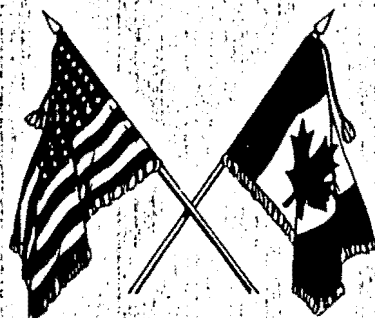


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*One Forest Under Two Flags*

**SUMMARIES
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POPULATION DYNAMICS AND ECOLOGICAL IMPACTS
OF MOUNTAIN PINE BEETLE

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The mountain pine beetle (Dendroctonus ponderosae Hopkins) causes extensive damage to all species of pines within its range in western North America, with lodgepole pine appearing to be its favorite host. Because of the beetle's strong attraction to large trees, it poses the most serious insect threat to growing lodgepole pine sawtimber. Tree losses by mountain pine beetle (MPB) cause ecological changes such as increases in other tree species and understory vegetation, increased water yield, and increased forage production. When dead trees fall over, access by wildlife and domestic livestock is limited, and costs of trail, fence, and recreation site maintenance are increased. Food and shelter for wildlife are affected. In stands designated for timber production, losses to MPB interrupt sustained yield and even flow. The large numbers of trees killed by the beetle create heavy fuel loads that could result in hot, destructive fires.

The mountain pine beetle typically has one generation per year, starting with adults infesting trees and introducing blue-stain fungi in July and early August. Eggs are laid singly in niches alternating between sides of the vertical egg galleries. Larvae hatch and feed in the phloem, usually at right angles to the egg gallery. Larvae overwinter, then complete development in the spring. Pupation occurs in chambers made in the bark and outer sapwood.

In lodgepole pine, numbers of beetles produced per unit of bark are directly related to the thickness of phloem, the food of developing larvae. Phloem thickness is strongly correlated with diameter at breast height (d.b.h.) of lodgepole pine and appears to be the reason that mountain pine beetles show such a strong preference for lodgepole of large diameter during beetle epidemics.

Stand characteristics of lodgepole pine associated with MPB epidemics are (1) trees greater than 80 years old, (2) average tree diameter for the stand exceeding 8 inches, (3) a substantial number of trees in the stand that are 12 inches and larger d.b.h. and that have phloem 0.10 inch or thicker, and (4) location at an elevation where temperatures are optimum for brood development.

Population dynamics studies in unmanaged lodgepole pine stands have provided knowledge leading to the development of several ways to hazard rate lodgepole stands to infestation by MPB, and the studies have suggested silvicultural strategies to reduce losses. Several strategies are being tested in Montana, Utah, and Wyoming.

With a reasonably satisfactory explanation of MPB epidemics in lodgepole pine, research direction now has shifted more to low level beetle populations and to managed stands.

When MPB populations are at low levels (endemic), beetles infest weakened and injured trees and those infested by other species of bark beetles. Epidemics appear to start when enough of such trees are in proximity that emerging brood adults converge and infest a common tree or group of trees that are medium to large diameter and contain medium to thick phloem. In such trees, beetle production can be high, thus triggering an epidemic.

The present research effort will determine factors that regulate low level MPB populations and thus form the basis for strategies to prevent epidemics from starting. Because secondary bark beetles and associated low level MPB populations are found in suppressed, diseased, and injured trees, we will test the strategy of keeping these sorts of trees, and consequently the bark beetles that infest them, out of stands to prevent beetle epidemics from starting.

We will also be testing the growing of lodgepole pine under management beyond the age and sizes that normally indicate an impending epidemic of MPB in unmanaged stands. Presently, an average stand age of 80 years and average stand diameter of 8 inches indicate a stand that is susceptible to beetle infestation.

The six methods of hazard rating lodgepole pine stands to MPB infestation will be tested to determine which method is most appropriate for a given geographic area. Development of models useful to land managers for predicting hazard of beetle infestation and the results of various management options will be part of the research effort.