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Focus on FORESTRY

DOES SLASHBURNING INCREASE ATMOSPHERIC CARBON DIOXIDE LEVELS?

Summary

Prescribed burning following logging, commonly called slashburning, is an important silvicultural practise in British Columbia. Prescribed burning produces significant amounts of CO_2, a greenhouse gas. However, much of the carbon in the burned materials would eventually be released as CO_2 during decomposition if burning were not carried out. Furthermore, much of the CO_2 is recovered by the new forest. Prescribed burning in managed forests will not necessarily result in a net increase in atmospheric CO_2 levels in the long-term.

Prescribed Burning in B.C.

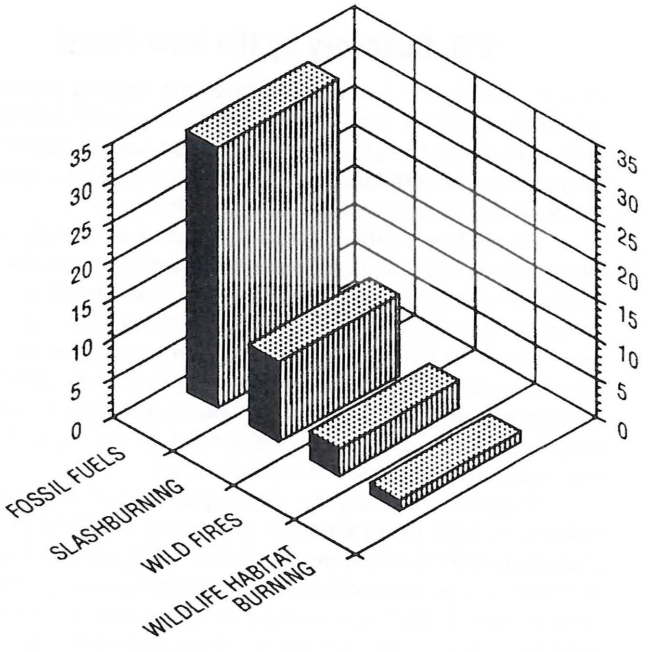
Prescribed burning of logging slash has been practised in British Columbia since the 1900s, and is regulated by the B.C. Forest Service under a permit system. In the early years highly flammable logging slash was burned to reduce the risk of wildfire. Since that time, the benefits of burning to achieve healthy regeneration in some forest ecosystems have been recognized. At present, prescribed burning is the most common method of preparing logged areas for planting. Burning is carried out to reduce fire hazard, facilitate planting, provide a favourable environment for seedlings, and to eliminate diseases such as dwarf mistletoe. An average of about 50,000 ha were burned annually during the period 1980-89 in B.C. Prescribed burning is also used extensively in the management of wildlife habitat and rangelands.

Research by Forestry Canada has helped to increase our understanding of the behavior, impact and ecological effects of prescribed fire, and has supported the development of application technologies and predictive systems, so that prescribed fire can be used in a safe, effective and ecologically appropriate manner.

Carbon Dioxide Released by Prescribed Burning

Logging removes some carbon stored in wood from forests, but substantial amounts remain in logging slash and other woody debris, and in the soil in most ecosystems in B.C. During prescribed burning, some of the logging slash and forest floor is consumed, and most of the carbon in the burned fraction is converted to CO_2, a greenhouse gas. In addition to CO_2, prescribed burning releases smaller quantities of other trace gases affecting global atmospheric chemistry. These include the greenhouse gases methane (CH_4) and nitrous oxide (N_20), and a group of gases and aerosols involved in the chemistry of photochemical smog, including non-methane hydrocarbons and nitrogen oxides (NO_x). An average of 6 million tonnes of CO_2 were released annually by silvicultural prescribed burning in B.C. during the period 1980-89.

Other forms of biomass burning such as wildfire, and the combustion of fossil fuels (petroleum products, coal, and natural gas) also release CO_2 and other greenhouse gases to the atmosphere. During 1987, CO_2 released by prescribed burning of 86,000 ha (a greater than average area) was 31% of that released by fossil fuel combustion in B.C. However, in all of Canada, CO_2 released by prescribed burning was only 3% of



CO_2 released by prescribed burning, forest fires, and by combustion of fossil fuels in B.C. during 1987 (in million tonnes of CO_2 - to convert to C divide by 3.7).

