



Manitoba Conservation and Water Stewardship
Forest Practices Guidebook

BIOMASS MANAGEMENT

First Published: March 2005

Revised: January 2015

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Copies of this publication are available at:

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

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The public is encouraged to send any comments and/or recommendations to

forestguidelines@gov.mb.ca.

Preface

Manitoba Forest Practices

This guidebook has been developed as part of Manitoba Conservation and Water Stewardship's Forest Practices Initiative. Led by the Forestry Branch, this guide provides direction for resource managers, timber operators, natural resource officers and auditors when conducting or assessing forestry activities.

A primary goal of the initiative is to advance best practices using guidelines and standards for sustainable forest management activities in Manitoba. These guidelines present alternative procedures or standards that can be applied to satisfy principles the guidelines are based on. Guidelines are then used to develop prescriptions. Specific guidelines are enforceable when included as conditions of an Operating Permit and/or Work Permit. Forest practices guidebooks ensure all forest resource values are appropriately addressed for the full range of forest activities.

Forest practices guidebooks are references available for resource managers, timber operators, natural resource officers and auditors. Others include provincial guidelines, forest management plans, operating plans and standard operating procedures, which are developed independently by each forest industry company.

Committee membership consists of members from Manitoba Conservation and Water Stewardship branches, one regional resource manager, one forest industry member from each Forest Management Licensees, Spruce Products Ltd and the Department of Fisheries and Oceans. Standing invitations have been extended to the Forest Industry Association of Manitoba (FIAM) representing quota holders, the Manitoba Model Forest and Ducks Unlimited. Committee members co-operate in a consensus seeking manner to develop forest practice guidebooks.

Each guidebook has a complete set of guidelines for a specific forest practice, pertinent references to science, legislation, policy, agreements and licences, as well as recommendations for the planning, implementation, monitoring and enforcement of this forest practice.

The recommendations, as much as possible, are:

- measurable
- practical
- based on scientific evidence, traditional knowledge and collective experience
- flexible and applicable in a variety of ecological conditions
- clearly presented for consistent interpretation and application
- supported by technical terminology and definitions

Forestry practices in Manitoba are continuously monitored and appropriately amended when necessary. Guidebooks are reviewed every five years or earlier, if required.

Guidebooks can be found on the Manitoba Conservation Forestry and Peatlands Management Branch website:

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

The public is encouraged to submit comments and recommendations to forestguidelines@gov.mb.ca.

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Biomass Management

Purpose

The purpose of this document is to provide guidelines for the effective management of biomass that accumulates during the course of timber harvesting operations.

Background

In Manitoba, limbing within the harvest block is preferred and considered to be the best practice. Table 1 provides an explanation of why limbing within the block is the preferred practice for dealing with tree limbs and tops.

Prior to 1993 full tree timber harvesting operations, with bucking and limbing at roadside, were generating excessive amounts of slash along roadsides. Debris piles were not being managed adequately. In order to improve debris management Forestry Branch Circular FEM 18 *Biomass Management All Timber Harvesting Operations* came into effect May 1, 1993. This policy required limbing within the harvest block, as near as possible to the stump, in all situations. Forestry Branch and forest industry representatives reviewed the policy in 2000 and an amendment was produced describing acceptable reasons to deviate from the Biomass Management policy.

This guidebook has been developed to address those sites where in-block limbing may not be the most appropriate action. On these sites alternative procedures and flexibility are preferred. This Biomass Management Guidebook has replaced the Forestry Branch Circular C-3 (FEM 18) entitled *Biomass Management All Timber Harvesting Operations November 2002*. The Biomass Management guidebook has been reviewed and revised in 2012. A new section dealing with chipper debris has been added.

Goal

To actively manage the impacts of debris accumulated during timber harvesting.

