The treeline as a refuge: are elevational gradients in bark beetle-caused mortality common in treeline whitebark pine populations?

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Mountain pine beetles (Dendroctonus ponderosae) are causing extensive mortality of whitebark pine (Pinus albicaulis), an important high-elevation tree species of western North America. Whitebark pines reach alpine treeline, the climatic boundary where growth forms transition from trees to shrub-like krummholz, eventually giving way to alpine vegetation.

Alpine treeline ecotone habitats may be refuges for whitebark pine from beetle attack because stems of treeline growth forms (stunted trees and krummholz) are smaller than lower-elevation trees (Logan et al. 2010, MacFarlane et al. 2013). Beetles typically select large diameter hosts.

Survivors at treeline with extensive beetle-caused mortality in the forest below. Tobacco Root Mountains, MT

Areas where whitebark pine killed by mountain pine beetle overlap with alpine vegetation

Preliminary results show consistent mortality gradients at alpine treelines, but not at other forest edges (e.g., cliffs, meadows, lakes, etc.). The unique growth form transitions at alpine treelines may drive this pattern. Treelines may serve as refuges if survivors make reproductive contributions and continue to evade mountain pine beetles.

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References