penalty for cutting trees outside harvest boundary or causing unreasonable damage to the remaining trees

Contact your local SFI participant for advice on how to set up a contract or for a sample contract.

i. Climate Change Awareness

Climate change is defined as a shift in patterns of temperature and precipitation relative to a given reference time period. Many people agree that the earth is currently experiencing anthropogenic (man-made) climate change or accelerated natural climate change. There is still much to learn regarding how climate change will affect forests and the role forests can play in mitigating climate change. SFI participants are required to participate in climate change research for both adaptation and mitigation. The governments of Ontario and Manitoba have been working on strategies to understand, mitigate and adapt to climate change. Refer to the following links for updated information:

<https://www.ontario.ca/page/managed-forests-and-climate-change>

http://www.gov.mb.ca/conservation/climate/about_us.html

4. Watersheds

Watersheds are areas of land where all surface water drains into one body of water. Improper road building or *harvesting* activities may:

- ▶ alter the natural course of water movement
- ▶ adversely affect the quality of water by adding sediment or changing water temperature

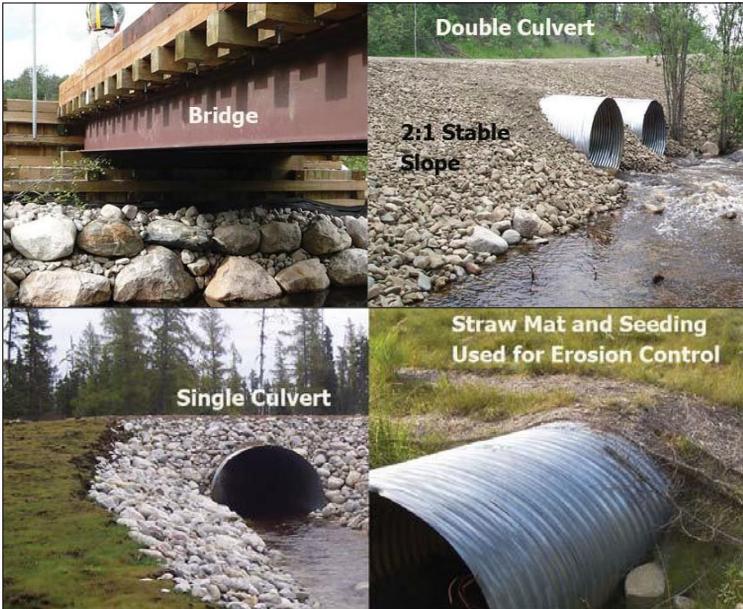
Refer to Sections 7 and 8 for BMPs associated with road construction and harvest operations.

5. Stream Crossings

Permits are required for stream crossings. Stream crossings can have a significant impact on fish *habitat* and water quality. If possible, they should be avoided. If not, proper installation will minimize damage to the streambed and banks and prevent sediment from entering the water. It will also reduce future maintenance costs.

-  Use stream crossings only when necessary; if you must use them, keep them to a minimum.
-  Check for *natural fords* or plan crossings in the winter when frozen conditions prevent *sedimentation*.
-  Avoid areas with sand and silt which can easily erode.
-  Position the crossing where the stream is narrow and cross at right angles.
-  Avoid sloped road approaches to the crossing to minimize *erosion* potential.
-  Avoid bedrock obstructions that prevent placement of a culvert 10% below the streambed; to avoid perching and blockage to fish passage.
-  Avoid locating the crossing immediately adjacent to fish spawning areas.

a. Types of Crossings



Types of crossings.

The type of structure you use depends on:

- ▶ Expected vehicle load
- ▶ Expected life-span of the crossing
- ▶ Time of year the crossing is required
- ▶ Size and shape of the stream; and
- ▶ The topography surrounding the crossing site.

Either permanent or temporary crossings can be used. The decision on which to use depends on the length of time the crossing will be needed.



Temporary bridge.



Permanent culvert.

b. Permits and Approvals



Contact the local Ontario MNRF, Manitoba Conservation office or Conservation Authority to obtain permits prior to any stream crossing construction.

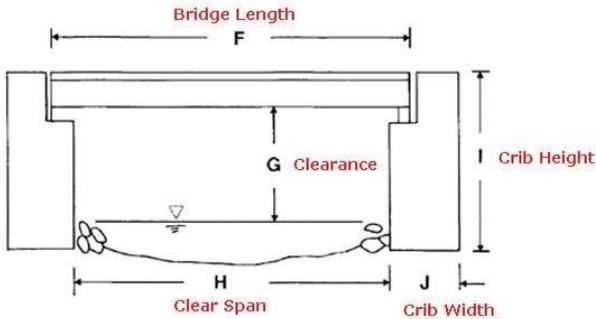
Any work around wetlands and watercourses is regulated by the Conservation Authorities, Ontario Ministry of Natural Resources and Forestry, Manitoba Conservation, the Department of Fisheries and Oceans and Transport Canada. **Permits are required.** Please check the websites below or contact your local offices for more information.

