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Longevity of lodgepole pine seed after mountain pine beetle attack

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Mountain pine beetle (MPB) is killing large tracks of pine forests in British Columbia and Alberta. Natural regeneration in these forests has been slow and there has been concern that quality of the seed stored in the serotinous cones on the standing dead trees will decline rapidly after tree death. Secondly, due to crown breakage there are also closed cones buried in the forest floor that might yield useful seed for regeneration after a secondary disturbance such as salvage or fire – but it not clear if the seed locked in these cones is viable.

Methods: We collected cones from the crowns and forest floor in lodgepole pine stands near Prince George, BC where most of the trees were killed by MPB 3, 6 or 9 years prior. As a control cones were also collected from living trees within the same stand. Seed was extracted from cones by heating cones to 60° C for 18 hours and the seed was germinated under standard conditions.

Results: We found little loss in seed germination capacity between the standing dead and the control trees. Seeds from partially-opened cones on living trees tended to have lower germination capacity than those collected on dead trees. However in both dead and live trees, germination capacity declined steeply in seeds from cones older than 15 years.

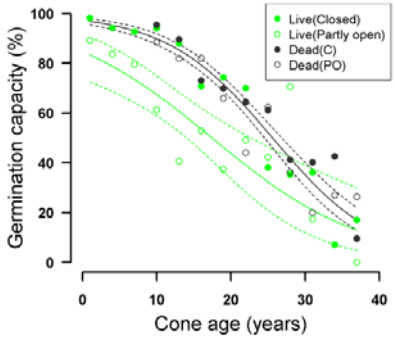

Fig. 1. Germination capacity of cones from living and dead trees (9 years after MPB). Living and dead trees in the same stand were sampled.

Cones that were partially or fully buried in the forest floor still had viable seeds but cones did not open easily after heating and had to be extracted mechanically.

Therefore these cones would likely not open under normal conditions and seeds are likely entombed in these cones.

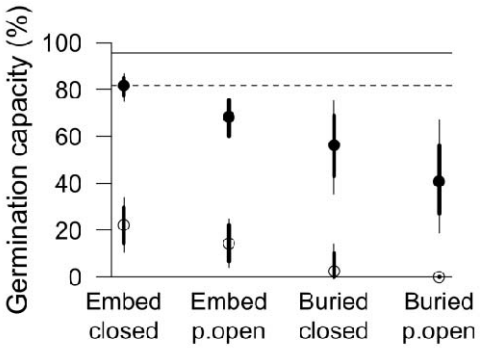

Fig. 2 Germination capacity of partially buried cones (embedded) and completely buried cones for stand killed by MPB 9 years earlier (dark circles). The open circles relate to seed from cones where seeds had to be extracted using mechanical means.

Implications: The seed stored in closed or partially-opened cones in the canopy of dead trees retains a high level of viability for at least 15 years after MPB. Treatments that provide seedbeds and allow for opening of these cones could be used to promote pine regeneration even a decade after MPB attack. Cones buried in the forest floor could also play some role in regenerating these stands. As there is also considerable loss of seed from the canopy due to cone loss from branch breakage in the crowns or through the opening of cones after MPB has killed the trees, there is some urgency to treat MPB killed stands early.

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Further Information:

Teste, F.P., Lieffers, V.J. and Landhäusser, S.M. 2011. Seed release in serotinous lodgepole pine forests after mountain pine beetle outbreak. Ecol, Appl. 21: 150-162.

Teste, F.P., Lieffers, V.J. and Landhäusser, S.M. 2011. Viability of forest floor and canopy seed banks in *Pinus contorta* var. *latifolia* (Pinaceae) forests after a mountain pine beetle outbreak. Am. J. Bot. in press.

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