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# Synthesis of fire and harvesting carbon flux measurements in the Canadian boreal forest

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Fire and harvesting are major forest renewal processes in the boreal forest. Carbon fluxes have been measured following fire or harvesting at several boreal locations in Asia, Europe and North America. However, there have been few opportunities for direct comparisons within a close geographic area. Here we report on a synthesis of measurements from central Canada, comparing carbon exchange at three recently burned sites, three recently harvested sites, and one mature jack pine site. As a comparative example, net ecosystem production (g C $m^{-2}$ $y^{-1}$) in 2005, from youngest to oldest site, was:

Harvested in 2002: -123

Burned in 1998: -43

Harvested in 1994: -31

Burned in 1989: +53

Burned in 1977: -78

Harvested in 1975: +79

Burned in 1929: +36

where a negative sign indicates carbon loss and a positive sign indicates carbon gain. In general, the burned sites had both higher gross ecosystem production and ecosystem respiration than the harvest sites. Although there is a substantial amount of interannual variability at any given site, the differences in age and the nature of the forest renewal mechanism largely dictates the vegetation and carbon dynamics. For example, it is hypothesized that the large carbon efflux from the site burned in 1977 is caused by the decomposition of coarse woody debris that is now lying on the soil surface, whereas the course woody debris at the site burned in 1989 is mostly perched above the ground and has not quite entered a decaying pool, resulting in a net ecosystem carbon gain. This pattern does not occur following harvest because coarse woody material enters the decaying pool immediately. Continued investigation of the processes supports on-going modelling efforts.