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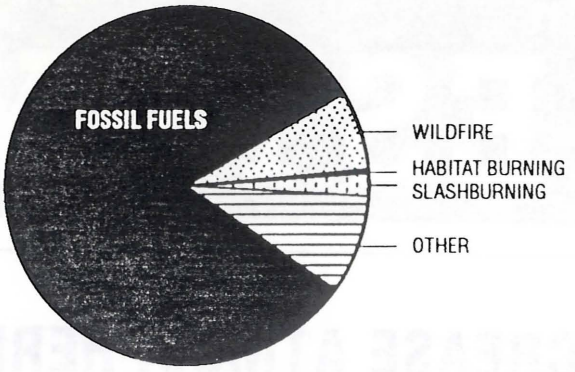
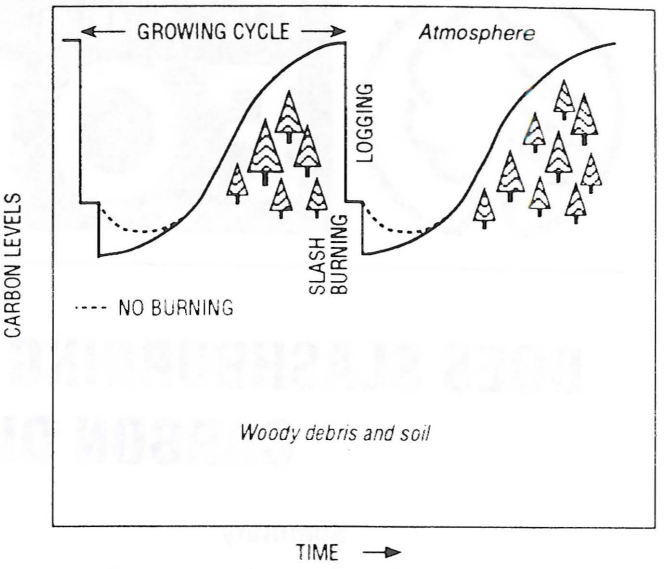


Comparison of CO_2 released by forest burning, combustion of fossil fuels, and other industrial sources in Canada during 1987.



General trend in carbon release and recovery in a managed forest ecosystem. The amount of carbon that is recovered in managed forests may be less than, similar to, or greater than unmanaged forests, depending on rotation length, the type and intensity of management and the nature of the unmanaged forest.

that released from combustion of fossil fuels. These percentages differ because of the significance of the forest sector in B.C. In contrast to prescribed burning, wildfire contributed a much higher proportion of total CO_2 emissions in Canada than in B.C.,though the wildfire values for both B.C. and Canada in 1987 were much lower than average. The amount of fuel consumption and CO_2 and other trace gases released from prescribed burning in some forest types in B.C. may be similar to the levels that resulted from natural wildfires before the introduction of fire control.

If prescribed burning were not carried out following logging, similar amounts of CO_2 would probably be released from the decomposition of the slash and litter over a longer period of time.

CO_2 Recovery by the New Forest

In B.C., prescribed fire is used following logging primarily to obtain or enhance forest regeneration - logged and burned areas remain as forest land. This differs from the use of fire in land clearing, where forests are not regenerated; fire is used in this way in some of the world's tropical forests.

As the forest grows, carbon is recovered as CO_2, and is incorporated into leaves, twigs, stems, and roots. As the forest ages and some of these components die, litter and debris builds up on the forest floor. Decomposition of these materials and of roots results in some release of carbon as CO_2, as well as in long-term storage of carbon in soil organic matter. The rate of carbon recovery by the new forest varies among different ecosystems in B.C., and is also influenced by the type of forest management practises that are employed.

If carbon recovery by forest growth is in balance with release through decomposition or burning of biomass, these processes will not influence atmospheric CO_2 levels. The long-term effect of prescribed burning on carbon levels is not definitively known for all forest ecosystem types and mangagement regimes in B.C. However, studies suggest that the amount of carbon that is recovered in managed forests over a growing cycle or rotation may be less than, similar to, or greater than levels in unmanaged forests, depending on the recovery rate, rotation length, and the nature of the unmanaged forest. The contribution of prescribed burning to increased atmospheric CO_2 levels, if any, will be substantially less than is suggested by emission values alone.

This is in contrast to the combustion of fossil fuels, because these carbon reserves are non-renewable, and because they would not be converted naturally to CO_2 at present rates. Preliminary calculations indicate that at present, more CO_2 is being recovered than is being released from Canada's forests. Forestry Canada is continuing to study emissions from forest burning, and is supporting a detailed study of the carbon budget of the Canadian forest sector. Further studies of the impact of forest management practices on carbon budgets in selected ecosystems are planned.

Conclusion

Silvicultural prescribed burning in British Columbia (slashburning) results in more rapid release of CO_2 stored in biomass residues than would occur if burning were not practised, but does not necessarily contribute to long-term increases in atmospheric CO_2 levels. This is because much of the CO_2 that is released during burning would otherwise be released during decomposition, and because CO_2 is recaptured by the new growing forest.

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