<http://www.conservation-ontario.on.ca/what-we-do/planning-regulations/ca-act-section-28-regulations>

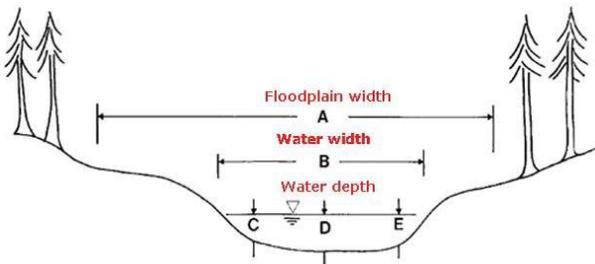
<https://www.ontario.ca/page/wetlands-evaluation>

<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>

<http://www.tc.gc.ca/eng/programs-622.html>



Required information for bridge permit (MNRF Permit Application).



Required information for culvert permit (MNRF Permit Application).

i Plan stream crossings well in advance to ensure required permits and approvals are in place prior to construction. Allow for a minimum of 6-8 weeks for permit approval.

c. Culvert Sizing

Choosing the proper culvert size is very important as it can affect water velocity and fish passage. Using the proper size will also prevent culverts from failing or washing out which can result in costly repairs.

 Estimate culvert length by assuming a 2:1 stable fill slope and using the formula $4 \times \text{fill height} + \text{road width} + 1\text{m}$.

 Culvert slope should not exceed 1%.

d. Crossing Installation and Erosion Control

Minimize *siltation* in the stream bed by following BMPs.

 Adhere to all conditions noted in your permit.

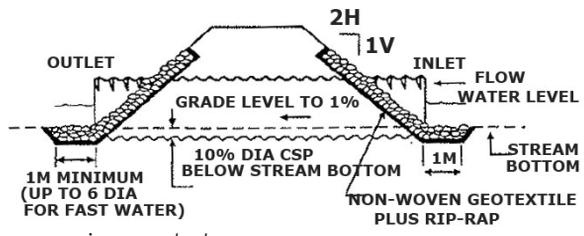
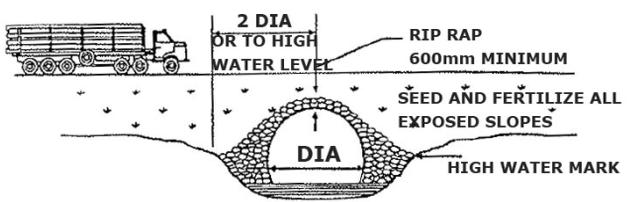
 Minimize *grubbing* and narrow the right-of-way on approaches (average 20m width unless stipulated otherwise).

 Install round culverts 10% below the streambed to avoid perching.

 Compact the fill around culvert for structural integrity.

 Compact at least 0.3m of fill over the culvert to prevent lifting.

- 
 Ensure stable fill slopes at crossing (rule of thumb 2:1 slopes).
- 
 Place cobble or shot-rock within the high-water zone around culvert ends.
- 
 Install check dams &/or diversion ditches on steep approaches to slow, divert and filter run-off.
- 
 Apply shot-rock, tamped uniform cobble, or *erosion blankets* and reclaim seed on fill slopes and approaches with exposed soil.
- 
 Complete installation and *erosion control* measures as quickly as possible to minimize environmental impacts.



Fill slope *erosion control*.



Proper use of rock for *sedimentation control*.



Geotextile used to prevent stream siltation.



Proper sediment control on bridge structure.

e. Decommissioning and Maintenance

-  Remove all temporary crossings at the completion of the harvest activities.
-  Rehabilitate stream beds and approaches.
-  Where crossings are left in place for future use, conduct frequent monitoring to ensure culverts are in good condition and washouts do not occur that could cause debris to enter the stream.

6. Significant Wetlands



Working around wetlands requires a permit from the local Conservation Authority. Contact them before you carry out any work. (Conservation Authorities Act, Reg. 97/04)

In Ontario, any developments on lands adjacent to areas designated as Provincially Significant Wetlands (PSWs), must demonstrate that there will be no negative impacts on the wetlands. Contact your local MNRF office to determine if wetlands on or adjacent to your property have been designated as PSWs.

The Ontario government has an incentive plan that provides tax relief to landowners who agree to protect the natural heritage values of their property. For more information regarding the Conservation Land Tax Incentive Program, please see the website below.

<https://www.ontario.ca/page/conservation-land-tax-incentive-program>



Brush mat used to cross wetland.



Poor landing placement causing heavy *rutting*.

-  If possible, avoid crossing wetlands.
-  Do not use wetlands for processing and landing wood.
-  Utilize frozen conditions, brush mats and *corduroy* if you must cross a wetland.
-  No fuel storage, lubrication or refueling of equipment should occur in these areas.

7. Aggregates and Roads

a. Aggregates

! A licence from MNR is required to operate a pit or quarry on private land in a designated area of Ontario. Contact your local MNR office to find out whether this applies to you and/or to obtain a licence. (Aggregate Resources Act R.S.O. 1990, c. A.8)

You must follow all of the conditions attached to your license. Basic legal operating standards associated with aggregate pits include:

- !** Remove trees within 5m of face.
- !** Maintain stable pit faces to avoid unsafe overhangs.
- !** Height of face should be no greater than 1.5m above the reach of equipment.
- !** Keep roads 15m from face.
- !** Do not undermine roads etc.
- !** Ensure that progressive and final rehabilitation of the aggregate pit is conducted as per the issued permit.



Example of a compliant active aggregate pit.

