BRITISH COLUMBIA | Ministry of Forests

BRIEFING NOTE FOR INFORMATION

DATE: September 28, 2023

PREPARED FOR: Honourable Bruce Ralston, Minister of Forests

ISSUE: Carbon impacts from salvage logging.

BACKGROUND:

- Wildfires are part of the natural dynamics of many forest ecosystems in British Columbia (BC). However, the frequency, severity, and scale of wildfires has increased in recent years due in part to past management, mountain pine beetle impacts, and climate change.

- Forms of salvage logging, or the harvesting of residual dead trees post-disturbance, are common management tactics applied to burned forests. Motivation for salvage logging can be to recover economic value from dead timber, to rehabilitate severely disturbed forests, or a combination of management objectives.

- Some salvage of wildfire impacted stands is carried out by BC Timber Sales in partnership with the Forest Investment Program. BCTS develops and markets damaged trees as Innovative Timber Sale Licenses so that the overstory of damaged stands can be removed and forests can be promptly re-established.

DISCUSSION:

Salvage logging in wildfire-burned stands can have complex and variable implications for forest carbon dynamics. The effects depend on several factors, including the severity of the wildfire, effectiveness of reforestation, and type of wood products being produced. Salvage logging provides a relative carbon benefit when it replaces green tree harvesting.

Fire severity:
High severity fires can cause significant mortality in mature trees, as well as reduce natural seed sources and impact the ability of a stand to regenerate itself. In these circumstances, salvage logging followed by tree planting may help to reestablish a productive stand in a shorter period after the fire than if left to regenerate naturally, increasing carbon sequestration and long-term storage.

After a low severity fire, there may be sufficient natural seed source and advanced regeneration to regrow the stand successfully without the need for tree planting or rehabilitation. In these stands, there is less long-term carbon benefit in planting a new cohort of trees, and salvage operations may damage natural regeneration. While a naturally regenerated stand may store carbon, it may not be as well suited for other forest values such as timber production.

Carbon emissions from green-tree harvesting:
Logging causes a decrease in total ecosystem carbon immediately following harvesting. While some carbon is stored in harvested wood products, that “embodied carbon” eventually decays over time as wood products move from use to landfill (see below). Meanwhile, at the harvest site, decomposition will occur in the forest floor and soils, resulting in increased emissions. Harvesting overall causes forests to be net sources of emissions, even in years following harvest.

Harvesting of green or dead trees (i.e. salvage logging):
Compared to green-tree harvesting, salvage logging has a positive climate benefit. The climate benefit depends on the extent to which green trees are included in harvest from salvage logging.

In some cases, salvage logging may remove both living and dead trees. As discussed above, removal of live trees not only causes a reduction in stored ecosystem carbon, but also a decrease in the carbon sequestration rate of the stand post-harvest. This reduced rate combined with an increase in emissions from decomposition of harvest residuals can cause a stand to be a net source of emissions for years after salvage. Focusing salvage to only removing dead trees can allow remnant live trees to continue sequestering carbon and reduce the time for the stand to return to a net sink. Select harvesting also provides other potential values like wildlife habitat.

Salvage logging produces less emission per unit of wood product when it replaces harvesting of green trees as dead trees are no longer sequestering additional carbon while green trees are. Salvage logging can therefore provide a source of fibre for timber production while leaving live trees to continue to store more carbon on the land base.

Storage in harvested wood products:
Harvesting involves the transfer of carbon from ecosystem carbon pools (i.e. live and dead trees) to harvested wood products, where a portion of the original stored carbon will remain sequestered for the lifetime of that product. Longer lived wood products will result in greater amounts of long-term carbon storage than shorter lived products such as pulp or bioenergy. Therefore, if salvaged materials can be made into longer lived products, the long-term carbon emissions from harvesting can be reduced. About a third of BC's harvest is made into long-lived products.

Forest regeneration:
The rate and success of forest regeneration following salvage logging can influence carbon dynamics. Stand growth starts off slow following harvest because it takes time for seedlings to build the crowns and root networks needed to gather light, water, and nutrients. As planted seedlings and natural ingress establish, trees will accumulate carbon in stemwood and coarse roots for decades to centuries. If new trees are planted or natural regeneration occurs quickly after salvage, carbon uptake can begin to offset emissions from logging and post-harvest decomposition and return the stand to a net sink of carbon in a shorter period. Planting diverse genotypes and species can lead to more robust growth and greater resilience to pests, disease, drought, and climate change.

Underplanting alternative
If worker safety and stand growing conditions allow, seedlings can be planted underneath a post-wildfire dead overstory (i.e. no salvage), thus avoiding the emissions associated with harvesting while establishing a new productive cohort of trees. This practice is often called underplanting and has been successfully implemented by the Forest Carbon Initiative (now Forest Investment Program) for the past five years. The standing dead canopy can enhance regeneration capacity both by being a source of nutrients into the soil as it decomposes, and by providing planted seedling with microsite protection from heat and drought. Leaving the dead canopies also serves to direct rainfall and snowmelt into the soil and provides structural diversity across the landscape. This makes underplanting particularly effective in areas that are at risk of hydrophobic soils, landslides, or spring floods, and where species-at-risk habitat is a management focus.

FINANCIAL IMPLICATIONS:
Not applicable.

SUMMARY:
The carbon dynamics of salvage logging in wildfire-burned stands are site-specific and can vary widely. Because of the trade-offs between harvest emissions, decomposition, and increased productivity from post-harvest planting, it is imperative that forest managers consider these trade-offs when selecting appropriate salvage treatments and consider alternative treatments such as underplanting. When salvage logging replaces the harvesting of live trees, it results in less carbon emission per unit of timber produced.

Attachment(s):

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REVIEWED BY:

	Initials	Date
A/DM	MS	Oct 17, 2023
Associate DM		
EFO	SM	Oct 17, 2023
ADM	SB	Oct 12, 2023
Program Dir/Mgr.	JB	Sept 24, 2023