

Title An investigation of Douglas-fir leave-tree mortality in the sub-boreal spruce zone: A temporal assessment of water relations under pre and postharvest conditions

Author Bruce Rogers

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Abstract

Mature interior Douglas-fir (*Pseudotsuga menziesii* var. *glauca* [Beissn.] Franco) leave-trees show inconsistent survival when retained after harvest in the Sub-Boreal Spruce biogeoclimatic zone of British Columbia. Government policy is to maintain appropriate levels of leave-trees on cut blocks to meet biodiversity objectives. Douglas-fir is retained because populations are naturally fragmented at the northern edge of their natural distribution. In natural disturbance regimes dominant and veteran Douglas-fir trees that survive fire persist to ages of 300 to 500-years while new cohorts of spruce, lodgepole pine, and sub-alpine fir come and go beneath them, which make Douglas-fir ecologically appropriate candidates for leave trees. In 2002, data were collected which provided knowledge on the geographical range of leave tree mortality in the central interior and revealed factors potentially related to mortality. Subsequently, in 2003, potential changes in water relations around large and/or old, pre and postharvest Douglas-fir leave-trees were measured on typical Douglas-fir leave-trees in harvested and unharvested treatment units on two sites: harvested winter 2003 and harvested winter 1998. Twig water potential, soil moisture, and climate data suggest differences in water relations between treatments and sites. Sample trees in harvested treatments, in some instances, reach water potentials that may be lethal on more occasions than those in the unharvested treatments. It appears some trees may acclimate to their new environment after a few years. Stable carbon isotope ratio trends seen in 2004 suggest that the postharvest survival of a percentage of residual trees on sites recently harvested may be diminished. To optimize the survival of Douglas-fir retention trees and to meet long term landscape level biodiversity objectives in the central interior, operational recommendations are to leave them either in untouched clumps of pure Douglas-fir or of mixed species rather than as single trees to maintain a suitable micro environment around the trees.