For more information on aggregate pits and quarries, see the MNRF website below.

<https://www.ontario.ca/page/aggregate-resources>

b. Road Location

Proper road location will reduce your construction and maintenance costs; and minimize disturbance to waterways, and soil erosion.

-  Avoid *rock outcrops* to minimize cost of blasting rock.
-  Utilize *saddles* between *rock outcrops* to cross *ridges*.
-  Utilize *benches* to locate *junctions, switchbacks* and *landings*.
-  Avoid *stream crossings* and *wetlands*, if possible.

c. Right-of-way Clearing

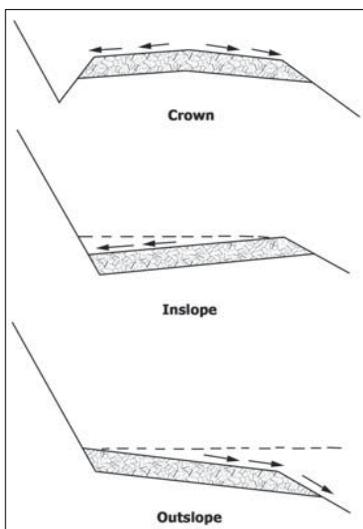
-  Contact the Ministry of Transportation or Municipality for approval to establish an access point along a public road right-of-way. (Public Transportation and Highway Improvement Act, R.S.O. 1990, c. P.50)
-  Contact the utility agencies (e.g. hydro, pipelines, water, sewage) for approval to cross utility right-of-ways.

-  Ensure right-of-way is wide enough for intended use with sufficient pull-offs and turn around locations.
-  Narrow right-of-way to <20 m on approaches to stream crossings.
-  Control clearing width by marking sidelines.
-  Salvage *merchantable timber* from right-of-way clearing
-  Incorporate *slash* and *stumps* into the sub-grade.
-  Place clearing debris in a manner that will not impede water flow or potentially increase *sedimentation* of waters.



d. Construction

- 🌲 Construct the road during dry periods or when the ground is frozen.
- 🌲 *Grubbing* should not proceed too far ahead of construction.
- 🌲 Swamps should not be grubbed; shear off stumps.
- 🌲 Minimize *grubbing* in areas with fine soils.
- 🌲 Decrease work during wet periods.
- 🌲 Build roads in advance of heavy use to allow for settling.
- 🌲 Shape roads to drain water off the road surface using a crown, an *out-slope*, or an *in-slope*.
- 🌲 Install drainage structures, as construction proceeds.
- 🌲 Excavate cuts uphill to improve drainage.
- 🌲 Combine elevating the grade with ditching.
- 🌲 Use clean granular material in fills near water.
- 🌲 Use *geotextile* material combined with *corduroy* &/or pit run gravel over moist, soft soils (i.e. peat, silt or clay).
- 🌲 Use silt fences or hay bales to slow water flows and trap sediment during construction.



Crowned roads may be used on all terrains. Water *turnouts* and cross drains must be provided. Out-slopped roads may be built on moderately sloping terrain. They are not suitable for deeply cut side-hill roads or in locations where upslope drainage areas are large. *In-sloped* roads may be used on sharp, steep turns as a safety precaution.

Road surface cross-sections.

<http://srdc.msstate.edu/02value/production/wood/ok/roadconstruction.pdf>

e. Road Maintenance

It is the landowner's responsibility to maintain roads after logging is completed. Inactive roads, whether closed temporarily or permanently, require occasional work to reduce potential impacts on streams, lakes, wetlands and seasonal ponds.

-  **Avoid plugging culvert ends and filling ditches during grading by not grading over the edges of the road**
-  **Regularly inspect ditches, culverts, *turnouts*, dips, and *water bars* for blockage and restore to working condition**
-  **Re-shape ditches as needed, and stabilize with *erosion control mats* and reclaim seed mix**
-  **Limit road use during wet seasons**
-  **Grade road surfaces only when necessary to eliminate *rutting* and surface *erosion channels***
-  **Avoid leaving grader berms that channel water and cause washouts.**

8. Harvesting Operations

Your harvest operation starts at the planning stage. For details regarding pre-harvest planning, refer to Section 2 Pre-Harvest Planning.

a. Environmental Protection

Site Disturbance

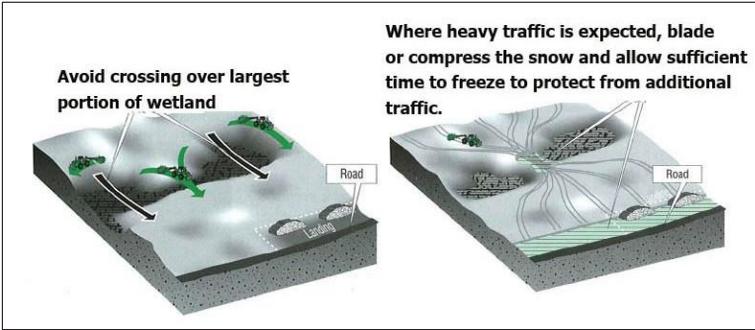
Identify sensitive areas that are prone to site disturbance (e.g. *rutting, erosion, compaction*) and apply the following BMPs:

