A VISUAL GUIDE TO HANDLING WOODY MATERIALS FOR FORESTED LAND RECLAMATION

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DEPARTMENT OF
RENEWABLE RESOURCES

Disclaimer

This publication is intended to inform the discussion around using woody materials in reclamation programs. While every attempt was made to ensure the accuracy of the statements contained within this publication, reclamation plans should always be discussed with the appropriate government authority. Use of woody materials should never be used in a way that compromises other reclamation objectives, such as soil conservation and placement, or forest fire protection rules.

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For a more detailed analysis of using woody materials for reclamation purposes, please see:

Vinge, T. and M. Pyper, 2012. Managing woody materials on industrial sites: Meeting economic, ecological and forest health goals through a collaborative approach. Department of Renewable Resources, University of Alberta. 32 pp.

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A guide to handling woody materials during reclamation

In a short period of time, the conversation around handling woody materials - deadwood such as logs, branches and stumps - has shifted dramatically. From piling and burning, to mulching and now towards keeping 'whole logs' on sites. The changes have led to confusion and this guide is intended to provide clarity around wise use of woody materials in reclamation programs.

Piling and burning

Mulching

Whole logs

Figure 1: An illustration of the significant changes in practice over the past 10 years in managing woody materials on industrial sites. Photos courtesy of Navus Environmental Inc. and M. Pyper.

This guide is intended to answer the following questions:

- Why has there been a shift in how we manage woody materials?
- How can woody materials be managed effectively on sites?
- What do effective woody material applications look like?

Through this work, we hope to promote effective use of woody materials in an effort to encourage revegetation on industrial sites through the creation of microsites. For a more detailed look at managing woody materials see: 'Managing woody materials on industrial sites: Meeting economic, ecological and forest health goals through a collaborative approach' by Tim Vinge and Matthew Pyper.

Why has this shift occurred - what is wrong with the way we have always done it?

There are three primary reasons why the conversation around woody materials has shifted:

1. New regulations have changed the way that reclamation certificates in forested areas are issued - certification now requires the presence of woody plants on sites. Maintaining wood on reclaimed sites has been shown to promote growth of woody plants.
2. Woody materials are valuable for reclamation because they create pockets of shade and moisture which encourage plant growth. Woody materials are also incredibly valuable for biodiversity.
3. Companies are increasingly interested in minimizing costs, reducing operational footprint and regenerating sites as quickly as possible. Woody materials present an opportunity to achieve these goals.

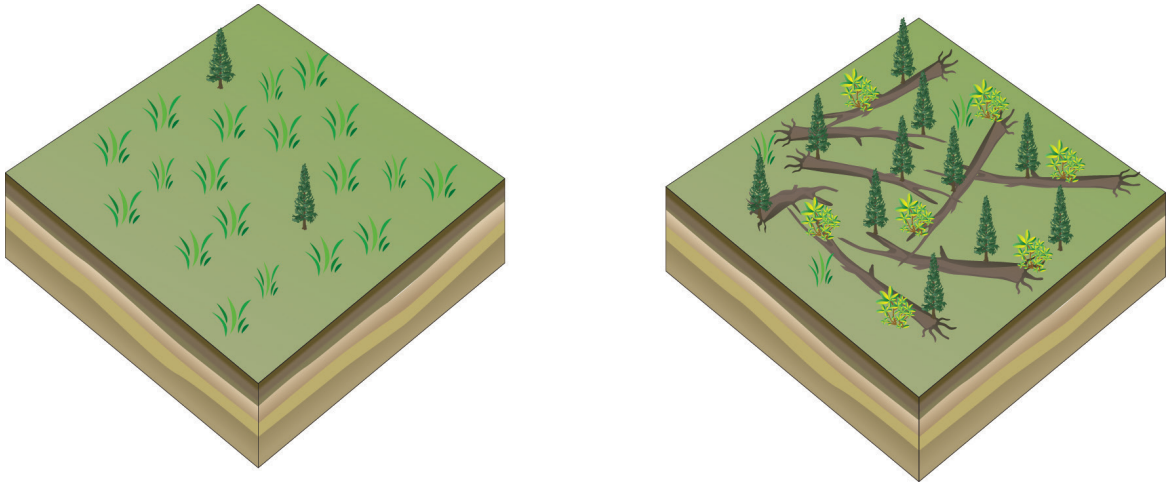

Figure 2: Illustration of typical plant diversity on sites without (left) and with (right) woody materials applied. Although not a 'be all end all' solution, woody materials have been shown to promote regeneration of native vegetation, enhance seedling survival and lead to an overall increase in plant diversity on reclaimed sites. (Images were created using tools from the Integration and Application Network, University of Maryland Centre for Environmental Science ian.umces.edu/symbols/).

What is it about woody materials that makes them so important?

The key benefit of woody materials - in terms of reclamation - is the creation of microsites. Microsites are pockets of shade and moisture which help promote the growth of tree seedlings and other plants. These microsites also provide protection for seedlings during the winter. As can be seen in the images below, trees and other plants often grow directly beside logs as a result of these microsites.

