

Early impact of Mountain Pine Beetle on water balance of lodgepole pine in Alberta

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Abstract

Objectives of this research were to document the impact of earlier phases of MPB (green & red attack) in mature lodgepole pine on canopy and forest floor rainfall interception, transpiration, soil moisture, and provide insight into how these processes are likely to vary across the climatic conditions in western Alberta. Chemical girdling was used to simulate controlled levels of variable intensity MPB attack.

While the combined rainfall interception and evaporation by the canopy / the forest floor layers dominated the evaporative losses in mature pine (~70% of growing season precipitation), no initial effects on rainfall interception losses were detected because of needle retention during green/red attack phases. In contrast, strong differences in transpiration among fading, dead, and surviving trees produced reduced total water consumption through transpiration by 47% in a stand with 80% MPB affected trees, whereas total transpiration increased by 9% in a partially attacked (50% MPB affected trees) because of increased water availability to surviving trees. Increased soil moisture was observed in both stands in surface soil layers only. Modeling based on field observations suggests larger hydrologic impacts can be expected during the later (red/grey) attack phases of MPB infestation and in regions with greater growing season precipitation.

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