-  **Minimize roads, skid trails & landings.**
-  **Keep skid trails to upland routes.**
-  **Avoid advanced regeneration.**
-  **Reduce skidder and forwarder load size.**
-  **Reinforce soft, wet areas with brush-mat or corduroy.**
-  **Consider using high flotation tires on skidders.**
-  **Monitor operations during wet periods and adjust operations accordingly.**
-  **Operate on moist, lowland areas during frozen or drier summer conditions.**
-  **Avoid skidding or site preparation over rocky shallow soils.**
-  **Avoid or minimize bulldozing landing areas on shallow soil sites.**
-  **Retain residual trees, organic matter and surface vegetation on steep slopes (e.g. over 30% slope).**

Operators can sometimes use the presence of certain plants as *indicators* of subsurface moisture and drainage of soil. Pines generally prefer drier upland areas, while Black Spruce, Eastern White Cedar, Black Ash Larch and Speckled Alder prefer wet or moist sites.



Examples of sites with elevated potential for negative site impact.



Best practices for minimizing *rutting* (Source: FERIC).



Poor timing of *skidding* leading to excessive *rutting*.

Values Protection

Consider the following BMPs to ensure the protection of identified values:

-  **Avoid damaging residual seed trees.**
-  **Leave dead standing trees and trees containing nests or dens to provide for critical species habitat.**
-  **Consider leaving standing trees adjacent to property boundaries to address neighbours' aesthetic concerns.**
-  **Leave standing trees adjacent to riparian areas.**



Physical damage on residual seed tree.

b. Harvesting Prescriptions and Equipment

Full Tree Harvesting: Trees are mechanically harvested using a *feller buncher* and skidded to roadside using *grapple skidders*. All processing is done mechanically at roadside. This system is the most productive however requires several pieces of heavy equipment (*feller buncher, skidder, delimeter & slasher or chipper*) to execute. Limbs, tops and un-merchantable pieces are left at roadside requiring management following the completion of harvest operations (chipping debris left behind at roadside following in-bush chipping operation). See section 9 for further details on slash management options.





Feller buncher used in full tree harvest operation.



Roadside chipping operation.

Cut-to-Length: A cut-to-length harvest system involves the processing of trees (cutting, *delimiting* and *bucking*) at the stump with *bucked timber* being forwarded to roadside. The use of modern *forwarders* and *brush-matting* techniques can reduce potential *rutting* and site impact. This system aids *natural regeneration* because the cones containing the tree seeds are left in the *cut-block*.



Cut to length operation.

Cut & Skid: Trees are manually *felled* using chainsaws and skidded to the roadside using cable *skidders* or horses. *Delimiting* and *topping* of trees is done in the *cut-block* and skidded trees are bucked at the roadside.



Cut and skid operation.

Seed Tree & Strip Cuts: The prescription of *seed tree* and alternate strip cutting systems can provide certain benefits to the land owner. Strip cutting involves a two-pass harvest allowing harvested strips to be naturally seeded by the *leave strips*. A continuous dispersal of seeds and the good, natural seedbed of sphagnum moss found on lowland black spruce sites makes this forest type suitable for strip cutting.

The *seed tree* system involves leaving mature trees with the best genetic traits behind to naturally seed the areas harvested. This system is particularly suitable for harvest areas that contain significant amounts of white and red pine. The rule of thumb is to leave approximately 25 trees/ha or 20m spacing between leave trees. Consider retaining red and white pine *seed trees* for aesthetics, old growth representation, *biodiversity* and as wildlife trees for nesting & perching. Once *regeneration* is established, owners can carefully log the *seed trees*.



Red and White Pine seed trees.



Strip cutting system.

CLAAG: CLAAG stands for 'Careful Logging Around Advance Growth'. This system is best applied to lowland black spruce sites which typically exhibit significant amounts of advanced *conifer regeneration*. These areas are usually logged during the winter months to minimize *rutting* and damage to *advanced regeneration*.



CLAGG.

Commercial Thinning: This practice refers to the removal of roughly 40% of a stand's volume by selectively *harvesting* trees using careful logging techniques and experienced equipment operators. Not only does commercial *thinning* allow access to timber prior to stands becoming fully mature, but the stand openings created by the partial harvest benefit the remaining trees leading to increased diameter growth and *merchantable* stand volume. An effective commercial *thinning* operation requires careful planning and assessment by resource professionals.



Processor used for commercial *thinning*.



Commercial *thinning* before & after.

c. Wood Utilization and Wasteful practices

Adherence to the following BMPs will ensure maximum fiber utilization and minimize wasteful practices.

-  Do not leave any *merchantable timber* behind.
-  Keep stumps low (generally no higher than 30 cm) and cut trees to full potential length to get maximum utilization.
-  Haul all processed wood from the cut block to the processing destination.
-  Educate yourself on all of the markets available to you (e.g. lumber, pulp, *biomass*, etc) to make the most of your woodlot.
-  Confirm the wood quality specifications with the destination mill.
-  Do not leave partially cut trees hung up (*widow makers*).