Objectives

The objectives of the biomass management guidelines are to:

- maintain soil fertility and site productivity
- minimize heavy accumulations of debris that result in loss of productive land
- enhance silvicultural activities and reduce pest concerns on a site-specific basis
- enhance the potential for natural regeneration
- protect understory regeneration, advanced growth or retained tree cover
- reduce fire hazard
- incorporate cover for small wildlife species
- enhance economic viability of a harvest operation

- make residual wood available for fuelwood
- support renewable alternative energy sources
- facilities that are using standing green timber for energy production should be encouraged to use logging debris, if available from a similar distance to the facility
- in “TomorrowNow – Manitoba’s Green Plan” there are numerous references to biomass. One of these references, “Manitoba will work with the forest industry to increase the use of woody debris from forest harvest operations to produce biomass for emerging biofuel and bioenergy markets, creating a climate for investment and business development”.

In-Block Limbing

The preferred biomass management method will continue to be in-block limbing where trees are limbed and topped within the harvest block, as near as possible to the stump. Whole tree harvesting, or the removal of branches and foliage from the site, can have a negative effect on the balance of the soil nutrient budget and forest renewal. The in-block method of biomass management allows for the movement of harvested trees to facilitate efficient limbing and topping and/or to move equipment off of unsafe or fragile ground. Examples of this include: aligning bundles of trees in rows, moving trees and equipment off steep, rocky terrain, or moving trees and equipment away from the trees that will not be harvested. In these instances, debris should be spread, back in the block, to a depth that will not restrict silvicultural activities.

Table 1 Why in-block limbing is preferred

Stand Type/Site Condition	Why In-block Limbing is Preferred
All sites	- large debris piles at roadside lead to a loss of productive land - debris piles may cause an increased fire risk due to unauthorized/accidental burning - improper burning of debris piles may cause an increase in fire hazards - maintaining coarse woody debris is important for maintaining biodiversity - promotes soil fertility
Jack pine and upland spruce sites	- promotes natural regeneration, lack of cone bearing slash decreases natural regeneration
Shallow soils or coarse textured dry sites (frequently dominated by jack pine)	- promotes natural regeneration, lack of cone bearing slash decreases natural regeneration - attempting to mitigate road-side limbing by spreading slash may increase traffic, which would negatively effect survival and productivity on dry, fragile sites - promotes soil fertility



Figure 1 In-block limbing

Debris Management Alternatives

Alternatives to in-block limbing must be in the operating plan or approved by the Integrated Resource Management Team (IRMT). Using alternatives to in-block limbing include strategies that leave fines and tops that meet the intent of in-block limbing.

Where limbing within the harvest block, as near as possible to the stump, is not appropriate, other debris management strategies will be recommended. When determining how to manage slash within the harvest block, consideration must be given to:

- the type of reforestation method to be used
- slash loading impacts on regeneration
- site sensitivity to nutrient loss
- wildlife habitat and travel
- the potential for escaped fires or fire spread

In general a combination of biomass utilization, spreading some material on tertiary roads and landings and burning some of the remaining accumulations is preferred over burning all piles at roadside. Biomass spread on tertiary roads and landings assists in vegetating the site by keeping trucks and all terrain vehicles off the compressed soils.



Figure 2 Slash piling

Stand Type/Site Conditions Which May Necessitate Alternative Debris Management

Upland softwood and mixedwood forest stands

When assisted regeneration is prescribed and there is a concern that excessive slash loading would obstruct silvicultural activities like site preparation and planting.



Figure 3 Excessive slash loading.

Softwood pockets within hardwood forest stands

Limbing debris may contribute to soil cooling and obstruct natural softwood regeneration. Limbing debris may contribute to heavy slash reducing the opportunity for an area plant. The application for this deviation must be accompanied by an indication of the number of seedlings to be planted, the approximate area to be planted and a map or photograph showing the location of proposed planting areas.

Black spruce forest stands on deep organic soils and/or semi-permafrost

On these site types roadside delimbing is considered the preferred biomass management prescription provided that there is an adequate standing black spruce seed source that is capable of regenerating the majority of the site. The reason this prescription is preferred is because limbing debris may negatively affect microsite development (moss) and contribute to excessive cooling of the soil.

Sites with significant understorey

When in-block limbing could damage understorey trees, or limbing debris would interfere with understorey growth refer to the *Protection of Softwood Understorey Guideline* (2010).

