

## Mountain Pine Beetle - spatial model for FVS/Prognosis

ESSA, in cooperation with scientists and others of the USFS, spent several years developing the Westwide Pine Beetle Model (WWPBM), which simulates the impact of mountain pine beetle (*Dendroctonus ponderosae* Hopkins), western pine beetle (*Dendroctonus brevicomis* LeConte), and *Ips* spp. on western pine tree species. The model is a multi-stand, landscape-level model and operates as an extension of the FVS/Prognosis stand projection model coupled with the multi-stand FVS Parallel Processing Extension (PPE).

### Simulation of MPB spread on the Chilcotin plateau

Map summaries show three 60-year simulation scenarios of an MPB outbreak on a 149,000 ha landscape around Tatla Lake, BC. The simulation of over 6,900 stands was made with Prognosis<sup>BC</sup> linked to the WWPBM and PPE extensions. The upper map shows the period of maximum volume loss under a baseline scenario. The outbreak spreads fairly evenly over the homogeneous landscape, beginning with the initial outbreak in 1976. The middle map shows a scenario in which the modeled landscape is embedded in an “outside world” that serves as an additional source and sink of MPB. In this case the epidemic shows a less orderly spread. The bottom map shows a scenario in which a severe winter kill in 1985 (and inclusion of an “outside world”) drives down the MPB until a much later time in the simulation. See [Beukema and Robinson \(2004\)](#) for more details.

The WWPBM simulates the contagion of beetles in a landscape, moving beetles between stands based on the current location of the beetles, the relative attractiveness of the stands in the landscape, and the assumed state of the unsimulated “outside world.” Once beetles have been allocated to a stand, the model simulates the attack of trees within the stand based on the size, species, and vigor of the trees. Beetle levels in a stand in the following year are related to the amount of beetle-related mortality that occurred in the stand.

**The Westwide Pine Beetle Model simulates the contagious movement of beetles in a landscape, moving beetles between stands based on location, the relative attractiveness of the stands, and the state of the unsimulated “outside world.”**

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Under the assumption that stressed trees are often preferred by beetles, the WWPBM has rudimentary models to simulate the effects of root disease, stem rust, dwarf mistletoe, lightning, fire, windthrow, and climate. The primary effect of these other agents is to attract beetles to a stand during dispersion.

The model has recently undergone some updates by the USFS, and is being made available in some western FVS variants.

### Additional Information

Beukema, S.J. and D.C.E. Robinson. 2004. [Modelling Mountain Pine Beetle in the Chilcotin using the Westwide Pine Beetle Model](#). Prepared by ESSA Technologies Ltd., Vancouver, BC for the Canadian Forest Service, Victoria, BC. 21 p.

[Incorporating MPB impacts at the stand and landscape level](#), in Hawkes et al. 2005

[USDA Forest Service Westwide Pine Beetle Model site](#)

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