Example of a high stump



Wasteful practice.

i. Biofibre/Biomass Harvest

Increasingly today, biofibre or biomass is the main product (e.g., low-grade poor-quality stand) or a by-product (e.g., tops, branches, culled logs, roadside logging debris) of a harvest operation. The same best management practices apply when harvesting biofibre as would apply to any SFI conforming harvest operation. In addition, it is not normally recommended to harvest or remove stumps and below ground portions of the trees (i.e. roots).

d. Adverse Weather

Adverse weather conditions can create safety and environmental hazards. Be aware of changing conditions:

- ▶ Avoid soft sites during extended wet periods
- ▶ Heavy rain/wet soil can lead to rutting, road erosion and washouts – avoid susceptible areas, maintain and inspect roads
- ▶ Extended hot/dry weather will increase fire risk – monitor conditions, consider moving to less susceptible forest types or shutting down
- ▶ High wind can cause trees or branches to break off and fall – use caution especially in partial or manual cutting systems

9. Post Harvest & Renewal

Following *harvesting* activities, landowners should follow best practices with respect to *slash* management, *decommissioning* of road access and forest renewal.

a. *Slash Management*

- ▲
Develop a plan for the management of logging *slash*, which could include the following options:
 - Grinding for biomass fuel production
 - Piling and controlled burning of *slash*
 - Re-distribute chipping debris on the harvested area.
- ▲
Keep *slash* free of contamination for potential grinding.
- ▲
Contact Municipality & MNR for rules regarding burning of *slash*.



Un-managed *slash* and chipping debris.



Slash management options.

b. Decommissioning of Roads and Water Crossings

- 🌲 Consider *decommissioning* landings, roads and water crossings following the completion of harvest activities.
- 🌲 Timely *decommissioning* of access eliminates liability/ safety concerns and potential trespassing issues.
- 🌲 If *site preparation* is being conducted following harvest, scarification of the road (perpendicular to the road) can effectively restrict vehicle access.
- 🌲 When removing water crossings owners should ensure soil stability using boulder rip-rap, *erosion control* mats and seeding.
- 🌲 *Erosion* and *sedimentation* into water courses must be avoided.





Decommissioned water crossings.

c. *Renewal*

To ensure long-term sustainability of the forest, landowners should consider their forest renewal options. *Regeneration* can be accomplished through “natural” means (natural seeding, root suckering, branch-layering, etc.) or “artificial” methods (planting trees, direct or aerial seeding). An investment in *silviculture* will not only secure future forests but also may present some immediate benefits in terms of land tax credits (MFTIP).

Natural Regeneration

The following BMPs should be considered to achieve optimal *natural regeneration* following harvest:

-  Consider *harvesting deciduous* and mixed wood stands during the winter to increase *suckering* potential.
-  Consider using a strip-cut harvest system on lowland spruce sites to promote natural *conifer* seeding in cut strips.
-  Consider using a Seedtree or Shelterwood harvest system in White and Red pine dominated stands to promote natural pine regeneration.
-  Consider redistributing cones into the cut-over or utilizing a cut-to-length harvest system on Jack Pine dominated sites to promote natural seeding.

Artificial Regeneration

If you want greater control over the *species* that will be established, you may want to consider *artificial regeneration*. The following BMPs should be considered when planning artificial renewal efforts.

-  **Species selection for planting should be similar to the trees that were harvested.**
-  **Conduct renewal immediately following harvest to assist desired crop trees to progress ahead of the competition.**
-  **Use scarification techniques to improve planting ease, crop establishment, survival rates and suppression of competing species.**
-  **Utilize local seed sources for seed and planting stock to ensure seedlings are adapted to the local climatic conditions. Refer to the MNR website for Ontario Seed Zones.**
-  **Planting should take place during May and June to promote proper root establishment and bud formation for the following growing season.**



Silvicultural treatments and results.

10. Hazardous Material

a. Fuel Handling & Storage

The Ontario Liquid Fuels Handling Code (LFHC) regulates the handling and storage of fuels including gasoline and diesel fuels commonly used on forest operations.

-  Tanks, hoses, pumps, and nozzles must be ULC approved.
-  6A80BC fire extinguisher and spill kit required at all refueling locations.
-  All containers must be labeled with their contents.
-  Automatic shut-off nozzles are required.
-  Protect tanks from vehicular traffic.
-  Park tank more than 4.5 m from buildings.
-  Use parking brake or chock block the wheels.
-  Park at least 30 m from water.

Fuel Handling is regulated by:

- ▶ Transportation of Dangerous Goods Act (Federal)
- ▶ The Dangerous Goods Transportation and Handling Act (MB)
- ▶ The Environment Act (MB)
- ▶ Dangerous Goods Transportation Act (ON)
- ▶ Technical Standards and Safety Authority Act, Liquid Fuels Handling Code (ON)
- ▶ Environmental Protection Act (ON)

b. Transportation

Federal regulations governing the Transportation of Dangerous Goods (TDG) require you to use approved containers, meet certain labeling and training requirements for transporting fuels dependant on the size of your fuel container and total volume of fuel on board. These rules apply on all public roads in Ontario.

Contact your SFI participant or the local O.P.P. if unsure of the regulations.

Transportation of Diesel (UN 1202) and Gasoline (UN 1203):

Jerry Cans:

- ⚠️ Secure containers to prevent accidental release.
- ⚠️ CGSB or CSA approved containers required for storage and transport.
- ⚠️ No TDG labels, training or documentation required if containers are $\leq 30L$ and total number of containers on board ≤ 150 Kg.