In-Bush Chipping Operation - Chipper Debris

Where in-bush chipping occurs or chipper wood is forwarded to another site there must be a debris management plan agreed to in advance of operations. The debris is generally composed of bark, cones, branches, tops and fines and can be greater than several metres in depth over a 400 hundred square meter patch. If the chipper debris is greater than 15 cm, there is a significant possibility that the chipper wood site will be not satisfactorily regenerated (NSR) and lost from the productive land base. Chipper debris tends to compact and thus the decomposition of the debris can take years.

Chipper debris must be disposed of or piled to conform of one or more of the following practices:

- spreading the debris on organic/lowland soils or make low (less than 3 metres high), narrow (less than 5 metres wide) and long piles along roads
- spread the debris onto in-block roads at a depth that will discourage vehicle travel and minimize the amount of fuel in one concentrated area
- remove the debris for hog fuel
- may be spread and windrowed to allow for planting between the windrows (Figure 4) –the debris may take up to 16% of the cutover area
- pile and leave chipperwood debris piles in the depleted area if they follow the ‘Chipperwood Piles not Recommended for Burning’ (page 7)
- chipperwood debris piles that are going to remain on site are to be constructed once settled less than 3 metres tall and five metres wide
- burning chipperwood the year of chipping up to December 31
- partial burnt chipperwood piles are preferred to unburnt chipperwood piles

Burning of chipper debris is an option if the debris is piled suitably for a successful burn. The option of burning the debris pile is to be discussed by the Natural Resource Officer and the proponent and will be dependent on planting options, soil type, moisture level, snow conditions and the risk of fire or smoke spreading to adjacent areas. A difference of opinion will be decided by the Regional Forester and the Regional Field Supervisor. Discretion must be used by the operator on whether a fire-guard is necessary or not. Burning of chipper debris must comply with the following conditions:

- piles may be ignited between the dates of November 15 to December 31 and possibly earlier through a burning permit, to ensure sufficient time for complete combustion -
- the operator is responsible for the burning pile until it is deemed to be out and released by the Natural Resource Officer
- the operator must supply Manitoba with the location of all chipper piles that have been ignited.
- piles must be scanned and/or inspected before March 15, or sooner if dry conditions are prevalent, to ensure they are no longer burning
- the Resource Officer, who will in turn advise the Regional Fire Control Officer, must be informed of piles that are still burning on March 31

- the proponent is responsible to have the piles extinguished
- the maximum optimum size for a chipperwood pile to be burnt should be long, high (no greater than 3 metres) and narrow (less than 5 metres) (after the pile has settled)

Centralized multi-year Stockpile Sites

- burning until March 31st allowed, due to year-round access debris piles would have **no** size restriction
- sites on Crown land are covered by a general permit. Site-specific conditions are described on the General Permit by the Natural Resource Officer, who will in turn advise the Regional Fire Control Officer, must be informed of piles that are still burning on March 31

Chipperwood Piles not Recommended for Burning

- Piles that are situated on organic soils
- Piles that have been developed in the winter (after January 1). These piles cannot be burnt safely with consistent results the year after they have been formed due to high moisture content
- The IRMT is directing the pile be used for access management – spread the debris on the road after the plant
- Piles in close proximity to a community or highways



Figure 4 Chipper wood debris windrows.



Figure 5 Trees planted in chipper wood debris windrows.



Figure 6 Roadside chipping

Exemptions From In-Block Limbing

Upland black spruce strips

On sites where this harvest system is used conditions will favour successful natural regeneration of black spruce and the limited suppression of pioneer grasses and other competitive vegetation. Strip cuts may benefit from the removal of heavy slash which may inhibit successful natural regeneration.

Salvage harvesting

Harvested areas damaged by fire, blow down, insects, or disease may not require in-block limbing. On these sites where infected or infested debris is encountered sanitation burning may be required.

Clearing road right-of-way, borrow pits and quarries

When the area needs to be cleared for a roadway etc., this does not require specific mention in the operating plan (OP).

Harvesting agriculture crown lands coded for development

When harvesting lands that are not going to be returned to a forested state limbing in the block is not required.

Biomass

Normally, when limbs and tops are to be used in biomass harvest, a portion of the limbing and topping may be conducted at roadside. The IRMT may require more or less coarse woody debris to be left on the site and this decision may affect a reduction or an increase in the amount of biomass that is available. Biomass is a preferred technique compared to piling and burning logging debris.

