Tree Mortality Caused by Western Hemlock Looper Defoliation 
in Coastal Forests of British Columbia

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Abstract

In this study, we report the temporal pattern of tree death and the resulting rates of mortality during and after a western hemlock looper (Lambdina fiscellaria lugubrosa Hulst) outbreak that occurred from 2000 to 2003 in coastal British Columbia. Using repeated census data and logistic regression models, we quantify species- and size-specific mortality rates for western hemlock (Tsuga heterophylla (Raf.) Sarg), western redcedar (Thuja plicata Donn ex D. Don), Douglas-fir (Pseudotsuga menziesii var. menziesii (Mirb.) Franco), and amabilis fir (Abies amabilis Dougl. ex Forbs). Between 2002 and 2005, 242 of 563 trees died, resulting in average plot-level cumulative mortality of 59.4 ± 22.7 %. Western hemlock, followed by Douglas-fir, had the greatest levels of mortality across all diameter classes, while mortality of western redcedar and amabilis fir was confined to subcanopy trees with diameter at breast height < 20cm. As a result of differential mortality rates, defoliation by western hemlock looper altered the composition and successional trajectories of the study stands. The duration of a western hemlock looper outbreak determined overall mortality rates, which also was influenced significantly by tree diameter and species. Salvage logging is not justified after outbreaks of short duration (≤ 2 years) since there will be little lasting damage to the canopy. However, during longer outbreaks (> 2 years), western hemlock and Douglas-fir with dbh > 20cm will have mortality rates greater than 50%, which may justify salvage logging in areas managed for timber production.

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