Mobile Refueling Tanks ($\leq 450L$):

- ⚠️ Secure containers to prevent accidental release.
- ⚠️ Gasoline (UN 1203) requires:
 - CGSB or UN approved containers required for transport & storage
 - One visible TDG (UN 1203) placard required
 - No TDG training or documentation required

Note: Diesel (UN 1202) is exempt from tank specifications and TDG labeling, training and documentation requirements.



Fuel tank with appropriate markings and tiedowns.

Mobile Refueling Tanks (Greater than 450L and \leq 2000L):

- ⚠️ Secure containers to prevent accidental release.
- ⚠️ CGSB or UN approved containers required for transport & storage.
- ⚠️ Tanks require internal & external inspection by Transport Canada registered facility every 5 years.
- ⚠️ Four visible TDG placards required per container.
- ⚠️ No TDG training or documentation required if total volume of containers on board $<$ 2000L.

Mobile Refueling Tanks (Greater than 2000L):

For legal information regarding the use or transport of larger capacities contact your SFI participant or the O.P.P. or R.C.M.P. in Manitoba.



Class 3 label with UN number for diesel & gasoline.

Compressed Gases (\leq 5 cylinders and total weight $<$ 500 kg):

Includes transport of Acetylene (UN 1001), Oxygen (UN 1072), Propane (UN 1978), Air (UN 1002), Argon (UN 1006), Methylacetylene & Propadiene Mix (UN 1060).

- ⚠️ Secure upright in open vehicle, with safety caps.
- ⚠️ One visible TDG label on shoulder of each cylinder.
- ⚠️ No TDG training or documentation required.

For legal information regarding the transportation of larger volumes of compressed gases, contact your SFI participant or the O.P.P.



Class 2 labels for compressed gases (UN number must accompany label).

c. Waste Management & Disposal

If you generate or store waste oil that is more than 5 kg or 25 litres in any one month of a calendar year, you are required to register with the Ministry of Environment (MOE) as a waste generator.

Refer to the following HWIN website for registration process:

<http://www.hwin.ca>

! MOE registered carriers & receivers must be used to dispose of waste oil & lubricants. Contact the local MOE to determine nearest registered waste carrier &/or receiver.

! Waste oil volumes greater than 500 L must be stored in UL or UN approved tank.

! Collect waste oil and lubricants in closed containers, which are in good condition and properly labeled.

! Return pails and recyclables to your supplier where available, or dispose of empty waste oil pails and grease tubes at approved waste disposal sites.

11. Health and Safety

Logging Contractors must adhere to the following Occupational Health & Safety regulations:

-  **Must have a documented Health & Safety Policy.**
-  **Employees must meet training certification for cut & skid or mechanical *harvesting* as required.**
-  **Must have documented and functional machine lockout protocol.**
-  **Must ensure personal protective equipment is worn (i.e. hardhat, CSA safety boots, eye, hand, and hearing protection, and fall arrest for hazards above 3 m).**
-  **Must have Worker Safety and Insurance Board (WSIB) clearance.**
-  **Must meet first aid kit and inspection requirements under Regulation 1101.**

Refer to the CCSIC website for details regarding the legal requirements for Qualified Logging Professionals (QLP):

<http://www.sficentralcanada.org/qlp.html>

-  **As a landowner or contractor, make every reasonable effort to ensure work is carried out safely.**
-  **If hiring a contractor, ensure they are qualified under the Occupational Health and Safety Act and that they have a WSIB Clearance Certificate.**
-  **If you are doing the work yourself, follow safe work practices, including wearing the proper protective equipment.**
-  **Never conduct harvest operations alone.**

12. Emergency Preparedness & Response

a. Spills

⚠ Under the Ontario Liquid Fuels Handling Code, a spill kit must be available at all points of refueling.

⚠ Do not refuel within 30 m of streams, lakes, or wetlands.

Spills involving petroleum-based products (e.g. fuel & oil) can have a significant impact on the environment and the animal and plant species. Operators should follow BMPs to prevent and minimize impacts.

- 🌲 **Ensure that machinery is well-maintained.**
- 🌲 **Ensure operators know the location of spill kits and have spill response training.**
- 🌲 **Use absorbent pads during maintenance and repair activities.**



Oil leaking from machinery.

Large spill kits

Are recommended at re-fuelling stations and at significant water crossing construction sites. Contents should consist of:

- ▶ Minimum of 10 oil only absorbent pads
- ▶ One roll of flagging tape
- ▶ Disposable rubber gloves
- ▶ Six heavy duty plastic bags
- ▶ One disposable plastic suit
- ▶ One container of "Plug N' Dike" dry granular compound
- ▶ Minimum of 20 feet of oil only absorbent boom (typically comes in 3' or 4' lengths).
- ▶ Approximately 20 ft of rope to attach booms together.

Small spill kits

Are recommended in all vehicles and machinery. Contents should consist of:

- ▶ Minimum of 10 oil only absorbent pads
- ▶ Disposable rubber gloves
- ▶ One plastic bag

When dealing with spills practice the four C's:

1. **Control:** Ensure that the source of the spill is eliminated; shut off equipment.
2. **Contain:** Dam or block spilled product from entering the soil or waterways.
3. **Contact:** Ensure that any immediate supervisors and/or spill reporting agencies are contacted.
4. **Clean Up:** Ensure that all contaminated material is cleaned-up as per MOE instructions.