Alternatives to In-Block Limbing

Limbing at staging areas

Staging areas for limbing groups of trees may be established within the cut block. Debris in staging areas must still be effectively spread throughout the cut block. Some debris pile(s) may be maintained or created on site to provide wildlife habitat. Large accumulations of debris may be piled and burned, with the approval of the Natural Resource Officer.

Roadside limbing

Full tree lengths with branches may be pulled to roadside where limbing and topping will occur. Debris must be disposed of by one or more of the following practices:

- biomass
- pile and burn debris
- spread debris back into the cut block, may be spread in windrows to allow for planting, with the approval of the Natural Resource Officer
- maintain or specifically create some debris pile(s) for wildlife habitat
- spread debris onto in-block roads



Figure 7 Roadside limbing

Coarse Woody Debris Piles for Wildlife Habitat

IRMTs may allow or require more or less coarse woody debris remain on site and the creation/retention of coarse woody debris piles in cutblock areas with significant marten (and other small mammal) populations in order to retain habitat and help maintain their numbers. Literature review recommends that piles should be one to two metres in height, three to five metres in width and five to ten metres in length. The piles should be located about 30 to 75 metres from edges (cutblock, riparian or residual patches of trees) and distributed at a density of one pile for every five hectares. These piles would consist of logging slash, including a mixture of tops, limbs and larger logs.



Figure 8 Signs of wildlife using debris piles

Roundwood Debris Pile Burning Procedure

Burning of debris piles will be required when large accumulations of limbs and tops are not desired as fuelwood or for use as alternate forest products. If these debris piles are not disposed of productive land will be lost and forest renewal will be affected. Piles left for a long period of time will become a fire hazard.

1. Burn piles as soon as possible so that the land is put back into production. Piles may be left until the following year to allow adequate drying for clean burning. Burning should occur within three years of harvest. Debris piles located near communities or highways should be burned only when weather conditions are favourable to ensure the safe dispersal of smoke (ex: no temperature inversions). To reduce the liability of burning debris piles adjacent to highways alternatives debris disposal methods should be considered.
2. Debris piles scheduled for burning should be piled on in-block roads, mineral soil, or on areas having an average maximum depth of less than 15 cm of duff. No burning of piles shall occur on deep organic soils. Piles should be a minimum of 15 m away from standing timber.
3. Windrows should be no more than 100 m in length, with a minimum of 15 m between windrows. Round piles should be at least 15 m apart. Whenever possible roundwood debris should be piled for more effective burning.
4. Slash should be piled in a manner that allows for clean, efficient burning of all material. Avoid mixing soil into the slash. Any residue or unburned materials remaining post-burn should not encumber renewal activities.
5. Burning will be authorized between October 1st and November 15th by a burning permit. Burning between November 16th and March 31st does not require a burning permit; however, the Natural Resource Officer must be advised prior to any burning. Written notification must be given to the district office for any burning that takes place between March 1st and March 31st. All fires must be completely extinguished by March 31st. If a pile is still burning past March 31st, or earlier if conditions warrant, it should be identified immediately to the Natural Resource Officer. The Natural Resource Officer can then either issue a burning permit to allow the pile to burn out, or require that the fire be extinguished, depending on circumstances. See appendix 1 for fire program operational guidelines regarding timber operations-debris pile management.

Ensure safety precautions are taken to keep the fire under control. Burn piles must be monitored, to ensure that subsequent fire hazards are not present. Upon completion of the burn, burn piles must be completely extinguished. All occurrences of fire spreading beyond the debris piles must be reported to the Natural Resource Officer.

It is recognized that portions of most piles are not completely burned and a few piles may be missed. This usually does not affect the renewal success of the block.



Figure 9 Debris pile burning

Manitoba Conservation and Water Stewardship Approval Process

1. The OP should describe biomass management strategies and alternatives to be used.
2. Within the OP provide the supporting information for recommending an alternative to limbing in-block.
3. The regional forester will consider the merits of each specific request. This may involve a joint site inspection if pre-harvest survey information is inadequate.
4. When a site-specific alternative strategy has been demonstrated to be effective in several cases, Manitoba Conservation and Water Stewardship (CWS) will consider adopting a general practice for those site types.
5. If amendments are required to the original debris disposal plan in an approved OP, CWS approval through regional foresters will be required.