Microsites provide diverse habitats in which trees and other plants can establish.

Figure 3: Following application of woody materials, it is common for plants to establish right beside logs because of the creation of microsites. Photos courtesy of M. Pyper.

Woody materials are also a natural component of forests

Woody materials are also found in forests and help to create diversity. This diversity leads to the creation of microsites in the forest floor and is also a key contributor to habitat for biodiversity in forests. By applying woody materials to reclaimed sites, we are able to capitalize on processes that occur all the time in forests - and in turn, promote regeneration on sites.

Figure 4: Examples of woody materials found naturally within forests. Photos courtesy of M. Pyper.

How can woody materials be managed effectively on sites?

Now that we know woody materials are valuable for reclamation, the use of burning should be restricted to areas where reduction of fuel loading is the primary goal. FireSmart zones are an example of such an area, although a Forest Officer can authorize retention of woody materials to meet ecological goals even within FireSmart zones. On sites outside of FireSmart zones where wood volumes are seen to be too high, operators should consider moving the excess wood to nearby sites or establishing wildlife piles.

The burning of woody materials increases operational costs and eliminates a critical reclamation tool.

Figure 5: Valuable forest floor material and woody materials being burned following site clearing. Photos courtesy of Navus Environmental Inc. and M. Pyper.

How should we store wood on our site?

On sites that will be reclaimed quickly (e.g., oil sands exploration sites) companies can salvage coarse woody materials along with their surface soils and pile it in the corner of the site. In the case of sites that will not be reclaimed for many years, a good practice is to bury logs beneath soil piles to reduce the risk of fire and to preserve woody materials until reclamation begins. Fine wood chips should not be mixed in with surface soils.

Figure 6: Examples of short-term woody material storage piles at the corner of oil sands exploration sites. Photos courtesy of M. Pyper.

What should woody material applications look like?

When applying woody materials, there are three key considerations:

1. Keep logs intact and avoid excessive compaction of logs. Logs are more valuable when kept intact than when they are crushed and broken down into the soil.
2. Avoid large piles as these are fire hazards. Woody materials should lie flat on the soil surface as often as possible.
3. Variability in log size and length is preferred and is important for diversity.

Figure 7: An example of an effective application of woody materials. Logs were kept intact, no excess volumes were left on site and variable log lengths were applied. Photo courtesy of M. Pyper.

Excessive compaction of woody materials should be avoided

It is important to remember that a main goal of applying woody materials to reclaimed sites is to create microsites. Thus, breaking down logs and compacting them into small pieces with heavy equipment should be avoided. During field tours, we saw numerous times where operators had intentionally tried to break down the woody materials with their equipment. The operators believed that they were doing the right thing by helping the wood to break down and decompose. The main benefit of woody materials is that they create microsites and add diversity to a reclaimed site. Sites that appear 'messy' with numerous intact whole logs, as in the picture above, should be encouraged.

How much should we be applying to our sites?

Upland sites should receive between 60 m^3/ha to 100 m^3/ha and lowland sites (e.g., those heavily dominated by black spruce) should receive 25 m^3/ha to 50 m^3/ha. This will lead to about 10% to 25% coverage on sites. These volumes will help to ensure a balance between fire risk and reclamation benefits are achieved. The 'Light' and 'Medium' photos shown below are visual examples of what acceptable volumes typically look like when applied; the 'High' photos show inappropriate applications of woody materials:

Light (25 m^3/ha to 50 m^3/ha)


Medium (100 m^3/ha)


High (200 m^3/ha)


Access management and restoration of wildlife habitat

Managing access and restoring wildlife habitat along linear features is increasingly a concern of industry and woody materials have been promoted as a means to assist both objectives. Similar to industrial sites, application of woody materials on existing features - such as seismic lines, pipelines and roads - has the potential to introduce critical microsites and promote vegetation re-establishment.

Figure 8: A seismic line (left) and pipeline (right) benefiting from the application of woody materials. Photos courtesy of T. Vinge.

Key points to consider

- Rollback should occur on as much of the line length as possible. To meet the Integrated Standards and Guidelines for the Enhanced Approval Process, a 25 metre rollback free fuel break is required every 250 metres along linear features.
- Target volumes on lines should be approximately 60 m^3/ha to 100m^3/ha.
- Operators can capitalize on older slash piles along the edges of linear features. Other options may include hauling in material from exploration sites that had excessive volumes of woody materials.
- Site preparation – such as mounding – may also help to trap moisture and promote vegetation re-establishment.

Figure 9: Rollback appears necessary to deter human use of access features. Fuel breaks are required every 250 metres. (Image was created using tools from the Integration and Application Network ian.umces.edu/symbols/).

Other considerations

What about leaving wood chips on industrial sites?