All spills of any amount, in water or on land, must be reported as soon as possible to:

- **Ministry of the Environment and Climate Change (MOECC) Spills Action Centre (SAC)**
- **Municipality, if affected**
- **O.P.P. (Ontario) and Canutec (Canada), if on a public road.**

Reporting Spills

ON 1-800-268-6060 (MOE Spills Action Centre)

MB 1-204-945-4888 (Environmental Accident Reporting)

b. Fire

The Forest Fire Prevention Act applies to private land. The following is a summary of the major issues that would apply to any work on private land; however, it is the responsibility of the landowner to ensure compliance with all parts of the regulation.

-  Ensure that serviceable fire suppression equipment is available on site. Each machine is required to have one serviceable fire extinguisher (6A80BC). Extinguishers are required to be inspected monthly and yearly. Additional internal inspection every 6 years and hydrostatic testing every 12 years.
-  No person shall smoke while walking or working in a forest or woodland during the fire season.
-  No person shall throw or drop, in or within 300 meters of a forest or woodland, a lighted match, cigarette, cigar or other smoking material; live coals; or hot ashes.
-  Ensure that all welding and torch work is performed on mineral soil and that sufficient fire suppression equipment is readily available (6A80BC fire extinguisher required by the FFPA).
-  No person shall use or operate in or within 300 meters of a forest or woodland any burner, chimney, engine, incinerator or other spark-emitting outlet that is not provided with an adequate device for arresting sparks.

Report all fires to the Ontario Ministry of Natural Resources and Forestry:

- **Call: 310-FIRE**

During the fire season from April 1st to October 31st consider implementing the following fire safety BMPs, particularly during moderate to high hazard conditions:

-  **Ensure adequate communication between operators and emergency contacts.**
-  **Inspect fire extinguishers daily.**
-  **Train employees in the use of fire suppression equipment.**
-  **Consider short shifting or shutting down operations, when conditions warrant.**
-  **Patrol for 1 hour after operations shut-down.**
-  **Have a documented emergency fire response plan that includes fire reporting phone numbers.**
-  **Keep machines clean of flammable debris.**

Appendix 1: Additional Sources of Information

Ontario Woodlot Association

<http://ontariowoodlot.com/>

Ontario Forestry Association

<http://www.oforest.on.ca/>

A Guide to Stewardship Planning

<https://www.ontario.ca/document/sample-stewardship-plan-guide-stewardship-planning-natural-areas>

Manual for Environmentally Responsible Forestry Operations in Ontario Available from:

The Lake Abitibi Model Forest
P.O. Box 129
143 3rd. St. Cochrane, Ontario, P0L 1C0
Canada
Tel.: 705-272-7800
Fax: 705-272-2744

Ontario Professional Forester's Association

<http://www.opfa.ca/>

FPInnovations

<https://fpinnovations.ca>

Ontario Ministry of Natural Resources and Forestry

<https://www.ontario.ca/ministry-natural-resources-and-forestry>

Appendix 2: Glossary

ADVANCED REGENERATION

- Trees that have become established naturally under a mature forest canopy and are capable of becoming the next crop after the mature crop is removed

AGGREGATE

- Any combination of sand, gravel, or crushed stone in a natural or processed state

ARTIFICIAL REGENERATION

- The establishment of a group or stand of young trees created by direct seeding or by planting seedlings

BENCHES

- A level shelf of land interrupting a downward slope (with steep slopes above and below)

BIODIVERSITY (BIOLOGICAL DIVERSITY)

- The variety and variability among living organisms and ecosystems
- Includes differences within and between ecosystems, differences between species and differences between members of the same species
- A high level of diversity within a species, which is known as genetic diversity, helps the species survive massive climatic and environmental changes, such as those created by pollution or global warming
- Ecosystems with a high level of diversity are more stable and support a greater number of life forms

BIOMASS

- Renewable organic materials, such as wood, agricultural crops or wastes, and municipal wastes, especially when used as a source of fuel or energy

BLAZE

- A mark on a tree, usually painted or a cut in the bark. Often used to delineate forest properties along the boundary lines

BUCKING/BUCKED

- Cutting trees into shorter lengths, such as logs or cordwood

BUFFER

- A narrow zone or strip of land, trees or vegetation bordering an area

BRUSH-MATTING

- A re-vegetation technique that provides a protective vegetative covering to a slope as soon as it is installed

CHIPPER

- A machine used to convert full tree stems into wood chips suitable for use in a pulp mill.