Figure 10 Examples of FML Operating Plans

Future Studies

Long term studies are desirable in the boreal forest to quantify the effects of whole/full-tree harvesting methods on the nutrient cycling, forest soils, long-term productivity and sustainability of the site. Currently, several studies (across Canada) are underway to compare the effects of full-tree, tree-length and in-block harvesting systems on forest soils and site productivity. As research results become available, biomass management strategies will be modified by way of adaptive forest management practices.



Figure 11 Spruce and jack pine regeneration

Appendix 1 – Timber Operations Debris Pile Management

**Manitoba
Conservation**



Operations Division

Operational Guideline

PROGRAM FIRE PROGRAM	DATE YR : 93 M O: 03 DY : 26	INDEX NUMBER F 0 1 0 3 1 2
SUBJECT TIMBER OPERATIONS - DEBRIS PILE MANAGEMENT	APPROVED Original Signed by: H. J. Boyle Assistant Deputy Minister, Operations	
CATEGORY Prevention		
<u>INTENT</u> To ensure that the fire hazards caused by debris piles resulting from timber operations are reduced or treated to the department's satisfaction.		
<u>PROCEDURES</u> - During the application/approval procedure for annual operating (work) permits, the Integrated Resource Management Team (IRMT) and Fire Control Officer will determine if anticipated debris piles require treatment as a fire hazard or for the purpose of reforestation. If burning is determined to be the required treatment a Burn Plan will become part of the Work Permit and will include the following conditions: - Pile size, location and contents. - Burning Permit requirements. - Timing of burns. - The Natural Resource Officer will monitor and ensure compliance with the approved plan and attached conditions. - Treatment of debris piles will be the responsibility of the Forest Management License Holder, Timber Sale Agreement Holder or Timber Permit Holder. - Upon final inspection, if the hazard reduction or debris pile treatment does not meet the objectives and is not satisfactory, the IRMT could delay or refuse to grant next seasons operating permit, until such time as necessary work is completed to their satisfaction. - Forestry Branch Circular #FBTM 35 (copy attached) covers brush disposal and must be adhered to as agreed by the IRMT.		

Glossary

Forest Practices - Activities that are conducted in the forest during all stages of forest management operations (ex: surveys, harvesting, road construction, silviculture).

Forest Officer –

"officer" means

- (a) a person appointed as an officer under subsection 35(1),
- (b) a peace officer appointed under an Act of the Legislature or the Parliament of Canada, or
- (c) an officer appointed under the *Customs Act* (Canada); (« agent »)

Appointment of officers

[35\(1\)](#) The minister may appoint any persons, or classes of persons, as officers for the purpose of enforcing this Act.

Guidebook - A collection of policies, guidelines, procedures and standards related to a specific Forest Practice.

Guideline - Alternative procedures or standards that can be applied to satisfy the principle upon which the guidelines are based. Specific guidelines are enforceable when identified on Work Permits or Operating Permits.

Integrated Resource Management Team (IRMT) – a regional management team organized to review natural resource issues (The IRMT is made up of members of Manitoba Conservation and Water Stewardship – director, regional services superintendent, chief natural resource officer and resource managers representing forestry, wildlife, parks, fisheries and lands' interests).

Policy - A deliberately chosen course of action. Policy in this document refers to governing principles and corresponding procedure and standards of the Provincial government.

Procedures - A step or series of steps taken to put into practice a policy or guideline.

Salvage Harvesting – The utilization of standing or down trees that are dead, dying, or deteriorating, for whatever reason, before the timber values are lost. (Dunster, 1996)

Standards - Descriptions of targets or goals used to measure the success of procedures. They may be general or specific.

Tree Length Harvesting - Extraction of the complete tree length, minus top and branches, from the stump to the landing. (Dunster, 1996)

Whole/Full Tree Harvesting - Extraction of the complete tree, including tops and branches, from the stump out to the landing. (Dunster, 1996)

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