Mulching of woody materials to create fine wood chips has been widely adopted in the past, however, companies quickly realized that high mulch depths were a serious problem for reclamation. As the images show below, low levels of mulch (i.e., 1 to 3 cm deep) have little impact on a site, but levels above 5 to 9 cm have a large effect on vegetative growth.

1 cm 5 cm 9 cm

Figure 10: An example of a well site that has excessive amounts of wood mulch on the site, hindering regeneration. Photo courtesy of I. Amponsah.

As a result, mulching should only be used for specific applications. For example, wood chips may be beneficial on dry sandy sites to preserve moisture on the site. This is currently being investigated through research at the University of Alberta. Some companies have also explored the use of wood mulch for constructing wood fibre roads and mulching is also a common tool for clearing seismic lines. This guide is not meant to address these specific applications.

Mulching to create fine wood chips increases costs and often has a negative impact on revegetation of reclaimed sites.

If mulching is necessary, rough mulching is preferable to complete mulching

Rough mulching is different than conventional mulching in that instead of mulching the entire tree, operators focus on 'buzzing' branches off the trees thereby leaving the logs relatively intact. This preserves the ability of the logs to create microsites and also helps to manage wildfire concerns on sites. When mulching is deemed necessary, rough mulching should be used whenever possible.

Rough mulching reduces operational hazards and preserves the microsite benefits of whole logs.

Figure 11: Examples of logs that have been rough mulched to keep most of the log intact. Photo courtesy of M. Pyper.

Guidelines for managing wildfire risk on sites with woody materials

Managing fire risk remains a priority on all industrial sites, particularly those within forested areas where woody materials are being applied. Both the 'FireSmart Guidebook for the Oil and Gas Industry' and the 'Canadian Association of Petroleum Producers Best Management Practices for Wildfire Prevention' can be used to ensure operations are reducing wildfire risks and hazards.

The 'FireSmart Guidebook for the Oil and Gas Industry' provides additional information for reducing wildfire risks and hazards on industrial sites.

Operators can also follow a simple set of procedures to minimize fire risks for their operations. These include:

- Piles of woody materials should be avoided unless intended to achieve specific ecological goals (e.g., wildlife piles).
- Avoid piles of branches and other fine fuels by spreading them across the site.
- Although variability is to be expected, woody materials should lie flat on the soil surface as often as possible.
- Minimize the number of 'ladder fuels' along the edges of reclaimed areas. Ladder fuels are those materials that extend vertically into the forest canopy along the edge of reclaimed sites (see Figure 12).
- When woody material piles will be stored for long periods of time prior to reclamation, they should be buried beneath or incorporated within stripped surface soil piles.

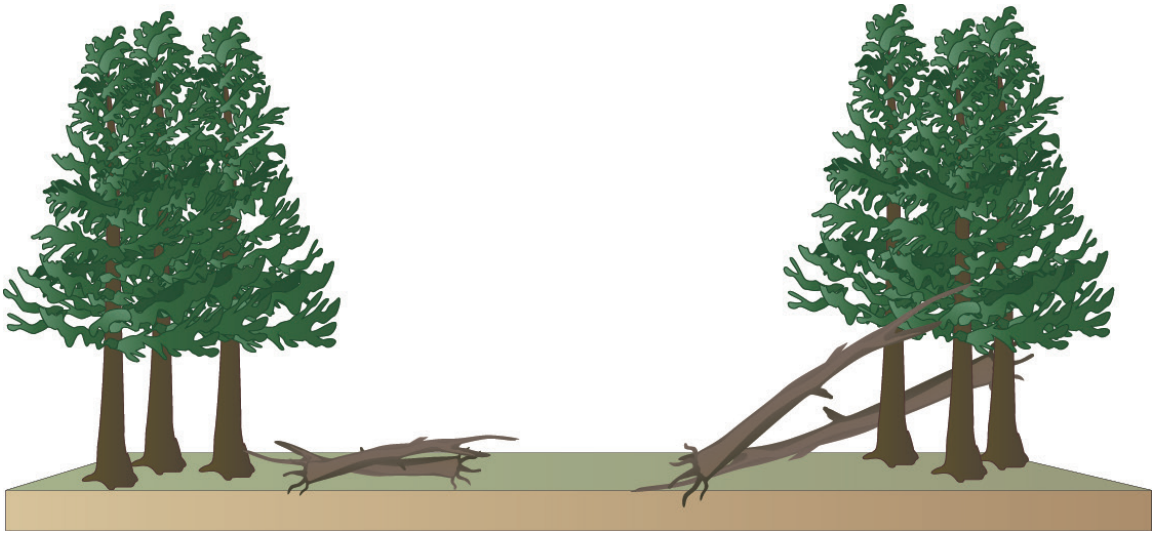

Figure 12: Woody materials should be applied in a way that minimizes their ability to function as 'ladder fuels'. Woody materials closer to the soil surface (left) are preferable to those that extend into the forest canopy (right). (Image was created using tools from the Integration and Application Network, ian.umces.edu/symbols/).