CONIFER

- A tree which is "evergreen." It has cones and needles or scale-like leaves that are usually retained throughout the winter
- Examples include spruce, fir, pine cedar and larch
- The wood of conifers is referred to as "softwood"

CORDUROY

- A road comprised of logs laid side by side, generally used over low lying swamp

CUT-BLOCK

- A specific area, with defined boundaries, authorized for harvest

DECIDUOUS

- A tree which sheds its leaves annually
- Examples include poplar, birch, and maple

DECOMMISSIONING

- To dismantle or remove from service

DELIMBING

- The process of removing side branches from the stem of a felled tree

DELIMBER

- A machine used to remove side branches and the tree top from the stem of a felled tree

EROSION

- The wearing away or removal of land or soil by the action of wind, water, ice or gravity

EROSION CONTROL

- The practice of preventing or controlling wind or water erosion in forestry. This usually involves the creation of some sort of physical barrier, such as vegetation or rock, to absorb some of the energy of the wind or water that is causing the erosion

FELLER BUNCHER

- A harvesting machine that cuts and fells a standing tree with shears or a saw and then piles it

FELLED

- Trees that have been cut and laid on the ground

FORWARDER

- A machine used to carry cut logs from the stump to roadside, usually paired with a processor

GEOTEXTILE

- A recently-developed product used as a soil reinforcement agent and as a filter medium. It is made of synthetic fibres manufactured in a woven or loose non-woven manner to form a blanket-like product. It is normally supplied in rolls that would cover four metres wide by 100 metres long (15 by 300 feet)

GRADE

- The elevation of the top of the finished road is called grade or profile grade. The longitudinal cross-section of a road showing the elevation at various points along the length of a road is called the road profile

GRUBBING

- Removal of stumps, roots, embedded logs, organics, and unsuitable soils before or concurrently with subgrade construction

HABITAT

- Food, water, shelter, cover and other elements of the environment that living organisms need to survive

HARVESTING

- The process of cutting trees to make wood products or fuelwood

HARVESTING PRESCRIPTION

- Detailed plan on how, when, and where timber will be harvested from an area

INDICATORS

- Species of plants used to predict site quality and characteristics

IN-SLOPE

- Shaping the road surface to direct water onto the cut side of the road



INVENTORY

- A survey of a forest area to determine such data as area, condition, timber, volume and species for specific purposes such as planning, purchase, evaluation, management or harvesting

JUNCTIONS

- A place where two roads (or two skid trails) meet

LANDINGS

- An area where cut timber is piled before slashing and/or haulage

LEAVE STRIPS

- Strips of trees remaining on a harvesting area as result of a predetermined silvicultural prescription such as strip-cutting
- The harvested areas will be naturally seeded by the trees in the leave strips

MERCHANTABLE TIMBER

- The part of a tree or a stand that is of commercial value for products such as lumber and veneer
- Determined by tree size and quality
- Usually a tree must be at least 10 centimetres in diameter to be considered merchantable

NATURAL FORDS

- A place in a watercourse in a stream or river that is shallow enough to be crossed by wading

NATURAL REGENERATION

- The renewal of a forest stand by natural seeding, sprouting, suckering, or layering. Seeds may be deposited by wind, birds or mammals

OUT-SLOPE

- To shape the road surface to direct water away from the cut slope side of the road

PROCESSOR

- Machine used to fell standing trees, delimb and cut them to log length at the stump, or to process trees into logs at roadside

REFORESTATION

- Establishing a new forest after the trees are cut

REGENERATION

- The process by which a forest is reseeded and renewed

RESIDUAL TREES

- The trees remaining intact following any cutting operation

RIDGE

- A long, narrow elevation of land

RIPARIAN

- Related to, living in, or located in conjunction with a wetland, on the bank of a river or stream or at the edge of a lake or tidewater

ROCK OUTCROPS

- The part of a rock formation that appears above the surface of the surrounding land

RUTTING

- Tracks in the soil resulting from the passage of heavy equipment

SADDLES

- A ridge connected two higher elevations; a low point in the crest line of a ridge

SEDIMENTATION

- The process of subsidence and deposition by gravity of suspended matter carried in water; usually the result of the reduction of water velocity below the point at which it can transport the material in suspended form

SEED TREE

- A mature tree left uncut to provide seed for regeneration of a harvested stand

SHALLOW SOILS

- Soil that is not deep and has little room for water storage. It may also be easily moved by the weather

SILTATION

- The process of becoming clogged with fine sediments

SILVICULTURE

- The science of growing trees

SITE PREPARATION

- The treatment of the soil and ground vegetation to prepare the soil surface as a favorable seedbed for either naturally or artificially disseminated seed or for planted seedlings

SKIDDER

- A rubber-tired machine with a cable winch or grapple used to drag logs out of the forest

SKIDDING

- The act of moving trees from the site of felling to a leading area or landing. Tractors, horses, or specialized logging equipment can be used for skidding. Skidding methods vary in their impact on soils and the remaining stands

SLASH

- Branches and other woody material left on a site after logging

SLASH GATHERING

- Gathering branches and other residue left on a forest floor after the cutting of timber

SLASHER

- A machine used to cut full trees into log lengths, usually at roadside

SPECIES

- A group of plants, animals or other life forms that can interbreed

STAND

- A group of trees that can be distinguished from other vegetation by its composition, age, arrangement or condition

SUCKERING

- A secondary shoot produced from the base or roots of a woody plant that gives rise to a new plant

SWITCHBACKS

- A sharp bend in a road or trail on a steep incline

THINNING

- Removing some trees from a stand
- Decreases the density of a forest, reduces competition and gives the remaining trees room to grow larger and faster

TOPPING

- Cutting off un-useable tree crown

TURNOUT

- The extension of an access road's drainage ditch into a vegetated area to provide dispersion and filtration of stormwater runoff

WATER BARS

- Transverse ditches excavated in the surface of an abandoned road to divert surface flow towards the roadside ditches



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